

A SURVEY OF ENDOPARASITE AND ECTOPARASITE INFECTIONS OF WILD RATS CAUGHT IN AREAS OF IPOH AND KUALA LUMPUR, MALAYSIA

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ABSTRACT. A survey of 95 wild rats which were captured from various locations was conducted to determine the diversity and distribution of ectoparasites and endoparasites infesting wild rat population around the city of Ipoh and Kuala Lumpur. The rodents captured were *Rattus norvegicus* and post mortem was carried out immediately after capture, with skin and organs examined for parasite infection. Ectoparasites recovered were blood sucking louse (*Polyplax spinulosa*) and mites (*Myocoptes musculus*). Endoparasites recovered were nematodes (*Aspicularis tetraptera*, *Trichuris* sp., and two strongyles, one of which is *Strongyloides* sp.) and three intestinal protozoan parasites (*Blastocystis* sp., *Trichomonas* sp., and a coccidia). Low diversity of ecto- and endoparasites were observed infecting wild rat population caught in Ipoh as compared to Kuala Lumpur.

Keywords: wild rats, ecto- and endoparasites

INTRODUCTION

Rodent control is a problem endemic to many urban areas, affecting public health

by the transmission of infectious diseases. The increase in rat populations are mainly due to poor sanitation practices. Exposure to zoonotic diseases carried by these wild rats and their parasites represents a growing threat to public health. Rodents are conceived as one of the most important orders of mammals and taxonomically the largest number of species, which playing an important epidemiological role (Nieri-Bastos *et al.*, 2004). Rats are the most thriving groups of rodents since they have develop to exploit a wide variety of habitats also playing a significant role as pests in the agricultural and urban environment causing to economic losses. Wild rats are as reservoir host transmitting a widespread of diseases to humans and animals because of their highly adaptable and unpredictable nature combined with other factors most favourable for parasitic growth (Chuluun *et al.*, 2005).

As climate change, urbanisation and agricultural intensification takes place, a global concern about communicable diseases is rising because it may cause some zoonoses to spread and even emerge in new areas or re-emerge in areas thought to be free of disease (Paramasvaran *et al.*, 2009).

The rapid development in Malaysia mainly in Kuala Lumpur has triggered a huge influx of low-skilled immigrant workers from Thailand, Burma, Bangladesh, Vietnam, Nepal and Indonesia into Malaysia with and without permit, who now constitute about 9% of the city population (Kuala Lumpur Structure Plan 2020, 2004). Synanthropic rodents like urban wild rats can play a significant role in both direct and indirect transmission of disease since these immigrants themselves could be host to a variety of diseases. According to Nursyazana *et al.*, (2013) study on parasite infections of wild rats have been carried out numerous times investigating rat population in urban cities and more recently studies have also included additional data on the widespread of endoparasite and ectoparasite from different habitats around Peninsular Malaysia.

In 2010, a post-mortem survey on ten rats (*Rattus* spp.) caught in the Veterinary Research Institute (VRI) was done to evaluate the parasite, viral and bacterial status. The results indicated that seven rats harboured mites (*Demodex* sp.) from skin samples. Four rats were positive for helminthiasis such as *Strongyle* and *Strongyloides* from intestines. Bacterial species isolated from the organs include *Mycoplasma arthritidis*, *Corynebacterium* sp., *Staphylococcus epidermidis*, *Escherichia coli* and *Enterococcus* sp. Also positive for *Leptospira canicola*, *Leptospira celledoni* and *Leptospira pyrogenes* by serological test for detection antibody (Premaalatha *et al.*, 2010). This study was conducted to survey the prevalence of endoparasites and ectoparasites in wild rats in areas around the city of Ipoh and Kuala Lumpur to identify the common

parasites and their zoonotic implications because infections carried by wild rats have important roles to play in public health.

MATERIALS AND METHODS

Sampling

From June to August 2013, a total of 95 wild rats, known locally as "brown rats", were trapped in wet markets and restaurants around Kuala Lumpur by civilians using baited cage-trap. These rats were transported to the Veterinary Research Institute (VRI) Ipoh for necropsy. Rats were also trapped from the Experimental Animal House of VRI, by adopting a convenience sampling method using cage-traps baited with salted fish. The traps were set up in the evening, collected and brought back to the laboratory the following morning.

The rats were put to death using chloroform and necropsy was conducted immediately by an experienced veterinarian. The skin samples and the gastrointestinal tract were removed and sent to the parasitology laboratory for detailed examination for ecto- and endoparasites. Simultaneous samples were also sent for bacteriological and virological diagnosis.

Ectoparasite examination and identification

The skin was observed visually and skin scraping was done. The skin samples were collected and put into bijoux bottles and preserved in 70% alcohol for identification ectoparasite such as ticks, lice and fleas. Mites sample were collected and processed

according to the method described in the Manual of Veterinary Parasitological Laboratory Techniques (1986). The collected samples were then examined by stereomicroscope and identification was performed according to the identification keys given by Soulsby (1968).

Endoparasite examination and identification

The intestines were cut open with scissors to expose any visible parasites collected and preserved in 70% alcohol for identification (Soulsby, 1986). The colon contents were subjected to simple floatation technique according to method described in the Manual of Veterinary Parasitological Laboratory Techniques (1986). The intestinal contents were subjected to a simple qualitative method for detection of helminth eggs and coccidia oocysts. Approximately 2 g of the gastrointestinal contents were mixed with 30 ml saturated sodium chloride (NaCl) solution. The suspension was subsequently poured through a strainer into a beaker. The retained debris was discarded and the strained gastrointestinal content suspension was transferred into a test tube. The test tube was topped up with the suspension in order to have a convex meniscus at the top. A cover slip was placed on top of the test tube for about 20 minutes. The cover slip was removed and the entire area under the cover slip was examined under the compound microscope for parasite eggs and oocysts identification.

In-vitro cultivation of *Blastocystis* sp. from faecal sample

In-vitro cultivation method was used to screen for *Blastocystis* sp. and *Trichomonas* sp. A pea size of the intestinal content was cultivated using Jones medium (Jones, 1946) supplemented with 10% heat-activated horse serum and incubated at 37 °C for 48 to 72 hours. The sediment of cultures were observed by light microscopy. The positive culture smears were stained with 10% Giemsa to observe the detailed morphology of the protozoan.

RESULTS

This study was fully dominated by the brown rat (*Rattus norvegicus*), which is distributed worldwide and is known to inhabit urban cities and commonly found around sewage systems, drains and dumpsites area. Overall at least 91% of the wild rats carried at least one species of helminths whereas 49% of it carried at least one species of protozoa parasite (Table 1).

Four species of helminth parasite comprising of only nematodes were found in this study, and they were *Aspiculuris tetraptera*, *Trichuris* sp and two strongyles, one of which is *Strongyloides* sp. Three species of intestinal protozoan parasites also found were *Blastocystis* sp., *Trichomonas* sp., and a coccidia. (See Figure 1).

The prevalence of ectoparasites of the wild rats were only identified from wild rats around Kuala Lumpur which harboured mites, namely (*Myocoptes musculus*) and lice (*Polyplax spinulosa*) species from skin samples. Most of the parasites detected

Table 1. Prevalence of endoparasite and ectoparasite in a total of 95 rats (*Rattus norvegicus*)

Parasitology	Prevalence	
Endoparasites From Ipoh and Kuala Lumpur	<i>Blastocystis</i> sp.	51%
	<i>Trichomonas</i> sp.	6.3%
	<i>Aspicularis tetraptera</i>	1.1%
	<i>Trichuris</i> sp	4.2%
	<i>Strongyloides</i> sp	4.2%
	Strongyle	42.1%
	Coccidia	29.5%
Ectoparasites (mites and lice) from Kuala Lumpur only	6.3%	

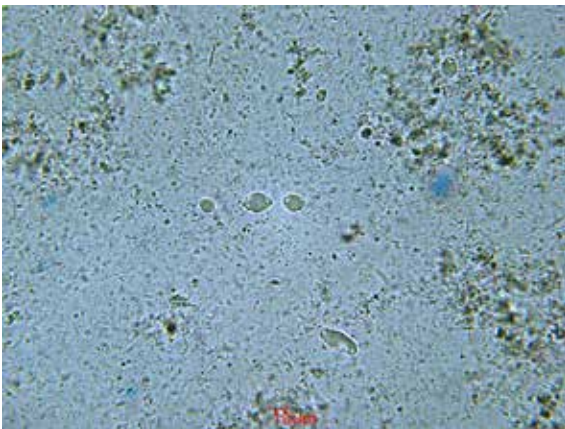


Figure 1a. *Blastocystis* sp.



Figure 1b. *Aspicularis tetraptera* egg



Figure 1c. *Polypax spinulosa* from skin scrapping

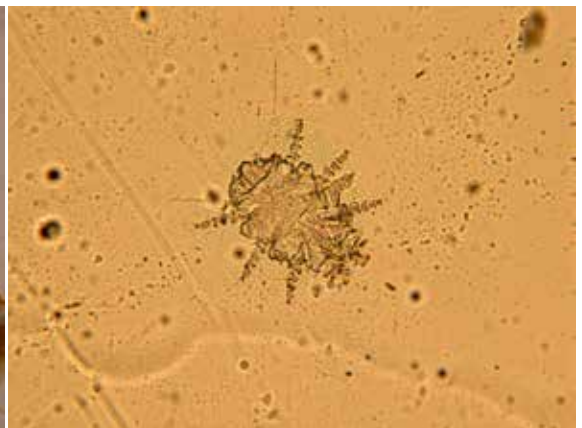


Figure 1d. *Myocoptes musculus* from skin scrapping

in this study are considered to have low pathogenicity and are very common in conventional colonies.

CONCLUSION

Overall, high parasite mean density was identified among rodents caught in Kuala Lumpur compared to rats caught in Ipoh. This can be attributed to the fact that rats in Ipoh were caught in a laboratory environment whereas the rats caught in Kuala Lumpur were from urban areas and may be more exposed to parasites. The intensity of infection and activity of these wild rats depend on some factors such as quantity of various hosts, environmental conditions and locomotion (Zoghi, 2006). Pathogens that may be zoonotic include blastocystis, skin parasites and helminths. Although all rats were from urban areas in Ipoh and Kuala Lumpur, the micro environment plays an important role in determining the type of parasites found. That is, in Kuala Lumpur, rats were trapped in public areas with access to rubbish and food where parasites can be a source of infection. Whereas, in Ipoh the private and clean experimental animal house environment where hardly any rubbish is present and food sources are mainly pelleted feed of experimental animals which had created an environment not conducive to parasite multiplication and reservoir.

Among the ectoparasites identified was *Polyplax spinulosa*, a blood sucking louse which completes its life cycle on the host. Clinical signs include anaemia, scratching and small skin wounds. Transmission is by direct contact and it

moves slowly and stick with their host. It is a vector of *Hemabartonella muris*, *Rickettsia typhi*, *Trypanosoma lewisi*, *Borrellia duttoni* and *Brucella brucei* (Donnelley, 2004). On the other hand, *Myocoptes musculinus* mite which is considered a surface dweller that feeds on superficial epidermal layers were also identified and it has pathogenic potential to cause myocoptic mange in wild and laboratory mice (Wall and Shearer, 1997). The mite burrows in the deeper parts of the superficial layers of the stratum malpighii of the skin and seldom go deeper. It completes its entire cycle at this level. Even in this superficial position, the mite causes severe itching, hyperkeratosis and acanthosis, and loss of hair results. It is considered as an ambulatory species and spread out over greater areas of the host body and self-trauma to the point of abrasion and secondary pyoderma can also be observed (Jones *et al.*, 1997).

Through this study, it can be concluded that routine screening of wild rats need to be carried out, integrated pest management through the co-operation between local authorities, residents and pest control operators is needed. Municipal authorities can improve sanitation and limit harbourage, while pest control operators can use baits to immediately influence the abundance of rodents. Residents can be educated and show more responsibility to change environment that leads to infestation. This kind of study or surveys need to be carried out for a longer period in order to build up a further extensive wealth of information on various aspects such as host-parasite relationship, biology and ecology. Furthermore, benefits of rodent

control are well documented such that urban areas are not reservoirs of zoonotic diseases carried by rodents. This is especially important in this era when livestock, pests, humans and wildlife are encroaching into each others territories thereby promoting the spread of diseases.

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