Short communication

Ectoparasites of Rodents Captured in Hamedan, Western Iran

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Abstract

Background: Rodents with a population greater than the entire population of other mammals on earth are the source of economic losses and health conflicts. One of the major health problems with the rodents is their role as reservoir hosts of zoonotic diseases. The aim of this study was to assess the infestation of commensal rodents with ectoparasites in Hamedan City, Western Iran.

Methods: The samples were collected by live traps during years 2012–2013. After transferring the samples to the Entomological Laboratory of Hamedan University of Medical Sciences, their ectoparasites were collected and identified.

Results: A total of 171 slides were prepared from 105 captured commensal rodents: *Mus musculus*, *Rattus rattus* and *R. norvegicus* comprising three orders namely Mesostigmata: *Hypoaspis* (*Laelaspis*) *astronomica*, *Dermanyssius* sp, Pachylaelapidae (male). Metastigmata: *Rhipicephalus* sp and Anoplura: *Polyplax spinulosa* were recovered in Hamedan City. Seventy (66.6%) rodents were found infested with at least one species of ectoparasites.

Conclusion: The results of our study indicate that ectoparasites infestation in commensal rodents of Hamedan city is high and more attention by local health authorities is needed to prevent zoonotic diseases.

Keywords: Rodents, Ectoparasites, Iran

Introduction

Over the past decades we have been facing with growth and uncontrolled urban development with problems such as environmental pollutions and increase of harmful organisms (Dezfooli et al. 2009). Rodents with a population greater than the entire of other mammals on earth have probably caused more human suffering than any other vertebrate pest (Meerburg et al. 2009). They are responsible for the spread of many diseases, either directly, by contamination of food with their urine and feces or indirectly through vectors like fleas (Azizi et al. 2008). Commensal is defined as “sharing one’s table.” Commensal rodents, by definition, thrive in close proximity to human activities and include *Rattus norvegicus* (Norway rats), *R. rattus* (roof rats) and *Mus musculus* (common house mice). Today, commensal rodents' outbreak in human and industrial centers has become an international problem. Ectopara-sites are organisms that temporarily or per-manently live on the host (rodents) that pro-vide their biological needs (Oormazdi 1995). Many of these ectoparasites are important from medical and veterinary point of view and have a great role in transmission of dis-eases such as Crimean-Congo Hemorrhagic Fever (CCHF), Theileriosis, Babesiosis, Anaplasmosis, Ehrlichiosis, Omsk Hemorrhagic Fever, Plague, Salmonellosis, Murine Typhus, Hemorrhagic Jaundice, Leptospirosis and Rural Cutaneous Leishmaniasis (Suntsov et al. 1997, Inokuma et al. 2001, Kia et al. 2009). In addition to transmission of diseases, rodents as important pests can cause the loss of economic

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resources by feeding on crops, grain and food stored and also, with chewing on telephone and electrical wires and damage to electrical devices encounter installations and houses with the major risks. Losses to the crops pre-and post-harvest by rodents and especially rats is in a wide range. It is estimated that each year, approximately to 20 percent of the world's food supply are consumed or damaged by rodents. The World Health Organization estimate that annually about 33 million tons of food is lost by mice, which it is equivalent to 5 % of the total world production of food to feed 130 million hungry people is enough. Even more the worst situation is in the third world, for example, rodents destroyed, 40 % of produced in the culture and the storage stage in Bangladesh, each year (Dehghani 2007, Kaboodvandpour et al. 2010). Due to the diverse climatic and geographic conditions in different regions of Iran, fauna of ectoparasites in different areas should be investigated to be able to draw a map of the distribution of ectoparasites. Although the study and identification of ectoparasites in rodents has a long history in the world, the history of research on rodent's ectoparasites are limited in Iran, despite the importance of rodents in terms of health compared with other mammals. This study conducted in Hamedan City during 2012–2013 to collecting and identifying commensal rodents and ectoparasites on them to provide basic information for further control measures.

Materials and Methods

Study area

Hamedan City as the center of Hamedan Province located in the West of Iran. The neighboring provinces are Zanjan and Qazvin from the North, Kermanshah and Kurdistan from the West and Markazi from the South and East (Fig. 1). The main economic activity in the province is agriculture and animal husbandry and is considered as a center of tourism in the country. Maximum and minimum temperature is 40 ˚C in July 2012 and -12 ˚C in January 2013, respectively. The total amount of rainfall in the study area over study period was 454 mm and the mean annual relative humidity is 45 %.

Rodent capture and identification

The samples were collected by using live-traps measuring 29× 22× 50 cm (Paramasvaran et al. 2009). These traps were placed in different locations in the city including under the bridges, inside canals, sewage and garbage at sunset and were collected on the next morning. Trapped rodents were killed lenity by placing them in a plastic bags containing cotton soaked in Chloroform. Captured rodents were identified after recording accurate and complete information (Etemad 1978).

Isolation and identification of ectoparasites

The bodies of collected rodents were brushed after general anesthesia to remove ectoparasites on a white tray filled with water. Also their ears were carefully examined by a forceps. The collected specimens were stored in 70 % alcohol for other process. Ectoparasites were cleared by KOH solution (10%), then all specimens were mounted with solution Hoyer as microscopic slides. All lice, mite and ticks were examined and identified by valid keys (Keirans and Litwak 1989, Faraji et al. 2008, Cannings and Scudder 2013) under an Olympus microscope (BX51) (Fig. 2). Also all collected specimens are deposited in Entomological Laboratory, Department of Medical Entomology, School of Medicine, University of Medical Sciences, Hamedan, Iran.

Results

This survey was carried out on the collection and identification of ectoparasites asso-

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ciated with commensal rodents in Hamedan City during 2012–2013. A total of 105 rodents in both sexes from different parts of the city were captured and from them 170 slides of ectoparasites were collected. The rodents included three species belong to suborder Myomorpha, family of Muridae (Subfamily: Murinae): *Rattus norvegicus* (Berkenhout 1769), *R. rattus* (L., 1758) and *Mus musculus* L., 1758. Among captured rodents *R. norvegicus* and *M. musculus* had the most and least frequency (Fig. 3). Ectoparasite samples were identified to species level if possible, representing to three orders, namely Mesostigmata (mites), Metastigmata (hard ticks) and Anoplura (sucking lice) (Table 1). The 140 specimens were mites belonged to three families, Laelapidae [*Hypoaspis* (*Laelaspis*) *astronomica* (Koch, 1839)] (7.6%), Dermanyssidae (*Dermanyssus* sp) (72.3%) and Pachylaelapidae (Male) (2.4%). Nine of 170 specimens were lice belonged to a single family, Polyplacidae (*Polyplax spinulosa*) (Burmeister 1839) and 21 individual hard ticks were from family Ixodidae (*Rhipicephalus* sp). The predominant collected ectoparasite groups were mites (82.3%), followed by hard ticks (12.3 %) and lice (5.3%). Seventy (66.6%) rats were found infested with at least one species of ectoparasites. Interestingly, no fleas were found on rodents sampled. *Rattus rattus* was the predominant host species with the highest record of ectoparasite infestation. The ectoparasite groups and their abundance in each host are shown in Table 1. According to this table the catch rate of ectoparasite on *R. norvegicus*, *R. rattus* and *M. musculus* were 87.6, 11.2 and 1.2 respectively.

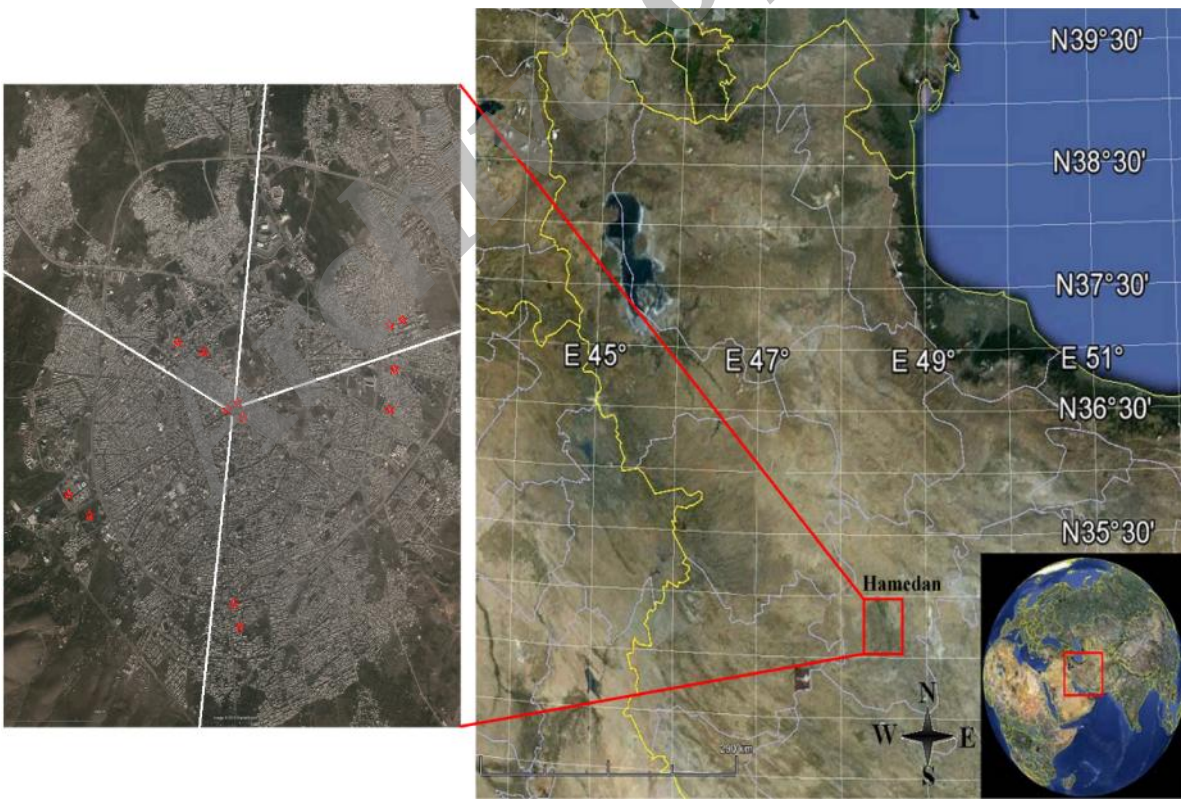

Fig. 1. Geographic location of collected commensal rodents in Hamedan City (Google earth © 2011 Europe Technologies)

∗ Sampling stations in Hamedan City

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Table 1. Ectoparasite arthropods among commensal rodents in Hamedan City, Hamedan Province, 2012–2013

Rodent species	n	Ectoparasite						Total catch	
		Mites		Lice		Ticks			
		Catch n	Catch rate (%)	Catch n	Catch rate (%)	Catch n	Catch rate (%)	Catch n	Catch rate (%)
R. norvegicus	92	123	82.5	9	6	17	11.4	149	87.6
R. rattus	8	15	78.9	0	0	4	21	19	11.2
M. musculus	5	2	100	0	0	0	0	2	1.2
Total	105	140	82.3	9	5.3	21	12.3	170	100

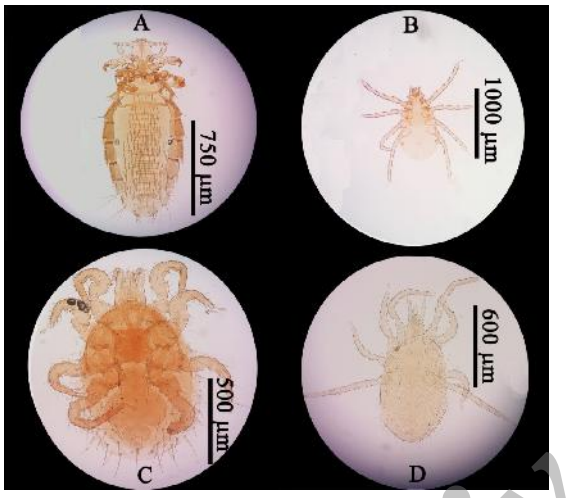

Fig. 2. Microscopic photos of collected Ectoparasites in Hamedan City, 2012–2013

A: *Polyplax spinulosa*, B: *Rhipicephalus* sp, C: *Hypoaspis* (*Laelaspis*) *astronomica*, D: *Dermanyssius* sp

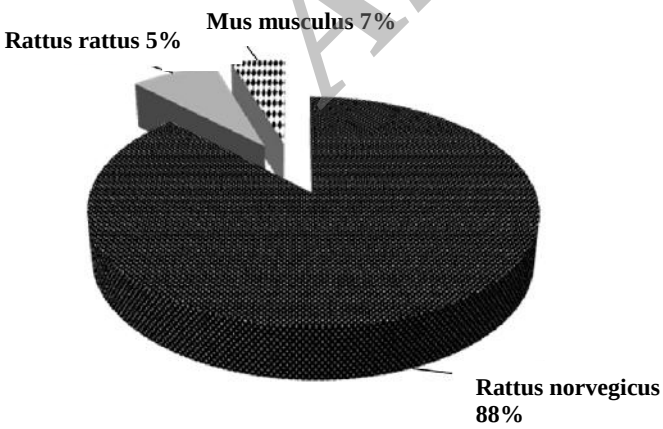

Fig. 3. Total captured rodents in Hamedan City, Hamedan Province, 2012–2013

Discussion

In this study, despite retaining the basic principles in collecting and preparing specimens of commensal rodent ectoparasite, fleas were not found. It may be due to a low distribution and infestation rate or ecological situation in Hamedan City is not suitable for surviving them. According to WHO Plague Manuel (1992), the flea (*Xenopsylla cheopis* Rothschild 1903) as most important plague vector spends more time in the nest of their host than on the host itself. Our results on ectoparasites in small mammals were similar to other studies such as Nadchatram et al. (1966), Ho and Krishnasamy (1991), Chulan et al. (2005) and Paramasvaran et al. (2009). Within all collected specimens, the lice (*Polyplax spinulosa*), were observed frequently in Iran already (Telmadarraiy et al. 2007, Kia et al. 2009, Rasouli et al. 2011, Nateghpour et al. 2013). This is considered to be of public health importance because this rat louse is known to harbor plague agent and transmit tularemia and bartonellosis to humans and play an adjunctive role in the transmission of murine typhus and plague from rat to rat (Zahedi et al. 1984).

Three species of rodents were infested with at least one species of Mesostigmatic mites. These mites (*Dermanyssius* sp) were found frequently on all captured rodents, although this genus was rarely discovered on Iranian rats. It has a worldwide distribution and has been incriminated to cause pruritic

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dermatitis in men (Telmadarraiy et al. 2007, Kia et al. 2009, Nateghpour et al. 2013). The host (*R. norvegicus*) with the majority of the ectoparasites of medical importance was found in areas with human activities (Meerburg et al. 2009). In a similar study *R. norvegicus* reported as prefer host for mesostigmatic mites (Easterbrook et al. 2007). Family Ixodidae have a main role in zoonotic diseases as medically important vectors for Far-Eastern tick-borne encephalitis virus in many parts of the world (Nadchatram et al. 1966, Roberts and John 2001, Rat ZooMan 2006).

Several reports of tick-borne zoonotic diseases were reported from Iran for example: Crimean-Congo Hemorrhagic Fever (Mostafavi et al. 2013, Sadeghi et al. 2013). Global climate changes may cause rapid environmental modification such as altering the ecology of rodents and creating new foci resulting in the proliferation of vectors and increase of rodent borne parasitic diseases and this situation will increase contact between human and rodents, resulting in a heavier disease burden that would challenge the efficiency of the public health services (Paramasvaran et al. 2009). Unfortunately updating the current data on ectoparasites of rodents in Iran is not sufficient.

Conclusion

Ectoparasites infestation rate of commensal rodents in Hamedan City is high (66.6%) and among different arthropods species identified, some had zoonotic importance. Therefore, the potential health hazard of these species needs to be considered by human and veterinary health authorities to prevent infectivity in humans and domestic animals.

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