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Seroprevalence of *Toxoplasma Gondii* Among Stray Cats in Qatar

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Toxoplasmosis is the most widespread infection worldwide due to the parasite *Toxoplasma gondii*. The protozoan is a ubiquitous pathogen of warm-blooded animals, including man. In man it is responsible for fetal damage and is a common cause of death in acquired immune deficiency syndrome patients, and is therefore considered as a major zoonosis (Dubey 1994). The infection has become a serious public health problem worldwide. It is estimated that about one third of the world population is chronically infected with *T. gondii* (Montoya et al. 2004, Zhou et al. 2008). The principal horizontal transmission of toxoplasmosis to humans is caused by consuming food or water contaminated with oocysts shed in the feces of infected cats or by eating undercooked meat from animals which have ingested oocysts and developed tissue cysts. (Dubey et al, 2009).

Indeed, Felids, mainly cats (*Felis catus*), can eliminate millions of environmentally resistant parasite oocysts in their faeces. Cats are often infected at less than 1 year of age where they can contaminate the environment shedding millions of oocysts per day for 1–2 weeks (Dubey, 2001). Stray cats are more likely to be exposed and infected; thereby contributing more frequently to environmental contamination than domestic indoor cats (Ballash et al, 2015). Stray - refers to street, alley, farm or semi dependent cats that may or may not receive some food directly from humans; however they do so indirectly by scavenging scraps from rubbish bins, dump sites or from slaughter remains on farms. No attempt is made to house these animals yet they may inhabit manmade structures such as farm buildings, factories, wharves or abandoned vehicles.

Moreover, the large home range of a feral cat of up to 10 km² ensures widespread contamination of the environment in a relatively short period, with some cats travelling up to 45 km in two days (Fancourt & Jackson, 2014). Indeed, stray cats are considered as the linkage between wild life and urban life in *T. gondii* transmission. The prevalence of *T. gondii* in cats is thought to reflect prevalence of the parasite in animals that cats access for food.

Under favorable climatic conditions privileged by humidity, oocysts develop infectivity in a few days by sporulation and may remain infectious for more than one year in unfrozen, moist soil (Mancianti et al, 2015). Number or

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presence of cats on farms was the risk factors the often identified in epidemiological studies. An environmental contamination with oocysts derived from infected cats can cause outbreaks of toxoplasmosis (Mullens, 1996; Karanis et al, 2013). Indeed, a large waterborne outbreak of toxoplasmosis in humans was epidemiologically linked to oocyst contamination of a water reservoir in British Columbia, Canada (Bowie et al., 1997).

In Qatar, scarce data are available about the prevalence of the parasite in the environment. Feline patent Toxoplasma-like coccidiosis among feral cats was investigated (Abu Madi & Behnke, 2014). Previous study reported an average seroprevalence rate in human of 29.8% with a progressive rise from 45 years of age (Abu Madi et al, 2008). Such observations provide further evidence for the increased risk of infection with acquisition of age through longer contact with infective parasite from the environment.

Within our current work, we investigated the prevalence of *Toxoplasma gondii* among stray cats in Qatar with gender, area and seasons correlation analysis.

Feral cats were caught live as part of the routine activities of the QCCU as described elsewhere (Abu Madi & Behnke, 2014). Briefly, trapped adult Cats were eligible for the trap-neuter-return (TNR) program and were transported to a shelter for sterilization, respecting current animal welfare rules. For each animal the GENDER, the AREA and the SEASON of sampling were recorded. Sera were checked to detect *T. gondii* IgG antibodies using the modified agglutination test (MAT) (Dubey and Desmonts, 1987). A titer of 1:25 or higher was considered indicative of *T. gondii* infection in cats. SPSS 21.0 statistical package has been used for the analysis.

Antibodies to *T. gondii* were found in 406 of the 495 (82%) of the stray cats in Qatar with four samples presenting prozone effect with negative result at the low dilution of 1:25 and positive agglutination at high dilutions $\geq 1:1600$. The overall seroprevalence, presented in our study, was 82%, which is far more than other reports from neighbor countries where prevalence among stray cats didn't exceed 19.6% in Kuwait (Abdou et al, 2013); 30.4% in Iraq (Switzer et al, 2013) and ranged from 33 to 52% in Turkey depending of the used technique (Ozkan et al, 2008 & Can et al, 2014).

Positive MAT results were found among 82.5% of male, 81.6% of female, 82.4% from urban area and 81.7% from sub-urban localities with no significant difference between the subgroups. The consistent high seroprevalence, in the different sampling areas, demonstrates a high level of *T. gondii* contamination throughout Doha. The non-significant difference between seroprevalences in male and female cats suggests that both genders are equally exposed and susceptible to infection.

Taken in account the season of sampling, 333 sera from 394 sampled in Summer were positive (84.5%). Anti-*T.gondii* antibodies were found in 73 of 101 sera sampled in Winter (72.3%). The difference is retained significant ($p < 0.005$). From the overall seropositive cats, 37.7% have a titer greater than 1:400. The observed high seroprevalence and its significant correlation to season of sampling gives further confirmation of the fact that favourable climatic conditions support long-term oocyst survival in the environment. While oocysts are not infective when first shed, they sporulate and become infective after 1–5 days in the environment and can remain viable at least 18 months under cool and moist areas (Frenkel et al, 1975).