

**PREVALENCE STUDY OF INTESTINAL PARASITES
IN STRAY CATS IN USMKK, HEALTH CAMPUS**

by

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requirements for the degree of Bachelor of Health
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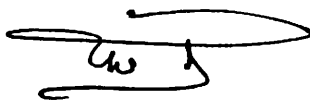
CERTIFICATE

This is to certify that the dissertation entitled

**“Prevalence Study of Intestinal Parasites in Stray Cats in USMKK,
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Abstract

This dissertation is written for the final year project. It is a study of a prevalence of intestinal parasites in stray cats in USMKK Health Campus. A total of 25 stray cats had been caught within 3 months. 5 stray cats were caught from Desasiswa Nurani, 10 from Desasiswa Murni, 5 from School of Medical Sciences, 2 from School of Health Sciences and 3 from around the USM hospital area. From the total of all 25 stray cats, 9 types of intestinal parasites had been identified from their stool samples by using saline wet mount preparation and Lugol's iodine wet mount preparation. The overall prevalence of intestinal parasites infection was 100% out of the 25 cats which involved in this study. Those parasites are *Taenia taeniaeformis*, Hookworms, *Trichuris spp.*, *Diphyllbothrium latum*, *Toxocara cati*, *Toxoplasma gondii*, *Giardia lamblia*, and *Isospora felis*. The highest prevalence among those intestinal parasites is *Toxocara cati* with the prevalence of 72%. The prevalence of *Ancylostoma spp.* is the second highest and that is 48%. *Taenia taeniaeformis* and *Trichuris spp.* have the same prevalence of 40%. The prevalence of *Toxoplasma gondii* and *Isospora felis* are both 32% among the 25 stray cats. Then *Diphyllbothrium latum* and *Giardia lamblia*, both had a prevalence of 28%. The prevalence of these intestinal parasites inside the stool samples of stray cats in USMKK Health Campus should be given a quick and effective response from the authorities of this campus so that public health wellness in this campus is left unharmed.

Abstrak

Disertasi ini ditulis untuk projek tahun akhir dan ia berkenaan dengan kajian prevalens parasit usus pada kucing liar di Kampus Kesihatan USMKK. Sejumlah 25 ekor kucing liar telah ditangkap dalam masa 3 bulan. 5 ekor daripada kucing liar itu telah ditangkap di Desasiswa Nurani, 10 ekor di Desasiswa Murni, 5 ekor di Pusat Pengajian Sains Perubatan, 2 ekor di Pusat Pengajian Sains Kesihatan dan 3 ekor lagi di Hospital USM. Daripada jumlah keseluruhan tersebut, 9 jenis parasit usus telah dikenalpasti dari sampel tinja kucing-kucing tersebut dengan menggunakan "Saline wet mount preparation" dan "Lugol's iodine wet mount preparation". Prevalens keseluruhan jangkitan parasit usus adalah 100% bagi kesemua 25 ekor kucing yang terlibat di dalam kajian ini. Parasit-parasit tersebut adalah *Taenia taeniaeformis*, cacing pita, *Trichuris spp.*, *Diphylobothrium latum*, *Toxocara cati*, *Toxoplasma gondii*, *Giardia lamblia*, dan *Isospora felis*. Prevalens yang tertinggi ialah *Toxocara cati* dengan prevalens sebanyak 72%. Prevalens bagi parasit jenis *Ancylostoma spp.* adalah yang kedua tertinggi iaitu 48%. *Taenia taeniaeformis* dan *Trichuris spp.* mempunyai prevalens yang sama iaitu 40%. Prevalens bagi *Toxoplasma gondii* and *Isospora felis* pula, adalah 32%. *Diphylobothrium latum* dan *Giardia lamblia* kedua-duanya mempunyai prevalens sebanyak 28%. Pihak berkuasa universiti haruslah mengambil tindakan dengan cepat dan berkesan terhadap kesemua prevalens parasit usus yang terdapat di dalam sampel tinja kucing-kucing liar yang berkeliaran di Kampus Kesihatan USMKK ini agar kesihatan umum di dalam kampus ini tidak terganggu.

1.0 Introduction

This final year research dissertation is made as a partial fulfillment for the graduation of the Bachelor of Health Sciences (Biomedicine) of USM. This research has been conducted as early as August 2005 where the proposal of this research has been made. Then, detail planning on how this research will be done was carried out. The outdoor and the laborious laboratory works were done from January until March 2006.

Felis catus are more commonly known as domestic cat, has been a quite common animal in our lives. They are everywhere. They are around us. These animals are so close to us that some of us love them so much they even take cats as their pet. These cat lovers, they take care of their cats, groom them, feed them and even take their cats as companion through their lives.

Most cats that are taken as pet can be grouped as the indoor cats. From a certain point of view, it is not wrong to say that these indoor cats are better than the stray cats. They don't have to face tons of dangers waiting for them outside of the house like being run over by cars, other cats challenging them for a fight and the most important of all they are safe from the exposure of diseases and parasites. Moreover, their owners will take them to the veterinary if they fell sick or maybe they will take them there just for a regular checkup.

works are done for 3 months. Three stray cats are caught in a week. So, for that period of study I managed to catch a total of 25 stray cats around the campus. The cats are put in the cages overnight and the stool samples are collected on the next morning. The stools were taken to the laboratory for macroscopic and microscopic examination straight away after being collected. Any encounters of intestinal parasites like helminth eggs or ova and protozoa cysts or oocysts were recorded. The results were then analyzed for the prevalence of intestinal parasites in those stray cats.

In USMKK Health Campus, we still don't know whether the stray cats living in our campus is safe to the students and public. Students and public are often seen feeding these stray cats, holding them, playing with them and rubbing their fluffy furs. They are enjoying those things. Those kinds of acts done by the students and public can cause them serious health problem if those cats are carrying infective helminth eggs, protozoa cysts and viruses. The students and public can get infected from those cats. This research is done to find out the health conditions of these stray cats, that is whether they are carrying any intestinal parasites or not and if they are, we will find out what kind of intestinal parasites that they are carrying. This will determine whether their health condition has great possibility to do any harm the public safety in this campus or they are boldly harmless.

1.1 Objectives

There are three objectives in this research and they are:

1. To find out whether stray cats in USMKK Health Campus have any intestinal parasites by examining their stool sample.
2. To find out what kind of intestinal parasites those cats are bearing if they happened to have any intestinal parasites.
3. To find out whether these stray cats have any possibility to harm the public health in USMKK Health Campus.

1.2 Literatures review

1.2.1 Stray cats

Overgaauw *et al.* (1998) mentioned that the most of the domestic cats there go outdoors and are likely therefore to be exposed to helminth eggs, particularly in areas with high density of domestic or stray cats. Places used for defaecation are often shared by several cats. This may lead to contamination of the cats' paws with infective eggs as they bury their faeces. Some cats hunt and eat birds and small mammals that can act as paratenic hosts for helminth parasites.

From the American Bird Conservancy's Resolution On Free-Roaming Cat (1997), it says that there are 10 million of free roaming domestic cats (*Felis catus*), including owned, stray (lost or abandoned by their owners) or feral (descendants and strays and shunning all human contact) are non-native predators and exist in significant densities throughout most areas populated by humans in the United States and free-roaming domestic cats are efficient predators estimated to kill hundreds of millions of native birds and countless small mammals, reptiles and amphibians each year. It also states that bites, scratches, and fecal contamination from free-roaming cats pose a health risk to the general public through transmission of diseases such as toxoplasmosis, roundworm, cat scratch fever and rabies.

BC Health Files (2005) indicates that cat can pass diseases on to human being. Most of the infected cats do not appear to be sick. The cats' feces contain the parasite for only two weeks after the cat is infected. However, the feces themselves may remain infectious for over a year.

1.2.2 Intestinal parasites

1.2.2.1 Roundworm and Whipworm

Intestinal parasites remain a major health problem in many developing countries. The World Health Organization (WHO) estimated that there were 1000 million cases of ascariasis due to *Ascaris lumbricoides*, and 500 million cases of *Trichuris trichiura* infection worldwide. In 1994, it is estimated that worldwide there were 1471 million and 1048 million cases of *A. lumbricoides* and *T. trichiura* infections, respectively. Clinically, *A. lumbricoides* can cause blockage of the intestine and *T. trichiura* has been associated with dysentery. Both helminths have also been associated with stunted growth and impaired cognitive functions in children. Another common soil transmitted helminth that causes severe morbidity and is often found with *A. lumbricoides* and *T. trichiura* infections is hookworm (Smith *et al.* 2001).

Geohelminthic infections are acquired by humans as a result of their contact with soil. The infective forms of the parasites are present in the soil and man acquires the infection from the soil, during ingestion of food contaminated with infective forms, walking bare foot, gardening activities, and other activities which entail contact with the soil. Ascariasis, ancylostomiasis, trichiuriasis, and strongyloidiasis are the principal geohelminthic infections to affect man. Roundworm infestation occurs in 70-90% people in tropic region due to *Ascaris*

lumbricoides. It affects 1.4 billion people in the world. Hookworm affects 1.3 billion people worldwide. Trichiuriasis affects 800 million people globally, and is widespread in South East Asia, including India (Parija *et al.* 2003).

Among children, an estimated 59 million cases of *Ascaris* infection are associated with significant morbidity; the estimate for acute illness is 12 million cases per year with approximately 10,000 deaths. The parasites have a widespread distribution in the tropics and subtropics, including both rural areas as well as the slums of large urban areas of the developing world. The Chinese national survey conducted between 1988 and 1992 estimated that 531million of *Ascaris* infection and 212 million cases of *Trichuris* infection occur in that country alone. *Ascaris* is typically more predominant soil-transmitted helminth in any given area, although *Trichuris* predominates in some parts of Southeast Asia, Africa, and the Caribbean. In some regions the prevalence may reach 95% among children. In developing countries, it is common to encounter children who are coinfectd with both *Ascaris* and *Trichuris*, and there is a statistically significant association between the two (Hotez *et al.* 2003).

According to Overgaauw and Boersema (1998), who had some research on *Toxocara* infection in cat breeding colonies in Netherland, said that the intestinal helminth described in cats in the Netherland include *Dipylidium caninum*, *Toxocara cati* and *Toxascaris leonine*. *Toxocara spp.* infections have important public health consequences because of their zoonotic significance. Factors that have been shown to play a role in the epidemiology of *Toxocara* infections in humans in the

Netherlands include soil contamination, and infection of companion dogs and cats, stray cats and dogs in breeding kennels.

Toxocara cati is the most common of the intestinal nematodes of cats, and in the opinion of many, the most important. This is the largest of the feline intestinal nematodes (3-10 cm) and similar in appearance to the canine roundworm. The few prevalence studies that have been conducted in cats in the United States indicate that *T. cati* is the generally the most common. For example, *T. cati* was present in 43 percent of 60 cats surveyed in Kentucky and Illinois, and in 92 percent of the 13 control cats acquired for the anthelmintic study conducted in Arkansas. Researchers at Cornell University have conducted fecal examinations on both shelter cats and cats that were privately owned. The combined prevalence of *T. cati* in the two cat populations was 33 percent (n=263 cats). The prevalence of *T. cati* in shelter cats was 37 percent. Surprisingly, the prevalence in privately owned cats was 27 percent. Although some of the surveys indicated that juvenile cats are more likely than adult cats to maintain patent infections, other sources indicate that cats retain their susceptibility to *T. cati* infections throughout their lives (Blagburn, 2002).

1.2.2.2 Hookworms

Human hookworms infection is a soil-transmitted intestinal helminthiasis caused by either *Necator americanus* or *Ancylostoma duodenale*. Intestinal

infections with the canine hookworms *Ancylostoma ceylanicum* and *Ancylostoma caninum* rarely occur as a consequence of zoonotic transmission. Like *Ascaris* and *Trichuris*, hookworms are among the most ubiquitous infectious agents of humankind; some estimates suggest that as many 1.2 billion people are infected worldwide. The infection is found wherever rural poverty occurs in a tropical or subtropical climate and adequate moisture. In the Western Hemisphere hookworm is common in rural areas of Central America and tropical regions of South America, including Brazil and Venezuela. In Asia, hookworms are highly endemic in South China, Southeast Asia, and the Indian Subcontinent (Hotez *et al.* 2003).

Hookworms (*Ancylostoma* spp.) are common intestinal parasites of dogs and cats (referred to here as pets). Not only can ascarids and hookworms cause disease in their respective hosts, they are also well-known causes of larva migrans syndromes in humans, especially children. While ascarids and hookworms are most commonly diagnosed in puppies and kittens, infections can occur in dogs and cats of all ages. Both puppies and kittens acquire hookworm infections (*A. caninum*, *A. braziliense*, and *A. tubaeforme*) through ingestion of or skin penetration by infective larvae, or from infective larvae passed in their dam's milk (*A. caninum*). Hookworms suck large amounts of blood from their hosts and while infected animals may look healthy in the first week of life, they can develop a rapidly severe, often fatal anemia (Parasitic Disease Information, CDC, 2004).

1.2.2.3 Tapeworms

Taenia taeniaeformis is the most common tapeworms. Cats become infected with this parasite by eating mice or other small rodents. The tapeworm, *Dipylidium caninum*, is the second most common tapeworm. Cats become infected with it by eating fleas or lice that carry the larval stages of this tapeworm. The least common tapeworm is the broad tapeworm, *Diphyllobothrium latum*. Cats acquire this parasite by eating raw fish. An understanding of the life histories of tapeworms helps to control these parasites. An adult *T. taeniaeformis* is approximately 60 cm long and lives in the small intestine of the cat. The posterior segments of the tapeworm produce eggs that accumulate until the segment becomes packed full. These gravid segments detach from the end of the tapeworm and pass in the feces. The detached segments are capable of movement and may crawl out of the anus onto the perianal skin. The eggs contaminate the food of rats, mice and rabbits and human. The egg must develop further in one of these animals to complete the life cycle of the tapeworm (Kennedy, 2001).

The gravid segments of the worm pass out with the feces of the cat or dog. Often, eggs are released from the segments before they are passed. The intermediate host ingests the eggs which are immediately infective. In the intermediate host, the embryo is released in the small intestine and the immature form migrates through the body to various organs, depending on the species of

Taenia. The immature form develops a small fluid-filled sac, called a bladder, which surrounds it and provides nourishment. When the 'bladder' is ingested by the definitive host, the head of the tapeworm is released, attaches itself to the intestinal wall, grows and segments. Cats and dogs may remain infected for a year or more, and the tapeworms can grow to be over 6 feet long (Nash, 2006).

As with other tapeworms, *D. latum* lives in the small intestines of its definitive hosts which include cats, dogs, fox, bear, other fish-eating mammals, and man. It is found in the Great Lakes area, in some southern Gulf areas and in the Arctic. Unlike other tapeworms already discussed, it has two intermediate hosts. The adult worms, which can reach the length of ten meters, are found in the small intestine of the definitive host. Instead of passing segments filled with eggs, *D. latum* eggs are discharged through a small 'uterine pore' in each segment. Segments which have released all their eggs are often shed in chains instead of individually. After the eggs are passed, they need to remain in water for 8 days before they are infective to the first intermediate hosts which are copepods, a type of freshwater crustacean. The *D. latum* embryos develop into second stage larvae inside the copepods. One copepod can contain large numbers of these second stage larvae. The copepods are often eaten by minnows in which third stage *D. latum* larvae develop. Often larger fish, such as perch, walleye, trout, and pike, will eat the minnows and the third stage larvae will move into the larger fish's tissues. A definitive host becomes infected by eating the infected minnows or larger fish (Nash, 2006).

1.2.2.4 Protozoa

a. Toxoplasma

Most cases of toxoplasmosis originate from contact with cats feces or from the consumption of raw meat. Cats are not likely to be infected if they have been raised indoors, never caught and eaten mice or birds and never fed raw meat. It also shows some of the common ways for people to become infected with toxoplasmosis like touching your hands to your mouth after cleaning a cat's litter box or touching anything that has come into contact with the cat feces, eating raw meat or undercooked meats, working in gardens or playing in sandboxes that contain cat feces, and drinking water contaminated with *Toxoplasma* (British Columbia Health Files, 2005).

Common examples of zoonoses are toxoplasmosis (a protozoan), psittacosis (virus) and ringworm (fungus). Toxoplasmosis is a protozoan which can be spread from cats and a wide variety of other sources to humans. A pregnant woman who contracts toxoplasmosis risks having a baby with congenital defects. Media attention is sometimes focused on Toxoplasmosis, a type of *Coccidia* that can cause birth defects in unborn babies. Toxoplasmosis, a disease of cats and other mammalian species, is caused by the protozoan parasite *Toxoplasma gondii*. Protozoa are single-celled animals and though infection with *Toxoplasma* is fairly common, actual disease caused by the parasite is relatively rare (Hartwell, 2003).

Toxoplasma transmissions to human have described two major natural routes (excepting transplacental infection in congenital transmission). The first route is infection by the oocysts through contact with infected cats or exposure to contaminated soil and the second route is infection by the cysts through ingestion of raw meat. It is generally accepted that the prevalence of *Toxoplasma* antibody in human populations depend on geographic, climatic, hygienic and socioeconomic conditions as well as on the lifestyle of the population. All of these factors are considered to be related to the opportunity for an individual to accidentally ingest either of the above two forms of the *Toxoplasma* organism (Terazawa *et al.* 2003).

b. Isospora

Coccidial infections in cats are caused by *Isospora* spp., also called *Cystoisospora*. The principal agents in the cat are *I. felis* and *I. rivolta*. These parasites reside in the posterior small intestine or in the large intestine depending on the species. Their life cycles are generally self-limiting, after which the infection is terminated. The parasites replicate first asexually by schizogony resulting in destruction of many host enterocytes in which they develop. Asexual development is followed by production of gametes that fuse to produce non-infective oocysts that are passed in feces. The developmental cycles in the feline host require four to 11 days depending upon the species (Blagburn, 2002).

c. *Giardia* and *Cryptosporidia*

Protozoan organisms consist up a group of intestinal parasites that some of them like as *Giardia* and *Cryptosporidia* have a zoonotic danger. Animals including cats can shed these organisms in their feces and lead to contamination of environment. Diagnostic problems in relation with their isolation and identification because of their very small size lead to a fact that a little study exist about these intestinal habitants. This study also showed that stray cats can harbor and shed these organisms in environment and some of them like as *Giardia* due to its zoonotic potential have very important role in public health considerations. Therefore, these animals need more attention and preventive methods concerning their contamination hazards should be noticed (Jamshidi, 2003).

Giardia infections in cats are caused by *Giardia intestinalis* (also called *G. lamblia*). The parasite usually resides in the small intestine, although exceptional infections in the lower bowel cannot be ruled out. *Giardia* is a dimorphic parasite in that it exists as a fragile flagellated binucleate trophozoite and a quadrinucleate cyst. The trophozoite attaches to the surface of epithelial cells in the small intestine; encystment (formation of cysts) occurs in the ileum, cecum or colon. Although the mechanism(s) of *Giardia*-induced disease remain unknown, evidence suggests that the disease is likely multifactorial involving inhibition of brush border enzymes or other factors such as altered immune responses, nutritional status of the hosts, presence of intercurrent disease agents, and the strain of *Giardia*

involved in the infection. Although many infected animals remain asymptomatic, the most common presenting sign is small bowel diarrhea. Feces are usually semi-formed, but may be liquid. Blood usually is not present. Feces have been described as pale (often gray or light brown), fetid and containing large amounts of fat. Cats with giardiasis may present with poor body condition, and weight loss. Vomiting and fever are not common presenting signs (Blagburn, 2002).

Giardia is a protozoan parasite that has been identified as an important cause of waterborne illness. The parasite is transmitted via the fecal-oral route of exposure, and both endemic and epidemic giardiasis can occur. Ingestion of contaminated water is only one source of infection, and the relative importance of waterborne transmission among other risk factors will vary from place to place depending on general sanitation practices. In the United States, contaminated water has caused a number of outbreaks and illnesses but is not likely the most important mode of transmission. *Giardia* is a common cause of illness in travelers and is frequently spread directly from person to person, especially among children or among persons in areas with poor sanitation and hygiene. Although all age groups are affected, the highest incidence is in children. Breast-fed infants under 6 months of age are not likely to be infected (United States Environmental Protection Agency, 1998).