

Prevalence of Antibodies to *Toxoplasma gondii* and *Neospora caninum* in Pigs in Grenada, West Indies

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Abstract

The aim of the study was to estimate the prevalence of antibodies to *Toxoplasma gondii* (*T. gondii*) and *Neospora caninum* (*N. caninum*) in pigs in Grenada, West Indies. *T. gondii* is a serious zoonosis affecting the unborn fetus and immunocompromized individuals. *N. caninum* is a similar coccidian parasite, which is not zoonotic, but is the cause of abortion and neonatal mortality in livestock similar to *T. gondii*. An earlier study conducted in Grenada and using a modified agglutination test (MAT) revealed seropositivity to *T. gondii* in pigs. No information is available on *N. caninum* infection of pigs in the Caribbean islands including Grenada. Serum samples from 185 pigs in Grenada, West Indies were tested for antibodies to *T. gondii* and *N. caninum* using an indirect enzyme linked immunosorbent assay (ELISA). Antibodies to *T. gondii* were found in 24.3% of pigs (95% confidence interval (CI): 18.12% to 30.48%) as all the tested pigs were negative for antibodies to *N. caninum*. Although, seroprevalence for *T. gondii* was higher in females (25.75%) than in males (20.70%), this result was statistically insignificant ($p = 0.57$). The results were similar to a previous study in Grenada confirming the continuity of infection in pigs. Human Toxoplasmosis is transmitted mainly through ingestion of tissue cysts in contaminated raw or undercooked meat or sporulated oocysts in soil, water or vegetables. Education of farmers and the Grenadian community on epidemiology of these parasites is warranted to prevent infection in pigs and in humans. This is the first report on the seroprevalence of *N. caninum* in pigs in the Caribbean region.

Keywords

Toxoplasma gondii, *Neospora caninum*, Pigs, MAT, ELISA

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1. Introduction

Toxoplasmosis is a parasitic disease caused by protozoa *Toxoplasma gondii*. The parasite infects warm blooded animals including humans. Human infection is mostly through ingestion of tissue cysts in contaminated raw or undercooked meat or sporulated oocysts in soil and water [1]. In addition to the zoonotic potential of *T. gondii*, it causes mortality in neonatal pigs and reproductive failure in adult pigs. To the author's knowledge, there is limited data on the prevalence of *T. gondii* in pigs in the Caribbean countries. The seroprevalence of *T. gondii* in pigs was first reported in Trinidad [2] indicating seroprevalence of 5.5%. Chikweto *et al.* [3] using a modified agglutination test (MAT) reported seroprevalence of 23.1% in pigs in Grenada.

Neosporosis is an infectious disease primarily of cattle and dogs, and it has been reported rarely in other species [4] [5]. *N. caninum* is not considered to be zoonotic. However, Helmick *et al.* [6] in UK while working on the prevalence of Neosporosis in aborted sheep and swine reported 0.45% seropositivity to *N. caninum* in aborted sheep and 9.3% in aborted pigs, by ELISA, but all samples were negative when tested by IFAT. Damriyasa *et al.* [7] using ELISA reported a seropositivity of 3.3% for *N. caninum* in sows in Hesse Germany. To the authors' knowledge, there is no data on seroprevalence of *N. caninum* in pigs in the Caribbean countries.

The objective of this study is to estimate the seroprevalence of *T. gondii* and *N. caninum* in pigs from Grenada, West Indies.

2. Materials and Methods

2.1. Ethical Approval

The research project was approved by Institutional Animal Care and Use Committee (IACUC) of St. George's University, Grenada.

2.2. Collection of Samples

Grenada is the southernmost island country of the Southeastern Caribbean Sea. Its size is 344 Km² and the island is divided in 6 parishes. Jugular vein blood was collected from 185 pigs and after centrifugation at 3000 g for 5 minutes serum was removed and stored at -20°C until analysis. Blood was collected from 53 boars and 132 sows, ranging in age from 6 months to 2 years.

2.3. Methodology

A Commercial *Toxoplasma gondii* multispecies ELISA kit and *Neospora caninum* multispecies ELISA kit from Pourquier Laboratories (IDvet, France) for detection of anti *T. gondii* and *N. caninum* antibodies were used according to the manufacturer's instructions.

3. Results

Antibodies against *T. gondii* were found in 45 pigs (24.3%) (95% confidence interval (CI): 18.12% to 30.48%). Out of the positive animals, 11 (20.8%) were males and 34 (25.8%) were females (**Table 1**).

All serum samples were negative for antibodies against *N. caninum*.

4. Discussion

A worldwide distribution of *T. gondii* has been reported based mainly on serological surveys [1]. Seroprevalence of 23% in market pigs and 43% in breeder pigs, in the USA were detected during a survey in 1983-84. After a decade there was a decline in antibodies in pigs tested from the same areas [8]. Good husbandry practices

Table 1. Seroprevalence of *T. gondii* in pigs in Grenada, West Indies.

| Number of pigs tested | | Number positive | Percent positive |
|-----------------------|-----|-----------------|------------------|
| 185 | | 45 | 24.3 |
| Male | 53 | 11 | 20.8 |
| Female | 132 | 34 | 25.8 |

were attributed to this decline in seroprevalence of *T. gondii*. Like other food animals, pigs also get infected with *T. gondii* oocysts from cats. Pigs can also be infected through ingestion of infected rats [6] [9] and through feeding on milk from infected goats [10] [11].

Our results showed 24.3% (95% confidence interval [CI]: 18.12% to 30.48%) seropositivity for *T. gondii* in pigs using an ELISA. This is similar to the first study conducted by Chikweto *et al.* [3] in Grenada, in which a seroprevalence of 23.1% was reported using a MAT. There is considerable variation in the Seroprevalence of *T. gondii* from different countries of the world. In Germany it was found to be 19% ([7]; in the USA, from 5% to 70.83 [1]; in Romania, 0.4% to 0.5% [12]; in Poland, 10.5% [13]; in Italy, 16.3% to 19% [14]; in the Netherlands, 2.6% [15]; 0.0% in Malaysia ([16] and in Serbia, 9.3% [17]. These variations are attributed to the type of husbandry, outdoor and indoor farms, access of cats to the farm, age of pigs, and the type of tests used for seroprevalence studies [1] [6].

Sera tested in the present study showed higher prevalence of antibodies to *T. gondii* in females compared to males, but this was statistically insignificant ($p = 0.57$). Published reports on association of gender and seroprevalence of *T. gondii* in pigs are scanty. Lonela *et al.* [9] reported a high seroprevalence of *T. gondii* in sows (80%) compared to boars (20%). Sergio *et al.* [18] in Brazil reported no association between gender and seroprevalence of *T. gondii* in pigs.

Canids are the final host of *N. caninum*. Livestock and wild animals get infected by consuming oocysts from infected canids. *N. caninum* is not zoonotic. Neosporosis is primarily a disease of cattle in which it is a major cause of abortion and reproductive disorders. Neosporosis in sheep and goats is asymptomatic. There have been reports on role of Neosporosis in abortion and neonatal mortality in adult sheep. However, the seroprevalence of *N. caninum* in sheep and goats varies from 0.6% to as high as 30.8% in various countries of the world [5].

There is paucity of published reports on Neosporosis in pigs. The few available reports indicate a very low seroprevalence of *N. caninum* in the swine population. Damariyasa *et al.* [7] reported a seropositivity of 3.3% pigs in Germany. Helmick *et al.* [6] reported seropositivity of 8.8% in pigs in the UK, but failed to confirm the seropositivity in that pig population by indirect fluorescent antibody test (IFAT) and an inhibition ELISA. A survey conducted in Brazil revealed a seroprevalence of 3.1% [18]. To the authors' knowledge, there is no report on seroprevalence of *N. caninum* in pigs in Caribbean countries. This is the first report on the seroprevalence *N. caninum* in Grenada and the Caribbean region.

5. Conclusion

Pork is popular meat in Grenada and preferred when cooked through barbeque. The chances of survival of *T. gondii* oocysts in barbeque cooked meat are increased. Infected animals could thus transmit the disease to humans.

Recommendation

Pigs in Grenada are moderately exposed to *T. gondii*. Measures taken to prevent toxoplasmosis in humans should include education of pig farmers and the community at large. Pig farmers need to realize the role of cats and rodents in transmission of infection to pigs. Cats and rodent in free farms with good sanitary practices will aid in the prevention of toxoplasmosis in pigs and humans. Grenadians must be educated about the importance of complete cooking of pork before consumption.

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Competing Interests

The authors declare that there is no competing interest.

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