

Short Communication

Record of Tropical Rat Mite, *Ornithonyssus bacoti* (Acari: Mesostigmata: Macronyssidae) from Domestic and Peridomestic Rodents (*Rattus rattus*) in Nilgiris, Tamil Nadu, India

***Pranab Jyoti Bhuyan¹, Anjan Jyoti Nath²**

¹National Centre for Disease Control, Coonoor-, Nilgiris District, Tamil Nadu, India

²Pasteur Institute of India, Coonoor, Nilgiris District, Tamil Nadu, India

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Abstract

Background: Tropical rat mite (*Ornithonyssus bacoti*) is reported from many parts of the world and is considered important in transmitting rickettsial pathogens. There have been scanty reports on prevalence of this parasite from India. Following a recent report of *O. bacoti* infestation in a laboratory mice colony from Nilgiris, Tamil Nadu, India, attempts were made to detect the parasite in its natural reservoir, ie the domestic and peridomestic rats (*Rattus rattus*).

Methods: The National Centre for Disease Control, Coonoor is involved in screening plague in domestic and peridomestic rats in Nilgiris and erstwhile plague endemic areas of Southern India. The parasite samples were identified based on the morphological characteristics attributable to *O. bacoti* and as per description of published literature.

Results: Seven mite samples identified as *O. bacoti* based on morphological characteristics were isolated incidentally from domestic and peridomestic rodents in and around the hilly districts of Nilgiris, Southern India, during the routine plague surveillance programme. The identification was based on the morphological characteristics attributable to *O. bacoti* observed under a low power microscope.

Conclusion: In India, this is probably the first record of isolation of *O. bacoti* from domestic and peridomestic rodents. Prevalence of such parasite in domestic and peridomestic rats necessitates further investigation on monitoring and surveillance of rickettsial diseases in the locality, as these parasites are considered to be potential vector of transmitting rickettsial pathogens.

Keywords: *Ornithonyssus bacoti*, India, Tropical rat mite

Introduction

Ornithonyssus bacoti Hirst, 1931 (tropical rat mite), an ectoparasite belongs to the family Macronyssidae, is an obligate, blood-feeding parasite commonly associated with wild rat throughout the world. The mite is found mostly in tropical and moderate climate zone which causes rat mite dermatitis in human (Beck and Fölster-Holst 2009). Although the status of rat mites as vectors in naturally occurring human infections has not been proven, yet there are considerable numbers of publications indicating that *O. bacoti* experimentally transmits *Rickettsia akari*

(ricketsial pox), *Francisella pestis* (plague), Coxsackie virus, *Francisella tularensis* (tularemia), and *Trypanosoma cruzi* (Chagas disease) and there is evidence that *O. bacoti* specimens are positive for *Coxiella burnetii* (Q fever), hantavirus, *Borrelia* sp, *Bartonella* sp, and *Rickettsia* sp as reviewed by Watson (2008).

The definitive diagnosis of *O. bacoti* requires the detection of the parasite which is more likely to be found in the environment of its host (cages, litter, corner or cracks of living area) than on host's skin itself (Beck

and Fölster-Holst 2009). There has been scanty report of this parasite from India. However, the recent report by Nath et al. (2013) from Nilgiris in a breeding facility of Swiss mice necessitated the search for the parasite in its reservoir, i.e. the domestic and peri-domestic rats, which are under plague surveillance activity of National Centre for Disease Control, Coonoor, Nilgiris.

This study reveals the detection of *O. bacoti* from domestic and peri-domestic rats in Nilgiris hills, Tamil Nadu during the routine surveillance of plague from rodents and is probably the first of its kind in this topography.

Materials and Methods

During the routine surveillance of plague in and around Nilgiris District, the domestic and peridomestic rats were collected by wonder trap (live trapping, multiple catch). The dead rodents were excluded from the routine surveillance of plague as per standard procedure. The rats were classified as domestic and peridomestic as per criteria provided by Agarwala et al. (2005). The rats were euthanized following standard protocol and searched for ectoparasite by combing on a white tray.

During January-August, 2013, our branch of NCDC received 401 rats, out of which 323 belonged to *Rattus rattus* (based on morphology as per standard literature). The collected mite samples were preserved in 10 % formalin and later examined in the laboratory and confirmed as *O. bacoti* according to entomology Walker key (Walker 1997).

Nilgiris is a hilly district located in the Northwestern part of Tamil Nadu state bordering Kerala and Karnataka, Southern India. It lies between the Latitude of 11°10' N and Longitude of 76°5' situated in altitude ranging from 900 to 2600 meters above M S L (Mean Sea Level) with 56.42 % forest cover. The Nilgiris district has an annual

rain fall of 1,200 mm, average daily temperature ranges between 5–28 °C. These peculiar land configurations, prevailing climatic conditions, abundance of varieties of rodents and ectoparasites harboring on such rodents might attributes to the endemicity of various disease in such locality. Nilgiris District has long been recognized as a potential plague endemic area which was attributed to the existence of complex factors of climate and a broad spectrum of rodent and flea fauna.

Results

All the seven mite samples in the present study were identified as *O. bacoti* based on their morphological characteristics attributable to *O. bacoti*, such as elongated, oval and hairy body, caudally tapered dorsal shield etc. (Engel et al. 1998, Watson 2008, Beck and Fölster-Holst 2009). The gnathosoma has chelicera and pedipalp. Figure 1 depicts a female *O. bacoti* mite observed under 10x objective of a light microscope (Nikon). All the mite samples were recovered from the domestic and peridomestic *Rattus rattus* (N=323). The parasite could not be found in the other rodent species, ie *Bandicoota bengalensis* (N=78) collected from the same areas during the said collection period.



Fig. 1. An adult female *Ornithonyssus bacoti* under 10X objective

Table 1. Some characteristic features that aid differentiation of *Ornithonyssus bacoti* from other confusing parasites viz. *D. gallinae* and *O. sylviarum*

Morphological features	<i>O. bacoti</i>	<i>D. gallinae</i>	<i>O. sylviarum</i>
Hairiness	Very hairy	Few hair	Few hair
Dorsal plate	Caudally pointed dorsal plate	Caudally rounded dorsal plate	Dorsal plate with a conical end.
Anal plate	Anal plate with cranial anus	Anal plate with caudal anus	Anal plate with caudal anus

Discussion

Ornithonyssus bacoti is prevalent world-wide except arctic and antarctic regions as a parasite of wild, commensal and laboratory rodents or of humans (Engel et al. 1998, Abai et al. 2002, Sabol-Jones et al. 2005, Beck and Fölster-Holst 2009, Radhar and Vazirianzadeh 2009). It is reported from India as occupational disease in laboratory personnel and Veterinary students (Tika-Ram et al. 1986) and recently, in laboratory mice colony (Nath et al. 2013). Although *R. norvegicus* and *R. rattus* are known to be the preferred hosts, infestation of 10 other rodent species has been reported (Engel et al. 1998). However, they might infest a wide range of hosts, including domestic and wild animals and birds (Watson 2008) when the preferred hosts are not available.

This parasite is more likely to be found in the environment of its host, viz., in the cages, in the litter, or in corners, or cracks of the living area, than on the hosts' skin itself (Beck and Fölster-Holst 2009). This might justify the very low record of its recovery from the trapped animals in the present study. Just as most representatives of the Macronyssidae tropical rat mites are active at night and seek dark hiding places during the daytime. At night the parasites search for their preferential hosts (Norway rat, house rat, mouse, gerbil and hamster) to feed on blood (Beck and Fölster-Holst 2009). However, the record of this parasite from domestic and peridomestic rodents in a locality is a potential

threat of transmitting zoonotic diseases.

The tropical rat mite dermatitis in human is a self-limiting disease but a condition for diagnostic dilemma which leads to under-reporting of suspected number of unrecognized infestation. Certain morphological structures (e.g. hairiness, caudally pointed scutum [dorsal plate], typical form of the anal plate with a cranial anus) allow for differentiation of the tropical rat mite from other mite species like red bird mite (*Dermanyssus gallinae*) and the Nordic bird mite (*O. sylviarum*) (Beck and Fölster-Holst 2009) which are enlisted in Table 1.

Recently, there was a report of an outbreak of *O. bacoti* infestation in the laboratory mice colony of from the Nilgiris District (Nath et al. 2013). Therefore it is obvious that the parasite is being harbored by some rodents. But, available literature suggests that there is no record of prevalence of *O. bacoti* in rodents in this particular geographical area. This report, probably, is the first of its kind about the prevalence of this parasite from the domestic and peridomestic rodents in this topography. Therefore, the epizootiology and the diseases transmitted by such parasites in the community under risk should be studied extensively.

Conclusion

With the evidence of an outbreak of *O. bacoti* infestation in laboratory mice colony

in the Nilgiri Hills of Southern India it is also recorded from the domestic/ peridomestic rodents in the same area. Prevalence of such parasite necessitates further investigation on monitoring and surveillance of rickettsial diseases in the locality, as these parasites are considered to be potential vector of transmitting rickettsial pathogens.

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There is no conflict of interest.

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