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Short Communications

RATS AND LEPTOSPIROSIS, A UNIQUE TROPICAL EXPERIENCE

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SUMMARY

Rats are the maintenance host for leptospirosis and are the source of the infection to humans and animals. To eradicate leptospirosis, then the maintenance hosts should be eliminated. This is not possible, particularly when it involved wildlife like rats. A good alternative then is to impose biological control on the rat population which is a safe and pragmatic approach. The environment is the indirect source of infection and in tropical countries; recreational areas are often the place foroutbreaks of leptospirosis. Claims that leptospires survive for months in the environment probably is not true. The "top up" or daily excretion of leptospires from the maintenance hosts particularly rats make it appears that the leptospires survived for months in the environment. The good news is that although there are many infected rats in the cities, there were hardly any reports of outbreaks of leptospirosis in urban areas. Outbreaks of leptospirosis tend to be in the countryside particularly in recreational areas, where infection is easily transmitted through the conjunctiva or mucous membrane of the upper respiratory or gastro-intestinal tract through water activities.

Keywords: Rats, environment, leptospirosis, Malaysia, tropical experience

INTRODUCTION

Tropical countries have many species of rats and they are the main source of leptospiral infection. The Southeast Asian Region (Asean) comprising 10 countries have large number of leptospiralserovars varying from 30 to 50 serovars prevailing in each country which is unique to this region. This big number of leptospiral serovars in the country causes frequent outbreaks of leptospirosis. The big number of rat species, the many leptospiral serovars and the wide variety of ecosystem make control and prevention of the infection very challenging. Fletcher (1928) reported the first case of leptospirosis in Malaysia in 1928. Since then, the Institute of Medical Research Kuala Lumpur has had many notable scientists working on this disease but the situation is still the same. Outbreaks of leptospirosis in humans are on the rise. There is a need to know the fundamentals particularly the epidemiology and pathogenesis of the infection in animals and humans to come out with strategies to control and prevent the disease.

Rats the maintenance host for leptospirosis

Rats are the principal maintenance host for leptospirosis in Malaysia. There are more than a dozen species of rats in Malaysia. A cross sectional survey of the country disclosed niche areas in the environment where certain species of rats dominate and maintain specific leptospiral serovars (Gordon-Smith ***et. al.,*** 1961).

However, recent surveys disclosed that *Rattus tiomanicus* was the dominant rats in Malaysiaand possibly the major source of leptospirosis (Mohamed-Hassan ***et. al.,*** 2012).

It has been estimated by the Kuala Lumpur City Council that there are almost seven million rats in Kuala Lumpur (ANON 2013). A survey by Siti Aminah (2006) found that 42% of the rats from Kuala Lumpur were positive for pathogenic leptospires on cultures. We believe that any rat population with more than 10% bacteriological prevalence of leptospiral infection could be considered as a maintenance host for the infection. It has been reported that a population of 5-10 ground rats per hectare is sufficient to maintain a leptospiral infection (Gordon-Smith ***et. al.,*** 1961). This is possible either due to close contact between the adults and the youngs or it could even be due to ascending infection when the youngs are still in the uterus.

With the big population of rats in Kuala Lumpur and almost all the rats have the potential to contaminate the environment; one would expect frequent outbreaks of leptospirosis in the human population. Surprisingly, there were no reports of leptospirosis in humans in Kuala Lumpur. Outbreaks of leptospirosis are common in the countryside particularly in recreational areas like waterfalls, pools and forests.

The large number of rats and outbreaks of leptospirosis are of big concern to the Ministry of Health. Trapping, poisoning and destroying the habitats of the rats have been done but no success. It looks like the pragmatic way to control rats is through biological control. We have developed a recombinant virus that is infective only to rats. The recombinant virus does not kill the rats but causes infertility. It is hypothesised that with time, if all the rats in a target locality is infected with this virus and become sterile, the rat population will eventually be under control. Rats in the countryside and plantations need not be disturbed as they form important part of the food chain to many animals like the raptors, snakes and other predators.

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Conducive environment for survival of pathogenic leptospires

Malaysia being in the tropics has a conducive climate and environment for the survival of leptospires in the environment. Reports on the survival of pathogenic leptospires in the environment vary from a few days to months. In an experimental study by Khairani-Bejo and co-workers (2004), they found that the leptospires did not survive for more than a week in the environment. This was also observed on the growth of leptospires in ideal conditions in the laboratory. We stipulated that the pathogenic leptospires found in the environment could not have survived for long but appear to be as they were regularly "top-up" by infected urine from the rats. In Malaysia, saprophytic leptospires are common in the environment and they need to be differentiated from the pathogenic strains excreted by the maintenance hosts. Saprophytic leptospires in the environment do not depend on maintenance hosts for survival. More than thirty nine pathogenic leptospiral serovars have been isolated in Malaysia and probably more will be discovered in the future. The reason for this big number of leptospiral serovars in the country is not known.

Recreational areas and leptospirosis in humans

In the past 5 years, there were many outbreaks of leptospirosis in humans in Malaysia and some with human mortalities. Looking back at these outbreaks, the outbreaks generally tend to be in recreational areas where people go fishing, swimming, picnicking in the countryside. Waterfalls, streams, pools and other water-related bodies seem to be most common places for these outbreaks. These places tend to be frequented by humans who left food and rubbish which then attract rats. The rats being maintenance host would contaminate the environment and people expose to this environment might pick up the infection. Most of the outbreaks in the countryside involve water. It is stipulated that the infection is through the conjunctiva or the mucous membrane of the upper respiratory system. The eyes and mucous membranes are very delicate and can easily be infected by leptospires. The oral route is questionable as the high acidity (pH 2 to pH 3) in the stomach would definitely kill the leptopsires. There have been a number of flash floods lately and occurrences of leptospirosis during floods have been reported in Jakarta in Indonesia, Bangkok in Thailand and several places in Malaysia. During floods, contaminated water get into the eyes to initiate infection.This is in contrast to urban areas where people wear proper attire and there is a slim chance for leptospires to get into the skin or conjunctiva. The good news is that although there are many infected rats in the cities, there were no reports of outbreaks of leptospirosis. Leptospirosis tends to be in the countryside particularly in recreational areas, where infection is easily transmitted through the conjunctiva or mucous membranes of the upper respiratory or upper gastro-intestinal tract.

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