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Soil transmitted helminths in animals – how is it possible for human transmission?

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ABSTRACT

Objective: To determine the current prevalence of soil transmitted helminths (STH) infections among cats and dogs in an animal shelter.

Methods: A total of 442 animal's faecal samples were collected from the selected animal shelter located in Kuala Lumpur, Malaysia. The samples were screened by direct smear and further confirmed by formalin-ether sedimentation methods.

Results: The overall prevalence of STH in animals was 48.4%. Among these, 51.5% and 45.8% were found in dogs and cats respectively. Among feline, hookworm was found to be the most predominant (41.7%), followed by *Toxocara cati* (4.6%). Whereas, hookworm was found to be the most predominant in canine (47%), followed by *Toxocara canis* (15.8%) and *Trichuris vulpis* (5.9%).

Conclusions: A high prevalence of STH infections was found among animals living in this local shelter. Hence, appropriate preventive measures should be taken to eradicate these infections.

1. Introduction

Zoonosis or zoonotic disease is an infection that transmits naturally from vertebrate animals to humans. Zoonotic diseases can be caused by viruses, bacteria, fungi, as well as parasites. Among these, soil transmitted helminth (STH) is a group of parasitic nematode that infect both humans and animals through the ingestion of infective eggs or through contacting with its larvae. It has also been suggested that domestic cats and dogs play a crucial role in parasitic transmissions to humans and other animals through an environment that has been contaminated with the infected animal's

faeces[1]. There are three main species of STHs, which include hookworms, *Toxocara* spp. and *Trichuris* spp., that are known to be the cause of major health problems among animals.

Hookworm is a parasite that is known to inhabit the small intestines of humans and animals, in which the cats and dogs hookworm species, such as *Ancylostoma ceylanicum*, *Ancylostoma braziliense* and *Ancylostoma caninum* are potential agents to cause zoonotic disease in humans[2,3]. The eggs of these parasites that are shed in the faeces can eventually contaminate the ground where the animal defecates. People become infected when the hookworm larvae penetrate unprotected skin, especially when walking barefoot or sitting on contaminated soil or sand. This can result in a disease called cutaneous larva migrans, where the larvae migrate through the skin and cause inflammation[4]. The symptoms caused by these zoonotic hookworms include eosinophilic enteritis, abdominal pain, diarrhoea, and less frequent symptoms such as localized myositis and erythema multiforme, and ophthalmological manifestations may occur[5-7]. Among the variant species, *Ancylostoma ceylanicum* is the only species of animal hookworm known to produce patent infections in humans and it is the second most common hookworm species infecting humans in Asian countries, such as Cambodia, Thailand, Laos, Malaysia, China and the Philippines[6-12]. *Ancylostoma caninum*, which is the canine hookworm, remains

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The ethical consideration (reference no. MEC1024.6) was obtained and approved by the Ethics Committee of the University Malaya Medical Centre, University of Malaya, Kuala Lumpur, Malaysia, prior to samples collection. Permission was also obtained from the respective authority of the animal shelter.

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the leading cause of human eosinophilic enteritis[6,13]. An outbreak of 150 cases was reported between 1988 and 1992 in Australia[14]. Moreover, several cases have also been reported in the USA, Mexico, India, Iran and the West Indies[15-20].

Toxocariasis results from the zoonotic transmission of roundworms, *Toxocara canis* (*T. canis*) and *Toxocara cati* (*T. cati*) from dogs and cats, respectively. Infection occurs when humans accidentally ingest the embryonated eggs that shed in dog and cat faeces via hand-to-mouth contact. Children are particularly prone to infection because they are exposed to the eggs in sandboxes and on playgrounds contaminated with dog and cat faeces[21,22]. After ingestion of the eggs, the released larvae penetrate the intestine and migrate through the liver, lungs and central nervous system, leading to two major clinical syndromes known as the visceral larva migrans and ocular larva migrans[23]. Visceral larva migrans occurs most commonly in young children and results in hepatitis and pneumonitis, as the larvae migrate through the liver and lungs, respectively. The full clinical presentation of toxocariasis includes hepatomegaly and pulmonary infiltrates or nodules accompanied by cough, wheezing, eosinophilia, lymphadenopathy and fever. Larval entry into the central nervous system can also result in meningoencephalitis and cerebritis and result in seizures[24-26]. Ocular larva migrans occurs more frequently in older children and adolescents and may result from the migration of even a single larva in the eye[27]. The manifestation of the infection is usually unilateral[27,28]. However, the resulting inflammation presents clinically as either a granuloma or a granulomatous larval track in the retina or as a condition of the vitreous body resembles endophthalmitis[29,30]. In serious cases, it may cause permanent vision lost in the patient[29].

Zoonotic trichuriasis is an infection caused by whipworm[31]. A few clinical cases that were triggered by *Trichuris vulpis* (*T. vulpis*) originating from dogs were reported in Thailand, the USA and Mexico[32-35]. In comparison to *T. vulpis*, *Trichuris serrata* and

Trichuris campanula are the two species of whipworms that can infect cats. There was a low prevalence of parasites in cats reported in previous studies. As a result, whipworm infection in cats is not a primary differential diagnosis for cats with diarrhoea[36].

To date, most studies have focused more on STH infections among humans and the aborigine population. However, data on the prevalence of STH infections among animals living in local shelters are still lacking. In addition, most of the literatures have proposed the prevalence of STH infection among animals in Western countries. However, this information remains scanty in Malaysia. Hence, this study was conducted to determine the prevalence of STH infection in animals living in an urban local shelter. The establishment of such data may shed some light on the topic for public health authorities as they can rectify the effectiveness of current control programs and for the planning of control strategies to reduce the prevalence of STH infections in animals.

2. Materials and methods

2.1. Ethics statement

The ethical consideration (reference No. MEC1024.6) was obtained and approved by the Ethics Committee of the University Malaya Medical Centre, University of Malaya, Kuala Lumpur, Malaysia, prior to samples collection. Permission was also obtained from the respective authority of the animal shelter.

2.2. Study design

The selected local animal shelter (Figure 1) is a non-government organization that provides basic necessities (foods, vaccinations, medical related treatments and adoptions) for more than 500 animals to facilitate their future adoption. The animals were either

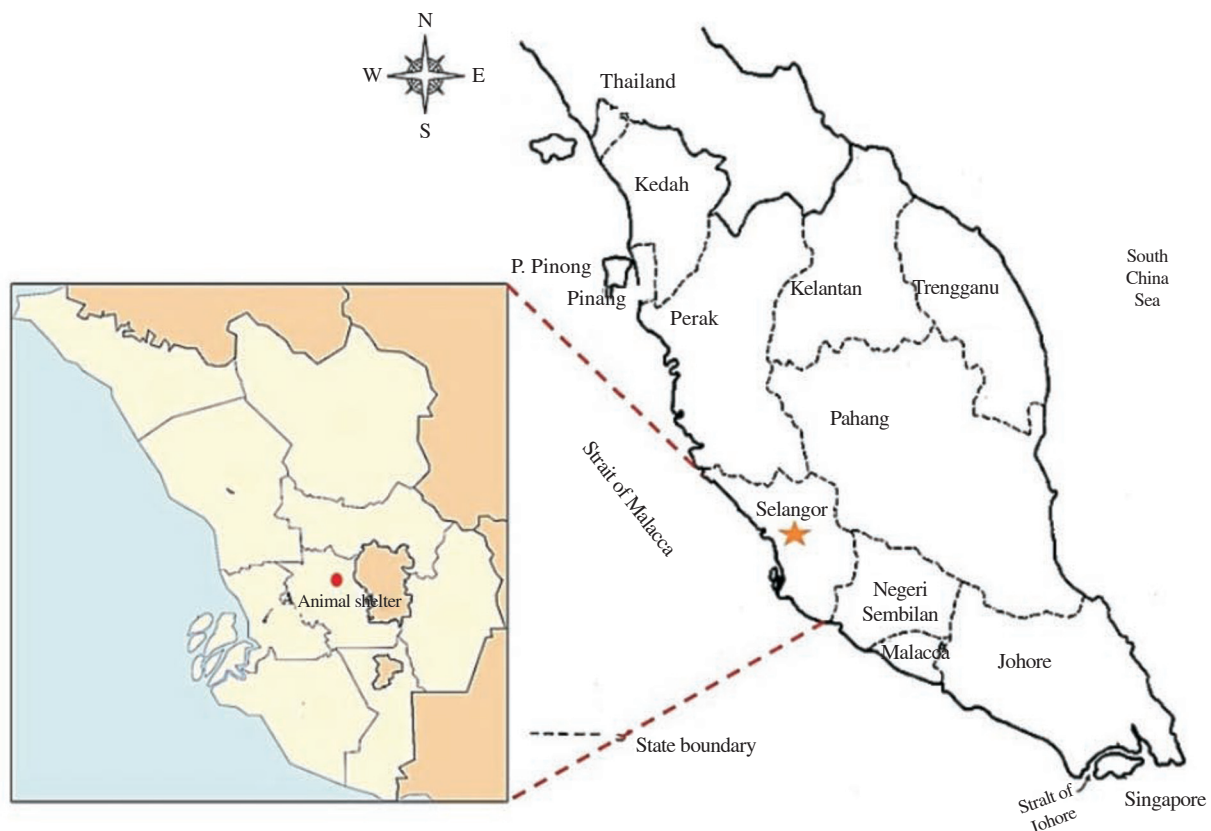


Figure 1. The location of selected animal shelter in this study.

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