

Distribution of Soft Ticks and Their Infection with *Borrelia* in Hamadan Province, Iran

**H Vatandoost*¹, *A Ghaderi*², *E Javadian*¹, *AH Zahir Nia*², *Y Rassi*¹, *N Piazak*³, *EB Kia*¹,
*M Shaeghi*¹, *Z Telmodarreyi*¹, *M Abolhasani*¹

¹*School of Public Health, Tehran University of Medical Sciences, Tehran, Iran*

²*Faculty of Medicine, Hamadan University of Medical Sciences, Tehran, Iran*

³*Iran Pasteur Institute, Tehran, Iran*

Abstract

Tick-borne diseases like tick-borne relapsing fever are a public health problem in Iran. Its occurrence is more prevalent in north part of country. In order to determine the distribution of soft ticks, Argasidae, and their infection with *Borrelia* species in Hamadan province, 53 villages were selected randomly. A total of 4805 ticks were collected directly from human dwellings, poultrys, and animal shelters. They belong to the genus *Argas* and *Ornithodoros*, among which 52.3% were *Argas persicus*, 2.6% *A. reflexus*, 2% *Ornithodoros canestrinni*, 41.4% *O. lahorensis*, and 1.77% *O. tholozani*. The most prevalent species was *A. persicus* and the least one *O. lahorensis*. Examination of ticks revealed that *O. tholozani* was infected with *Borrelia persica*. Infection rate and disease prevalence is coincident in the region. The results will be discussed in more details in terms of preventive measures.

Key words: *Soft ticks, Borrelia, Iran*

Introduction

Tick-borne infectious diseases are of worldwide importance. Lyme Borreliosis commonly known as lyme disease is now acknowledged as the most highly prevalent arthropod-borne human diseases in the northern temperate region of the world (1). Soft ticks (Family: Argasidae) play an important role in transmission of bacteria, rickettsia and viral diseases to human (2). Crimean Congo Hemorrhagic Fever (CCHF) and relapsing fever are the most common tick-borne disease in Iran. According to the Ministry of Health of Iran, the total number of 201, 205 and 264 relapsing fever cases have been reported in years 2000, 2001 and 2002, respectively (3). The highest record is from Ardebil province (119), followed by Zanjan (59) and Hamadan provinces (37). Its distribution is more or less prevalent in different parts of Iran. The aim of this study was to find out the fauna and infection of soft ticks with *Borrelia* in Hamadan province during their seasonal activity in year 2001.

Materials and Methods

Study area. Hamadan province is located in central part of Iran. Among 1030 villages the total number of 53 (5%) were selected randomly for investigation.

Tick collection. Tick collection was carried out in human dwelling, animal and poultry shelter in 30 minutes. Ticks were collected from cracks, crevices, ceiling and floor and transferred into the holding tubes. All the specimens were identified by morphological characteristics.

Infectivity of ticks with *Borrelia*. *O. tholozani* were fed on, new-borne mouse, litter, of mouse for 30-45 minutes. After 2 weeks, blood samples obtained from challenged mice, were examined microscopically to determine the presence of *Borrelia* in their blood samples. *O. tholozani* were smashed and then injected subcutaneously to sensitive animals. The animals' blood samples were examined for *Borrelia* after 1 week.

Results

During the study period, among 53 villages, the total number of 4805 ticks were collected and identified. Table 1 shows the percentages of ticks in whole study area. Species characteristics are presented in Figure 1.

*Corresponding author: P.O.Box: 6446-14155, Tehran, Iran

Table 1: Frequency of Ticks collected from study area

Ticks	Total No.	Frequency
1- <i>Argas persicus</i>	2512	52.3%
2- <i>Argas reflexus</i>	125	2.6%
3- <i>Ornithodoros canestrinni</i>	96	2.0%
4- <i>Ornithodoros lahorensis</i>	1987	41.4%
5- <i>Ornithodoros tholozani</i>	85	1.77%

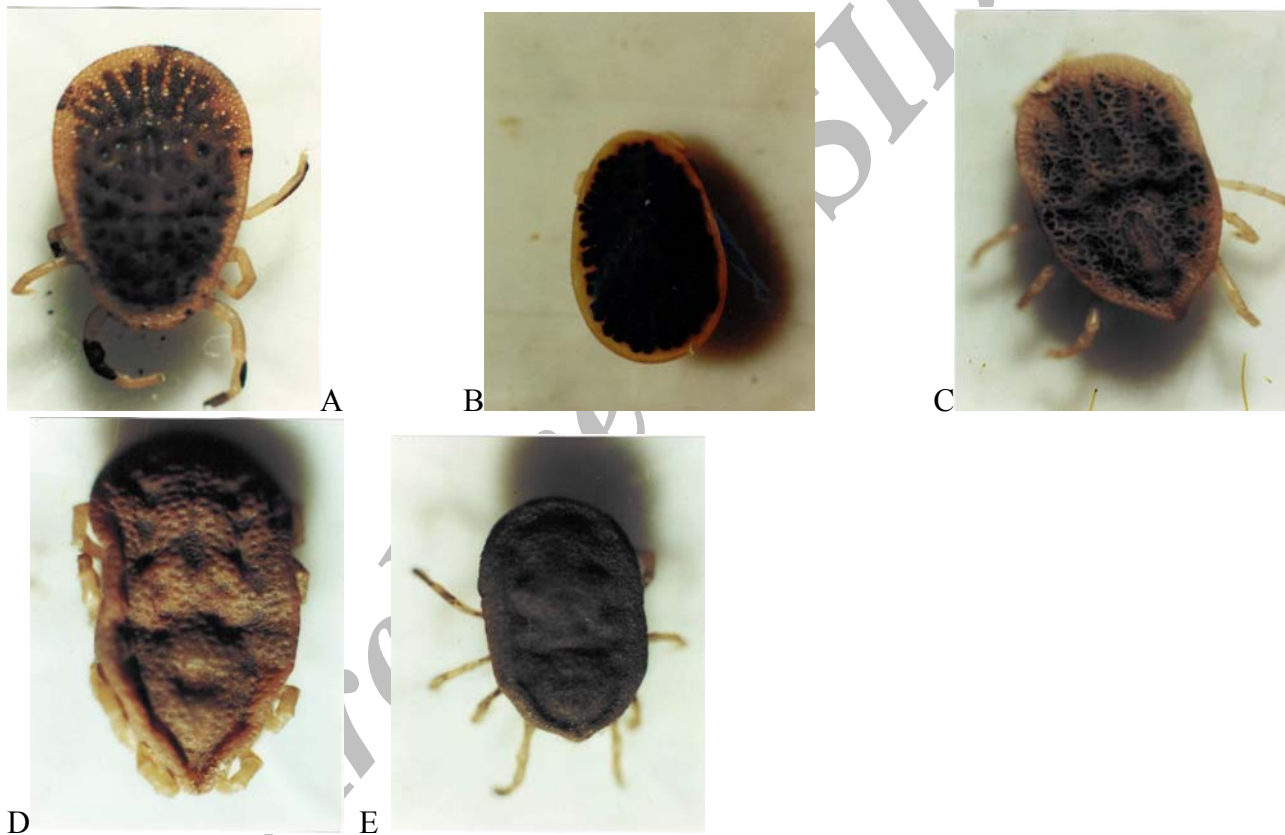


Fig.1: Demonstration of collected ticks
A: *A. persicus* **B:** *A. reflexus* **C:** *O. canestrinni* **D:** *O. lahorensis* **E:** *O. tholozani*

Discussion

From table 1 it can be concluded that *A.persicus* and *O.tholozani* encompass the highest and lowest frequency, respectively. Among the 82 specimens of *O.tholozani* only 3.7% revealed infection with *B.persica*. The infection of ticks is correlated with

disease distribution in the province. In Iran three species of *Ornithodoros* are able to transmit the *Borrelia* to human including *O. tholozani*, *O.erraticus* and *O.tartokovyskyi* (4). The main *Borrelia* species in Iran can be classified as *B.persica*, *B.microti*, *B.latyschevi*, and *B.baltazardi*

(5). The main reservoirs of the *Borrelia* are wild rodents. An investigation was carried out by Janbaksh and Ardalan (6), they found that *O.tholozani* was infected with *Borrelia* in Arak city. Aghighi et al (7) found that the main ticks' distribution in Ghazvin province was *O.tholozani*, *O.canestrini*, *O.lahorensis*, *O.erraticus*, *A.persicus* and *A.reflexus*. They found that *O.tholozani* was infected with *B.persica* and *O.erraticus* with *B.microti*. It should be noted that in Europe the main vector of *Borrelia* is *Ixodes* and there are several species of *Borrelia* reported from this region, they are *B.burgdorfi*, *B.afzeli*, *B.garinii*, *B.valaisiana* and *B.lusitaniae* (8). For control of ticks there are several measures which can be classified as follows: interior residual application, animal treatment, exterior application, using repellent, removal of ticks from body, vaccination, and environmental sanitation, active case detection and treatment and health education.

Acknowledgements

The authors would like to appreciate very much for kind collaboration of CDC, Ministry of Health & Medical Education of Iran, Staff of Department of Medical Entomology, Iran Pasture Institute and Hamadan University of Medical Sciences

References

1. Gray JS, Kahl O, Lane RS and Stanek G (2002). *Lyme Borreliosis: Biology and control*. CABI publishing Book. p. 368.
2. Cunha BA (2000). *Tick-borne infectious disease, diagnosis and management*. Marcel Dekker, Inc. Publication, New York, p. 283.
3. Department of Zoonosis, Ministry of Health & Medical Education of Iran (2003) (unpublished data).
4. Karimi Y (1981). *Epidemiology of relapsing fever in Iran*. Pasteur Institute of Iran Publication. pp.5-15.
5. Kelly RT (1976). *Cultivation and physiology of relapsing fever Borrelia; the biology of parasite spirochetes*. Johnson RC (ed), New York, Academic Press Inc, pp. 88-94.
6. Janbakhs B , Ardalan A (1977). The nature of sporadic cases of relapsing fever in Kazeroon area, southern Iran. *Bull Path Exot*, 70: 587- 89.
7. Aghighi Z, Asmar M, and Vatandoost H (1998). An investigation on the vectors of Borreliosis in Ghazvin province, Iran. *Moddaress*, 3 (2): 111-14.
8. Gern L, Perret JL, Gremion F, Guigoz E, Rais O Mosman Y (2002). Five year survey on the prevalence of *Borrelia burgdorferi* sensu lato in *Ixodes ricinus*, on tick density and clinical cases of Lyme borreliosis in an endemic area of Switzerland. *Int J Med Microbiol*, 291 (Suppl 33): 21.