

Human and Animal Pentastomiasis in Malaysia: Review

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ABSTRACT

Pentastomiasis is a zoonotic parasitic disease induced by the larval stages of pentasomes. The disease has been reported in Africa, the Middle East, and Southeast Asia and caused by the nymphs of the two genera: *Linguatula* and *Armillifer* and the two species *L. serrata* and *A. armillatus* regard for more than 90% of human cases. The definitive hosts of *Armillifer* spp. are snakes, lizards, and other reptiles. The parasites live in the upper respiratory tracts and lay eggs that are passed out through respiratory secretions, saliva or feces. Intermediate hosts are humans, rodents, and other mammals. Humans incidentally acquire the infestation by the consumption of uncooked infected snake meat or by drinking water contaminated with ova of the pentastomes. In the intestinal tract, the larvae hatch from the ova, penetrate the intestinal wall and migrate to organs in which the liver is the most common site. In Malaysia, human pentastomiasis was reported among aborigines in Peninsular and East Malaysia. *Armillifer moniliformis* was identified in wild animals and carnivores with infection rate 1.8% and 20.7% respectively. In addition to that, a previous study has discovered the adults of pentastomes of *A. moniliformis* in two out of six snakes from species *Python reticulatus*. Recently a case of human pentastomiasis was reported in Sabah, East Malaysia, caused by the nymph of *A. moniliformis*. Therefore, the aim of this review is to provide the latest updates on human and animal pentastomiasis especially in Malaysia.

Keywords: *Pentastomiasis, human, animal, Malaysia*

INTRODUCTION

Pentastomes are wormlike parasites ("tongue worm"), 3 - 13 cm in length. They have centrally located mouth surrounded by four hooks making they seem like they have five mouths hence the name "pentastomes". Their body is segmented, forming annuli and covered in a chitinous cuticle [1] (Figure 1).

Adult parasites dwell in the upper respiratory tracts of the definitive hosts (snakes, lizards, and other reptiles), lay eggs that are passed out through respiratory secretions, saliva or feces. Humans, rodents, and other mammals act as intermediate hosts which acquired the infection by; drinking water contaminated with ova of the pentastomes, consumption of infected snake meat, handling infected snakes and harvesting skins of the infected snake (Figure 2).

Pentastomes are cosmopolitan and widely distributed especially in tropical and subtropical

countries. Generally, the range of the natural hosts and the degree of water and food sanitation affect the distribution of these parasites [2].

In Malaysia, pentastomiasis was reported in both human and animals [3]. The disease is considered being neglected and less attention is given by the authorities. Therefore, the aim of this review is to provide the latest updates regarding human and animal pentastomiasis especially in Malaysia.

HUMAN PENTASTOMIASIS WITH LATEST REPORT IN MALAYSIA

Human pentastomiasis is a zoonotic parasitic disease, which human serves as an incidental host for the infection. Most of the cases are asymptomatic and discovered only during surgery or autopsy. Generally, the diagnosis is largely depends on parasitologic and histopathologic examination [4].

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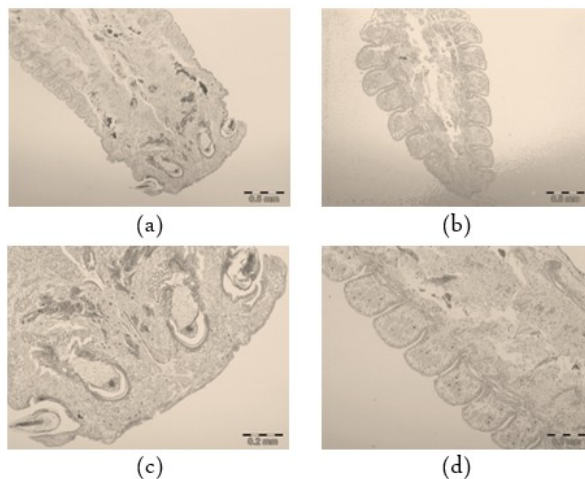


Figure 1. Nymph of *A. moniliformis*. (a) Anterior end with four oral hooks (4 \times), (b) Posterior portion with annulations (4 \times) (c) Mouth surrounded by four hooks (10 \times), and (d) Annulated rings (10 \times) [19].

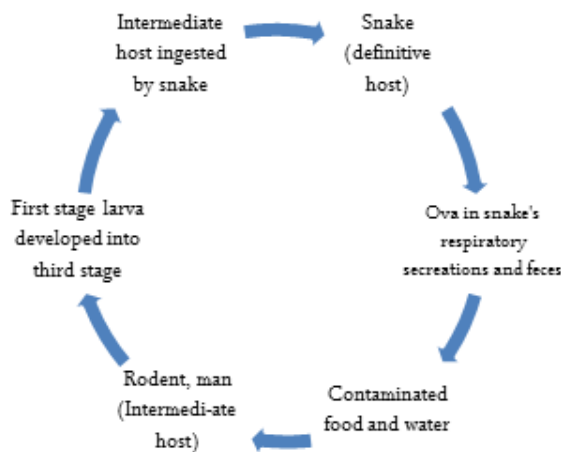


Figure 2. Life cycle of pentastome parasite

Historically, the first case of human pentastomiasis was reported by Pruner in Egypt in 1847 [5]. Following that, the disease has been reported sporadically in Africa, Middle East, and Southeast Asia and it was caused mainly by the nymphs belonging to genera; *Linguatula* and *Armillifer* [4, 5, 6-10]. The two species of the parasites; *Linguatula serrata* and *Armillifer armillatus* accounted for more than 90% of human cases [11]. To date, there are four species of *Armillifer* recorded in human infection; *A. armillatus* in Africa and the Arabian Peninsula, *A. agkistrodontis* in China, *A. grandis* in Africa and *A. moniliformis* in Southeast Asia [11, 12].

Human is a dead end host of pentastomes and acquired the infection by the consumption of uncooked infected snake meat or by drinking water contaminated

with ova of the pentastomes. In addition to that, human has possibility to acquire the infection while handling, harvesting the snake's skins or playing and touching the mouth of the pet snakes. In the intestinal tract, the larvae hatch from the ova, penetrate the intestinal wall and migrate to many organs in which the liver is the most common site [1].

Infection with pentastomids is mostly asymptomatic. However, in some cases, the clinical manifestations include fever, abdominal pain, vomiting, diarrhea, jaundice and abdominal tenderness [11]. In severe disseminated cases, the disease may lead to death [5, 13, 14]. According to Herzog *et al.* (1985) cysts could be serious enough to cause death [15]. However, the larvae are usually die and calcify within two years of infection [2].

In Malaysia, human pentastomiasis was reported in both Peninsular and East Malaysia [16-18]. In a series of 30 consecutive autopsies performed on aborigines from five different states in West Malaysia, pentastomid infection was found in 33.3% of the cases with the prevalence of 45.4% in adults with the liver and the lungs were the most infected organs [16].

The most recent infection of human pentastomiasis was reported in a 70 year old aboriginal farmer from Borneo in 2011 [19]. Most of the infections were caused by *A. moniliformis*. Table 1 shows the summary of human pentastomiasis cases in Malaysia.

Table 1. Reported cases of human pentastomiasis in Malaysia (1967- 2011)

Species	Organ	Reference
<i>A. moniliformis</i>	Neck, abdomen	Rail, 1967 [18]
<i>A. moniliformis</i>	Liver, lung	Prathap <i>et al.</i> , 1968 [14]
<i>A. moniliformis</i>	Chest, abdomen	Burnx –Cox <i>et al.</i> , 1969 [17]
<i>A. moniliformis</i>	Liver, lung	Prathap <i>et al.</i> , 1969 [16]
<i>Armillifer</i> sp.	Fallopian tube	Ong, 1974 [20]
<i>A. moniliformis</i>	Liver	Latif <i>et al.</i> , 2011 [19]

ANIMAL PENTASTOMIASIS WITH SUMMARY OF CASES IN MALAYSIA

Animals acquired the infection with pentastomids through ingestion of eggs in food and water contaminated by feces or nasal discharges of snakes, *Python* sp. [21] or by feces of lizards [22]. In Malaysia, pentastomiasis was reported in domestic animals such as dog and cat and in wide range of wild animals [23, 24]. Table 2 shows the summary of reported cases of animal pentastomiasis in Malaysia.

The genus *Armillifer* occurs as adults in snakes and

Table 2. Pentastomiasis among animals in Malaysia (1969-2003)

Host	Species	Organ	Reference(s)
Monkey (<i>Macaca irus</i>)	<i>A. moniliformis</i>	n/a	Burnx –Cox <i>et al.</i> , 1969 [17]
Cockroaches	<i>A. moniliformis</i>	n/a	Anuar and Paran, 1976 [29]
Rat (<i>Rattus bowersi</i>)	<i>A. armillatus</i>	Abdomen	Lim and Krishnasamy, 1973 [26]
House geckoes	<i>R. hemidactyli</i>	n/a	Lim and Yong, 1977 [27]
Wild Animals	<i>A. moniliformis</i>	Abdominal cavity and lung	Krishnasamy <i>et al.</i> , 1981 [24]
Cat	<i>A. moniliformis</i>	Liver and spleen	Chooi <i>et al.</i> , 1982 [23]
Wild Animals	<i>A. moniliformis</i>	n/a	Krishnasamy <i>et al.</i> , 1984 [30]
Wild Animals	<i>A. moniliformis</i>	Respiratory tract and viscera	Krishnasamy <i>et al.</i> , 1985 [3]
Otter	<i>A. moniliformis</i>	Kidney, liver, spleen and mesenteries of GIT	Cheah <i>et al.</i> , 1989 [31]
Toad	<i>Raillietiella</i> sp.	Lung	Jeffery <i>et al.</i> , 1995 [32]
Lizard	<i>Raillietiella</i> sp.	Lung	Jeffery <i>et al.</i> , 1997 [28]
Cockroaches	<i>A. moniliformis</i>	n/a	Jeffery <i>et al.</i> , 2003 [33]
Wild rats	<i>A. moniliformis</i>	n/a	Zain and Syed Arnez, 2006 [34]

infects mammals, reptiles, and birds as intermediate hosts [3]. Honjo *et al.* [25] and Burnx-Cox *et al.* [17] reported *A. moniliformis* in cynomolgus monkey, *Macaca irus* while Lim and Krishnasamy [26] reported heavy infestation in giant rat *Rattus bowersi* with the larval stage of *A. armillatus*. The same authors found that *A. armillatus* is common among bats, rats, squirrels, and carnivores from the study conducted in West Malaysia.

Besides, Lim and Yong found *Raillietiella hemidactyli* in four species of house geckoes, namely: *Hemidactylus frenatus*, *Platyurus platyurus*, *Gehyra mutilate* and *Gecko monarclus* [27]. The prevalence of infection in latter was high in two species of house geckoes, *Hemidactylus frenatus* and *Platyurus platyurus* from the shop houses. The high prevalence in geckoes of shop houses was attributed to the presence of intermediate insect hosts, particularly cockroaches which are abundant in these shop houses due to the availability of food and poor sanitation in these places. In addition to that, Jeffery *et al.* found *Raillietiella* sp. in the lungs of 5 out of 9 geckoes, *Gekko smithi* [28].

Other than geckoes, cockroaches are also common and closely associated with human dwellings in Malaysia. Previous studies recorded the recovery of *Moniliformis moniliformis* larva in the American cockroach, *Periplaneta americana* [33, 29]. This is interesting since the researchers found the remains of *P. Americana* in the stomach of house geckoes [22].

Adult pentastomids in the gecko's lung produce eggs which are passed out with feces. Cockroaches and other coprophagous insects ingest the feces of geckoes, and the eggs will hatch into larvae and settled in their

bodies. Lizards become infected with pentastomids when they ingest the infected insects. Meanwhile, there is a possibility of geckoes to transmit the infection to humans through feces which contaminate food and utensils.

Pentastomiasis was also reported in wild animals. Krishnasamy *et al.* found that out of 5209 wild animals of 33 species in West Malaysia, 92 (1.8%) were infected with nymphal stages of *A. moniliformis* [3]. The infection rate of the wild animals and carnivores with *A. moniliformis* was 1.8% and 20.7% respectively.

The occurrence of a nymph stage of *A. moniliformis* in a fruit-eating bat *Cynopterus brachyotis* was reported by Krishnasamy *et al.* [30]. The parasite measured 15 mm in length and 1.58 mm in width and had 31 annuli. The larval stages of *A. moniliformis* were found in two banded palm civet, *Hemigalus derbyanus*, and they are considered as a new host for the parasite [3]. The same authors identified 12 species of Malaysian pentastomids in a variety of animals.

In 1981, Krishnasamy *et al.* recovered the adults of *A. moniliformis* from two out of six *Python reticulates* [24]. Another finding of *A. moniliformis* in pythons was reported in 1986, when Krishnasamy *et al.* found the adult of *A. moniliformis* from the respiratory tracts of 6 out of 7 pythons (*P. reticulates*) in study involving zoo animals [35]. The latter study also reported discovery of the nymphs from the liver and the kidney of a lar gibbon (*Hylobates lar*) and meerkat (*Suricatasuricata*) respectively. In addition to that, the pentastomes parasites were also reported in other animals such as the smooth otter [31], toad *Bufo*

melanostictus [32] and wild rats [34].

DIAGNOSIS

In pentastomiasis, a diagnosis could not be made before the surgery. The disease is generally asymptomatic, and detected commonly in autopsy or biopsy. Histopathologic and parasitologic examinations of biopsy or autopsy lesions are part of the common diagnostic methods. In X-rays examination, the parasite can be detected by appearance of calcified nymphs, crescent-shaped bodies which distributed throughout the body. Serological tests involve using indirect immunofluorescence; ELISA and Western blot [36]. Due to the difficulty to detect the infection, modified serological tests (pentastome kit) are required for the diagnosis of this disease.

PREVENTION AND CONTROL

In order to prevent human infections, personal hygiene measures are necessary including; avoid drinking river water directly or the water should be boiled before drinking. The authorities should provide some health education to alert people from consuming the under-cooked snake's meat, possibility of transmission after handling snakes and avoidance of contact with snake excretions.

CONCLUSION

Human pentastomiasis is endemic in Malaysia and parallels with that reported in animals. Snakes play an important role in the transmission of human pentastomiasis. Extra precautions should be undertaken especially by snake handlers to avoid infection. More epidemiological studies together with the surveillance of pentastomes in food and water are recommended to clarify the geographical distribution of this disease in Malaysia.

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