Original Article

Ticks and Fleas Infestation on East Hedgehogs (*Erinaceus concolor*) in Van Province, Eastern Region of Turkey

*Yaşar Göz 1, Ali Bilgin Yılmaz 1, Abdulalim Aydin 2, Yalçın Dicle 3*

1Department of Parasitology, Yüzüncü Yıl University, School of Health, Van, Turkey
2Department of Parasitology, Hakkari University, School of Health, Hakkari, Turkey
3Department of Microbiology, Muş Alparslan University, School of Health, Mus, Turkey

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Abstract

**Background:** Ixodid ticks (Acarí: Ixodidae) and fleas (Siphonaptera) are the major vectors of pathogens threatening animals and human healths. The aim of our study was to detect the infestation rates of East Hedgehogs (*Erinaceus concolor*) with ticks and fleas in Van Province, eastern region of Turkey.

**Methods:** We examined fleas and ticks infestation patterns in 21 hedgehogs, collected from three suburbs with the greater of number gardens. In order to estimate flea and tick infestation of hedgehogs, we immobilized the ectoparasites by treatment the body with an insecticide trichlorphon (Neguvon®-Bayer).

**Results:** On the hedgehogs, 60 ixodid ticks and 125 fleas were detected. All of the ixodid ticks were *Rhipicephalus turanicus* and all of the fleas were *Archaeopsylla erinacei*. Infestation rate for ticks and fleas was detected 66.66% and 100%, respectively.

**Conclusion:** We detected ticks (*R. turanicus*) and fleas (*A. erinacei*) in hedgehogs at fairly high rates. Since many ticks and fleas species may harbor on hedgehogs and transmit some tick-borne and flea-borne pathogens, this results are the important in terms of veterinary and public health.

**Keywords:** Tick, Flea, Hedgehog, Turkey

Introduction

Hedgehogs are small, nocturnal animals which have bodies covered with spine. Some ectoparasites of hedgehogs such as ticks and fleas have zoonotic importance (Khaldi et al. 2012). Hedgehogs may act as reservoir hosts for some diseases for instance salmonellosis, leptospirosis and pulmonary capilloriois (McCarthy and Moore 2000, Riley and Chomel 2005, Marie et al. 2012).

Ticks and fleas are blood feeding arthropods that act as vector for transmitting many bacterial, viral, rickettsial and parasitic infection among both domestic and wild animals as well as between animals and humans (Mullen and O'canner 2002). Ticks are the most important ectoparasites affecting wild-life as they transmit many important diseases in the wildlife, among the livestock and humans (McLean 2008, Castellaw et al. 2011). Ticks are vectors carrying a number of diseases named tick-borne diseases including Lyme disease, Rocky Mountain spotted fever, tick-borne meningoencephalitis, babesiosis and Crimean-Congo hemorrhagic fever (CCHF) (Service 2012). Also several flaviviruses are transmitted by *Ixodes* ticks, that cause encephalitis and haemorrhagic fever among humans (Capinera 2010). Ticks are common in Eurasia and Africa and are usually found in similar habitat to that of hedgehogs (Causey et al. 1970). Hedgehogs are a fre-quent host of hard tick *I. hexagonus* (Gern et al. 1991, Beichel et al. 1996, Gern et al. 1997). In Switzerland, an enzootic transmission cycle...
of *B. burgdorferi* involving hedgehogs and *I. hexagenus*, another tick vector, has been described in urban environment (Gern et al. 1997).

Fleas such as ticks transmit many diseases to humans and animals, viral, bacterial, rickettsial and protozoal diseases, in addition some helminths are transmitted by fleas (Boris 2008). Fleas can transmit *Yersinia pestis*, *Rickettsia typhi*, *R. felis*, *Bartorella henselae*, *Myxoma* virus and some helminthic diseases, such as *Hymenolepis nana* and *Dipylidium caninum* (tapeworms). Most species of fleas are host specific. Rodents are predominant host and 74 % of fleas feed on rodents (Otranto and Wall 2008, Capinera 2010).

The aim of our study was to detect the infestation rates of East Hedgehogs (*Erinaceus concolor*) with ticks and fleas in Van Province, eastern region of Turkey.

**Materials and Methods**

**Study area**

Hedgehogs were captured around the city of Van (38° 28' N 43° 20' E) in the eastern region of Turkey. The city is located around Lake Van and has 370.000 inhabitants. The study was conducted between June 2013–Sebtember 2013 in three different localities.

**Animal capture and collection of ticks and Fleas**

Hedgehogs were captured between June and Sebtember 2013 with the aid of spotlight nightly walks through parts of the study area. In order to estimate flea and tick infestation of hedgehogs, we immobilized the ectoparasites by polluting the body with a insecticide including trichlorphon (Neguvon®-Bayer). Immobilized fleas were removed from the hedgehogs by gently shaking the animal over a sheet of paper and then all the fleas counted. We collected all ticks from hedgehogs and conserved them in 70 % ethanol for post identification. Ticks were identified according to Karaer et al. (1997) and fleas were identified according to Dinçer (1971).

**Results**

Throughout the investigation, 60 ixodid ticks and 125 fleas in total were collected from 21 hedgehogs, collected seven hedgehogs each locality, from three different localities. All the collected ticks belonged to *Rhipicephalus turanicus* species and all fleas belonged to *Archaepsylla erinacei* species (Fig. 1, Fig. 2). Other ectoparasites, apart from this kind of species, were not observed in this investigation. Rates of the tick and fleas infestations were 66.66 % and 100 % respectively. Table 1 and Table 2 shows lo-calities where hedgehogs were obtained and the numbers and gender distribution of the fleas and ticks that were collected from these hedgehogs.

![Fig. 1](http://jad.tums.ac.ir)

**Fig. 1.** A) Dorsal view of male *Rhipicephalus turanicus*, B) Spiracular plate of male *Rhipicephalus turanicus*, C) Dorsal view of female *Rhipicephalus turanicus*, D) Spiracular plate of female *Rhipicephalus turanicus*

![Fig. 2](http://jad.tums.ac.ir)

**Fig. 2.** A) Female *Archaepsylla erinacei*, B) Male *Archaepsylla erinacei*, C), D) Adult ticks on the hedgehog
Table 1. Locality names and numbers of hedgehogs

| Locality                  | n of hedgehog |
|---------------------------|---------------|
| Kasımbağı village         | 7             |
| Gölağzı neighborhood      | 7             |
| Çınarlı neighborhood      | 7             |
| **Total**                 | **21**        |

Table 2. Numbers and gender distribution of fleas and ticks obtained from hedgehogs

| Locality                  | Kasımbağı village | Gölağzı neighborhood | Çınarlı neighborhood |
|---------------------------|-------------------|-----------------------|----------------------|
| Ectoparasite              | Fleas | Ticks | Fleas | Ticks | Fleas | Ticks |
| F | M | F | M | F | M | F | M | F | M |
| 4 | 3 | 3 | 2 | 2 | 3 | 2 | 0 | 1 | 3 |
| 6 | 1 | 0 | 0 | 4 | 2 | 0 | 0 | 5 | 2 |
| 3 | 3 | 4 | 0 | 6 | 1 | 1 | 3 | 5 | 1 |
| 3 | 5 | 4 | 1 | 3 | 4 | 3 | 3 | 4 | 0 |
| 3 | 4 | 0 | 0 | 6 | 0 | 3 | 1 | 6 | 2 |
| 4 | 0 | 3 | 2 | 3 | 3 | 0 | 0 | 3 | 5 |
| 3 | 4 | 2 | 0 | 0 | 2 | 1 | 1 | 0 | 3 |

Female= 26 Female= 13 Female= 24 Female= 10 Female= 24 Female= 11
Male= 20 Male= 6 Male= 15 Male= 8 Male= 16 Male= 12
Total= 46 Total= 19 Total= 39 Total= 18 Total= 40 Total= 33

Discussion

One of the most important arbovirus transmitted by ticks is Crimean-Congo hemorrhagic fever virus (CCHFV) believed to be survived mainly by Hyalomma ixodid ticks in the nature. Ticks and fleas are important vectors of several patogens and majority of this patogens are zoonotic. But CCHFV has been isolated in nature among at least 30 tick species including I. ricinus, R. sanguineus, R. turanicus, R. bursa and Dermacentor spp. ticks in addition to H. marginatum (Estrada-Peña et al. 2007, Nijhof et al. 2007, Randolph et al. 2008). Ticks in the genus Rhipicephalus belongs to family Ixodidae (hard ticks). Rhipicephalus turanicus is a three-host tick species. Adult of R. turanicus normally infest cattle, sheep and dogs in Mediterranean region but it can also effect humans (Chochlakis et al. 2014). Its immature forms generally infest hedgehogs, gerbils and murid rodents (Estrada-Peña et al. 2004). Rhipicephalus turanicus is a vector of Q-fever and north Asian tick typhus caused by Rickettsia sibirica (offe-Uspensky et al. 1997).

Some studies performed on hedgehogs ticks, prevalence of R. turanicus infestation was detected respectively 67.70 % in Urmia City and 5.26 % Tabriz City of Iran (Gorgani-Firouzjaee et al. 2013, Nematollahi et al. 2014), and 77.80 % Tokat City, central anatolia region of Turkey (Bursali et al. 2013). Rate of the tick infestation in present study (66.66%) was detected approximately similar to studies of Gorgani-Firouzjaee et al. 2013 and Bursali et al. 2013.

Archaeopsylla erinacei is the hedgehogs fleas. It is also hosted by cats and dogs other than hedgehogs and it may be transferred...
from hedgehogs through direct contact. Adult animal fleas may attack and bite humans. Human cases with flea bite eruption reported in some countries (Pomycal 1985, Naimer et al. 2002).

Prevalence of A. erinacei in hedgehogs was detected 55.90% in Iran, neighboring country of Turkey (Gorgani-Firouzjaee et al. 2013). Our result (100%) was very higher than this study.

Conclusion

We detected ticks (R. turanicus) and fleas (A. erinacei) in hedgehogs at fairly high rates. Many ticks and fleas species may harbor on hedgehogs and transmit some tick-borne and flea-borne pathogens. Therefore, hedgehogs sharing the same habitats with humans in especially urban and suburban regions may be transmission of some tick-borne and flea-borne diseases from hedgehogs to humans. At least, hedgehogs ticks and fleas can attack to humans and consequently some traumatic lesions can occur in humans.

Acknowledgements

The authors declare that there is no conflict of interest.

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