

# REVIEW OF TOXOPLASMOSIS IN MALAYSIA

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**Abstract.** Various studies on toxoplasmosis in Malaysia have shown that specific antibodies to *Toxoplasma gondii* are common among Malaysians. Among the ethnic groups, the Malays have the highest prevalence rate followed by Indians, Orang Aslis (aborigines) and Chinese. Antibody is acquired early in life and increases with age. There is no significant difference in the prevalence rate between males and females. The disease is apparently more prevalent among rural dwellers and those in the lower socioeconomic group. It appears that the prevalence rate is also influenced by environmental conditions, occupation, diet and cultural habits. Studies with animals have shown the presence of antibody to *T. gondii*, but this does not seem to be the source of infection since Malaysians normally cook their meat well.

## INTRODUCTION

Toxoplasmosis is an infection caused by a protozoan parasite, *Toxoplasma gondii*. It has a worldwide distribution. The infection is acquired through ingestion of oocysts shed by cats into the environment, ingestion of undercooked or raw infected meat, and through transplacental transmission or congenital infection.

Estimates on the prevalence of toxoplasmosis mainly rely on the detection of specific antibodies to *T. gondii*. Various serological methods have been used in Malaysia to detect the antibodies in men and animals, such as the indirect hemagglutination (IHA) technique (Singh *et al*, 1967; Tan *et al*, 1973; Tan *et al*, 1978), Sabin-Feldman dye test (Bisseru and Lim, 1974), indirect fluorescent antibody test (IFAT) (Cheah *et al*, 1975; Dissanaik *et al*, 1977; Zahedi *et al*, 1985) and enzyme-linked immunosorbent assay (ELISA) (Chan *et al*, 1985; Rahmah *et al*, 1989). They considered ELISA a good alternative to the conventional IFAT and it was more sensitive than the IFAT. Indira *et al* (1989, unpublished observation), showed that the indirect immunoperoxidase technique (IIP) was also useful for the diagnosis of toxoplasmosis.

### Seroprevalence among human populations

Tan and Zaman (1973) reported 13.9% of 728 sera collected from healthy individuals of different

age groups, races and occupation from various parts of West Malaysia, to be IHA positive. Using the Sabin-Feldman dye test, Bisseru and Lim (1974) examined sera from 44 Orang Asli patients admitted to hospital for various medical conditions and reported a positive rate of 4.6%. Cheah *et al* (1975), studied 1,459 sera from pregnant female patients (40 were foreigners) who came to the University of Malaya Hospital for antenatal care and delivery, and 27.0% were positive with IFAT titers at 1:16 or higher. In later studies, Dissanaik *et al* (1977), reported that of 226 sera from Orang Asli (aborigines) tested, 16% had positive IFAT titers of 1:64 and higher. An equal number reacted at 1:16 showing that a good percentage of this community had experience with *T. gondii*.

In a study by Tan *et al* (1978), 161 infectious mononucleosis (IM) negative sera were tested for *Toxoplasma* antibodies using IHA and 24.1% were positive. Among the positive, 11.1% were considered to have acute toxoplasmosis, while 13.0% had residual antibodies indicating previous infection. Thomas *et al* (1980), collected 736 sera from cord blood, babies, children and adults of both sexes of different age groups, races, occupation and socioeconomic groups. Using the IFAT, 20.9% were positive at titers of 1:64 and higher; 11.8% were reactive at a titer of 1:16. In another study by Sinniah *et al* (1984), a total of 1,597 sera were collected from the main ethnic

Table 1

The prevalence of *Toxoplasma gondii* antibody in major ethnic groups in Peninsular Malaysia.

References	Overall prevalence (%)	Percent positive by ethnic group			
		Malays	Indians	Chinese	Orang Asli
Tan and Zaman, 1973	13.9 (728)*	25.4 (257)	19.6 (251)	5.0 (220)	-
Bisseru and Lim, 1974	4.6 (44)	-	-	-	4.6 (44)
Cheah <i>et al</i> , 1975	27.4 (1419)	38.8 (431)	25.2 (373)	20.7 (1615)	-
Dissanaike <i>et al</i> , 1977	16.0 (226)	-	-	-	16.0 (226)
Thomas <i>et al</i> , 1980	20.9 (736)	33.9 (118)	23.2 (138)	14.6 (212)	19.0 (268)
Sinniah <i>et al</i> , 1984	30.2 (1550)	37.7 (803)	29.9 (197)	20.8 (298)	17.5 (252)

\* Number in parenthesis = number tested.

groups (Malays, Chinese, Indians and aborigines), and 30.2% of them had positive titers by the IFAT. In a recent study by Zahedi *et al* (1985), a total of 1,772 serum samples from normal persons of different occupational groups were screened for toxoplasmosis using IFAT and the prevalence rate in these workers was 25% to 51.2%.

#### Ethnic group and antibody prevalence

The prevalence of *Toxoplasma* antibody among the four major ethnic groups are summarized in Table 1. The major ethnic groups are Malays, Chinese, Indians and Orang Asli.

Studies by various workers showed that the prevalence rate was highest in Malays, followed by Indians and lowest in Chinese. Dissanaike *et al* (1977) and Thomas *et al* (1980) showed that Orang Asli had higher prevalence rates than Chinese but lower than Indians.

#### Association of age and sex and antibody prevalence

Antibodies were detected in sera samples of all age groups as well as from cord blood. Antibody

was observed to be acquired early in life and tended to increase with age. Tan and Zaman (1973) reported a slightly higher prevalence of antibody to *T. gondii* in males (14.8%) than in females (10.35%). In another study by Tan *et al* (1978) on infectious mononucleosis negative sera, antibody prevalence rates were found to be higher in males.

Thomas *et al* (1980) found no significant differences in the overall prevalence rates between males (20.1%) and females (21.6%). However, they noted that among the Indian group, the prevalence rate in females (20.75%) was significantly higher than the males (10.8%).

#### Socioeconomic status, geographical distribution and antibody prevalence

Cheah *et al* (1975) showed that among those positive for antibody, 71.8% were from the lower income groups compared to 28.2% from the higher income groups. Their study also showed that the antibody prevalence rate and antibody titers were higher among rural and suburban dwellers. These findings were also observed by Thomas *et al* (1980).

### Occupation and antibody prevalence

In a study by Tan and Zaman (1973), five occupational groups were examined for *Toxoplasma* antibodies. Padi planters were found to have the highest prevalence rate (22.2%), followed by veterinarians (20.2%), workers in oil palm and rubber estates (13.5%), antimalarial laborers (10.1%) and underground tin miners (3.7%). Zahedi *et al* (1985), investigated four different occupational groups, and found that zoo workers had the highest prevalence rate (51.25%), followed by medical students (41.7%), vegetarian Hindu priests (29.4%) and housewives (25.0%). Strict vegetarian habits of the Hindu priests do not seem to prevent them from becoming infected.

### Ownership of cats and antibody prevalence

Zahedi *et al* (1985), also studied the association of ownership of cats and antibody prevalence rate. They showed a positive correlation between cat ownership and seropositivity: 31% of cat owners were positive for toxoplasmosis, while only 23.8% of non-cat owners were positive (Chi square = 6.28; 0.02 > p > 0.01).

### Seroprevalence in domestic and wild animals

Serological studies of toxoplasmosis among Malaysian domestic animals (Singh *et al*, 1967), showed seropositivity in pigs as 12.5%, buffaloes 11.2%, goats 9.5% and cattle 4.1%. Chooi (1989), showed a prevalence rate of 1.2% in pigs slaughtered for human consumption in Selangor. There is, therefore, an apparent lower prevalence rate among local pigs.

In a study by Lokman *et al* (1989), the prevalence of *Toxoplasma* antibodies in wild caught monkeys was found to be 3.0% in *Presbytis cristata*, 16.7% in *Macaca fascicularis* and 57.1% in *Macaca nemestrina*.

## DISCUSSION

Studies in Malaysia have shown that specific antibodies to *T. gondii* are common among Malaysians. There is a difference in the prevalence rate among the main ethnic groups; it is highest among groups of Malays and lowest among Chinese. Similar findings were observed in Singapore (Lim *et al*, 1982). The close association of Malays with cats was postulated as the

cause for the high prevalence rate in this ethnic group. The Malays do not keep dogs for religious reason, thus enabling stray cats to freely frequent their habitations. They are, therefore, exposed more often to oocysts deposited by cats (Tan and Zaman, 1973; Thomas *et al*, 1980). Zahedi *et al* (1985), showed that there was a positive correlation between cat ownership and seropositivity. However, they noted that among the *T. gondii*-positive housewives, only 21.4% kept cats in their homes. They concluded that constant contact with an environment contaminated with oocysts from cats feces, and not the ownership of cats, was the most important predisposing factor to toxoplasmosis. Frenkel and Ruiz (1981) showed that an antibody prevalence rate in Costa Rica correlated highly with individual cat contact and with cat density.

Malaysian Chinese were shown to have the lowest prevalence rate. The same observation was reported among Chinese in Singapore (16-22% for Chinese, compared to 20.1-39.0% for Malays and 19.3-37.0% for Indians) (Lim *et al*, 1982) and in Indonesia (2.3-7.0% for Chinese, compared to 14.3-18.0% for Indonesians) (Partono and Cross, 1975; Gandahusada, 1978). The low prevalence rate in this ethnic group indicates that infected pork is not the main source of infection, as the Chinese are known to consume more pork than the Indians, while Malaysian Muslims do not eat pork. The chance of acquiring infections through ingestion of infected meat is rare since Malaysians generally cooked the meat well (Thomas *et al*, 1980).

The fairly high prevalence rate among Indians could be explained by their socioeconomic activities. They are mostly involved in agriculture pursuits and use their hands for tilling lands and collecting their products. The soil where they work may be contaminated with oocysts from cat feces and they may get infected through contaminated hands.

The antibody prevalence rate among Orang Asli was higher than that of the Chinese. Being semi-nomadic, they do not have close association with cats. In fact their association is more with dogs. They still hunt wild animals, such as monkeys, for their food. A recent study (Lokman *et al*, 1989) showed that the antibody prevalence in three species of wild caught monkeys was

high. These monkeys may, therefore, serve as a possible source of *Toxoplasma* infection in this community.

Congenital toxoplasmosis seems to be rare in Malaysia. Thomas *et al* (1980), showed that although a high percentage (22%) of sera from cord blood showed antibodies to *T. gondii*, none of them had specific IgM antibodies. The Institute for Medical Research has been screening sera from neonates suspected to be suffering from intrauterine infection; 0% and 1.88% were positive for specific IgM antibodies in 1988 and 1989, respectively (unpublished observation).

It was observed that the antibody prevalence rates were different between various occupational groups. The nature of work may expose people to the risk of getting toxoplasmosis (Fayer, 1981). Tan and Zaman (1973) explained that the high prevalence rate of antibodies among padi planters was due to their being in farms where domestic animals and cats were often kept. Veterinarians, because of constant contact with animals, also had high antibody rates. A similar explanation would appear to hold for the high prevalence rate among zoo workers (Zahedi *et al*, 1985).

The high prevalence rate of antibodies among the lower-income group could be explained by the life style and habits of this group, their daily past-times and hobbies normally centered in and around their homes, and domestic cats being the favorite pets (Cheah *et al*, 1975).

Toxoplasmosis is apparently more prevalent in the rural areas (Cheah *et al*, 1975; Thomas *et al*, 1980). More human-contaminated soil contact in the subsistence agriculture in the rural environment could probably explain this situation.

Seroprevalence surveys among meat animals in Malaysia showed the presence of antibody to *T. gondii* (Singh *et al*, 1967). A lower prevalence rate among local pigs, from 12.5% (Singh *et al*, 1967) to 1.2% (Chooi, 1989), could be due to less exposure of pigs to the parasites. The majority of pigs are now reared on concrete floors and fed a commercially prepared diet, compared to the traditional methods of rearing on soil and feeding on table scraps.

In summary, toxoplasmosis in Malaysia is influenced by various factors including environ-

mental conditions, dietary and cultural habits, age, occupation, geographical distribution and socioeconomic status. Environmental contamination and constant contact with cats are the most important contributing factors to *T. gondii* infection.

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