



Seroprevalence of *Toxoplasma gondii* in donkeys (*Aquus asinus*) from Grenada, West Indies

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ABSTRACT

The objective of the present study was to estimate seroprevalence of *Toxoplasma gondii* in donkey from Grenada, West Indies. Using a modified agglutination test (MAT), sera of 37 donkeys were examined for evidence of exposure to *T. gondii*. Two (5.4%; 95 percent confidence interval: -1.88% to 12.68%) of the 37 donkeys were seropositive with titers of 50 in one donkey and 100 in the other. The lower Seroprevalence coupled with non consumption of meat and milk from donkey in Grenada suggests that donkeys are not important in the epidemiology of *T.gondii* in this country.

Keywords: *Toxoplasma gondii*, seroprevalence, donkeys, Grenada

Toxoplasma gondii is an obligate intracellular parasite that causes the zoonotic disease, toxoplasmosis. About 30-50% of the world's population is estimated to be seropositive (Flegr *et al.* 2014; Furtado *et al.* 2011) All warm-blooded animals including mammals and birds are susceptible to *T. gondii* (Robert and Darde, 2012). Cats are important in the life cycle of *T. gondii* because they are the only known definitive hosts capable of shedding environmentally resistant oocysts in nature (Dubey, 2010). Ingestion of oocysts shed by cats is the main source of infection for herbivores, where tissue cysts develop in infected animals

Humans can get infection through ingestion of oocysts, in contaminated water, vegetations and soil or from milk from *Toxoplasma* positive goats and donkeys (Dubey, 2010; Francesca, 2014) or from tissue cysts contained in undercooked meat of *Toxoplasma* positive animals and birds (Flegr *et al.* 2014). In most cases, infection with *T. gondii* is usually asymptomatic in humans with a competent immunity. Although primarily asymptomatic in healthy humans, toxoplasmosis is responsible for 10-30% of fatality in AIDS patients and if first contracted during pregnancy it can cause abortion or congenital problems in

the fetus. [(Flegr *et al.* 2014; Furtado *et al.* 2011; Robert and Darde 2012; Dubey 2010).

Infection of donkeys with *Toxoplasma gondii* has been reported in Italy (Francesca *et al.* 2014; Machakova *et al.* 2014), Turkey (Balkaya *et al.* 2011), China (Na Yang *et al.* 2013; Miao *et al.* 2013), Brazil (De Oliveira *et al.* 2013), Egypt (El-Ghaysh, 1998; Fauad *et al.* 2010), USA (Dubey *et al.* 2014), Mexico (Cosme *et al.* 2015) and in Spain (Garcia *et al.* 2012)

To our knowledge, there has been no report of *T. gondii* in donkeys from the Caribbean region. The aim of this study was to determine the seroprevalence of *T. gondii* in donkeys from Grenada, a small island country in east Caribbean.

MATERIALS AND METHODS

Geographic location of Grenada

Grenada, Petite Martinique and Carriacou make up the tri-island country of Grenada, located in the southern end of



the West Indies, about 160 km north of Venezuela. The climate is tropical with a wet and humid season occurring between June and December.

Sample collection and serology

Approximately 5 mL of blood was collected from each of 37 donkeys in Carriacou by jugular venipuncture and allowed to clot. All samples were centrifuged at 1000 g and serum was separated and stored at -20 °C until tested at the diagnostic laboratory of the St. George’s University, School of Veterinary Medicine. The samples were collected between September and October during 2013 and 2014 from Carriacou. This is the only part of Grenada where sufficient numbers of donkeys are domesticated. Serum levels of *T. gondii* IgG antibodies were detected using the Modified Agglutination Test (MAT) as described by Dubey and Desmonts (1987). Sera for the MAT test were diluted two-fold serially from 1:25 to 1:3200.

RESULTS AND DISCUSSION

Antibodies to *Toxoplasma gondii* were found in 2 (5.4%; 95 percent confidence interval: -1.88% to 12.68%) of 37 donkey serum samples tested, with titers of 50 in one donkey and 100 in the other.

A low to very high seroprevalence of *T.gondii* antibodies in donkeys have been reported from different parts of the world. Very high seropositivity was found in Egypt (45 % in serum and 46.3% in milk (Fouad *et al.* 2010). In another study in Egypt, El-Ghaysh (1998) found 65.6% positivity in blood. Very high Seroprevalence has also been reported from Brazil, 43.2% (De Oliveira *et al.* 2013) and Turkey 62.0% (Balkaya *et al.* 2011). Moderate Seroprevalence was found in China 20.3% (Miao *et al.* 2013) 23.6% (Na yang *et al.* 2013) Italy 25.0% (Francesca *et al.* 2014) and Spain 20.0% (Garcia *et al.* 2012). Similar to our study, low seroprevalence of *T.gondii* in donkeys was reported from the USA 6.3% (Dubey *et al.* 2014) Mexico, 10.9% (De Oliveira *et al.* 2013) and Italy, 5% to.8% (Francesca *et al.* 2014).The variation in seroprevalence in different counties may be due to methods of husbandry, and contact of cats with donkeys and their feed. We are not aware of the status of cats on the island of Carriacou, however food animals from Grenada and Carriacou had higher seroprevalence rates (Dubey *et al.* 2005; Chikweto *et al.* 2011; Sharma

et al. 2015). It is possible that husbandry and the environment of the donkeys could limit their contact with cats, infected feces or contaminated feed sources.

Table 1: Studies on seroprevalence of *T.gondii* antibodies in various hosts in Grenada, WI

Host	Seroprevalence (%)	Reference
Pregnant woman	57.0	Asthana <i>et al.</i> 2006.
Pet cat	36.0	Dubey <i>et al.</i> 2009
Feral cat	28.0	Dubey <i>et al.</i> 2009
Free range chicken	52.0	Dubey <i>et al.</i> 2005.
Rat	0.8	Dubey <i>et al.</i> 2006
Owned dog	25.0	Sharma <i>et al.</i> 2014
Stray dog	33.4	Sharma <i>et al.</i> 2014.
Goat	42.8	Chikweto <i>et al.</i> 2011
Cattle	8.4	Chikweto <i>et al.</i> 2011
Sheep	44.1	Chikweto <i>et al.</i> 2011
Pig	24.3	Sharma <i>et al.</i> 2014
Mongoose	17.0	Choudhary <i>et al.</i> 2013

Prior studies conducted on *T. gondii* antibodies from various animal species and pregnant women in Grenada showed a wide range of seroprevalence rates (Asthana *et al.* 2006; Dubey *et al.* 2009; Dubey *et al.* 2005; Dubey *et al.* 2006; Sharma *et al.* 2014; Chikweto *et al.* 2011; Sharma *et al.* 2015; Choudhary *et al.* 2013). (Table1).

This is the first study on *Toxoplasma gondii* seroprevalence in donkeys from Grenada. However, we found the seroprevalence in donkeys to be lower (5.4%) than most other animal species in Grenada. In various part of the world, the vast majority of donkeys are mainly used for draught, meat and milk production. In many countries now donkey is being kept as pet. Donkey meat is delicacy in most counties. Recently the use of donkey milk for children suffering from cow milk allergy is being advocated (Machakova *et al.* 2014; Fouad *et al.* 2010).

CONCLUSION

Since in Grenada meat and milk from donkeys are not consumed, coupled with our finding of low seroprevalence of *T.gondii* in donkeys, it is suggested that donkeys may not be important in the epidemiology of *T. gondii* in Grenada.

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