

RESEARCH ARTICLE



Monitoring of Congo-Crimean Haemorrhagic Fever Vectors during 2010-2013 in Albania

PERPARIM KADRIAJ¹, ENKELEJDA VELO¹, KUJTIM MERSINI², KRISTAQ BERXHOLI³, SILVA BINO¹¹Infectious Disease Control Department, Institute of Public Health, Tirana., Albania;²National Veterinary Epidemiology Unit, Institute of Food Safety and Veterinary, Tirana, Albania;³Faculty of Veterinary Medicine, Agriculture University, Tirana, Albania;

*Correspondent author: E-mail: pkadriaj@yahoo.com

Abstract

During 2010-2013, ticks from hosted animals, have been collected from 9 districts in Albania. Here we present the composition of tick species and the prevalence of their distribution. Dragging, collection from the host used for tick collection. Cows, sheep, goat and dogs are examined for the presence of ticks. Collected ticks were transported alive in the laboratory were subsequently identification at species level has been carried out based on identification keys and taxonomic characters as described by Estrada-Pena. Eleven ticks species have been identified during this study. *Boophilus annulatus* (34%) was the predominant collected species, followed by *Hyalomma marginatum* (23%) *Rhipicephalus bursa* (18%), *Rhipicephalus turanicus* (14%) and *Rhipicephalus sanguineus* (7%), *Ixodes ricinus* (1%). *Dermacentor marginatum*, *Hyalomma detritum detritum*, *Hyalomma detritum scupense*, and *Hemaphysalis sulcata* were found with very low prevalence. Cows were the main host for *Hyalomma marginatum*. All *Rhipicephalus sanguineus* were collected on dogs. *Hyalomma marginatum* were the prevalent species in CCHF endemic areas in Kukes prefecture. *Hyalomma marginatum* and *Rhipicephalus bursa* are predominant in CCHF endemic areas in Albania. While other species are distributed all over the districts. Identification of geographical distribution of ticks allows evaluating the risks and promptly implementing control measures for tick borne diseases.

Keywords: Tick, *Hyalomma marginatum*, Crimean-Congo Hemorrhagic, Fever virus.

1. Introduction

In Albania the first cases of Crimean-Congo haemorrhagic fever was identified in 1986. The primary tick vectors belong to the *Hyalomma* genus. *Hyalomma* ticks infest a wide spectrum of different wildlife species. In Albania, cases with Crimean-Congo haemorrhagic fever occur almost every year. The most endemic region is the northeast part of the country, such in Kukes and Has [1]. The ticks of *Hyalomma* genus are considered as primary vectors of CCHF [1]. A wide range of wild and domestic animal are host animals for ticks. After controlling the domestic animals resulted that they were infested with different species of ticks, with the highest infestation from *Hyalomma* sp. and *Rhipicephalus* sp. During 2010-2013, ticks were collected from domestic animals in 9 districts in Albania. Ticks are ectoparasites (external parasites), living by hematophagy on the blood of mammals, birds, and sometimes reptiles and amphibians. Ticks are vectors of a number of diseases that affect both humans and other animals [13]. Ticks are usually found in habitats with vegetation where they feel protected and that are frequented by their host animals. [4]. Ticks belong to phylum *Arthropoda* (the body is covered with exoskeleton and nodulated legs, separated in segments), Class *Arachnida* (missed antennae, multiple eyes and arms), Order *Acarinave*, s/order *Metastigmata*, s/genus *Ixodide*, which includes 13 genus with approximately 680 species; *Argasidae* with circa 190 other species of 5 genus and *Fam. Nuttalliellidae* with one genus and one species. The ticks' species that belong to genus *Hyalomma* are found in Africa, South Europe and Asia. Some species of this

genus are re-described lately based in their morphological characteristics. *Hyalomma* carry out their development circle mainly in two or three host animals. [8,9]. They have relatively big body, long mouth apparatus, pale to dark and light rings in their legs. All the species of this genus have convex eyes, festoons and in males there is the anal plaque as well [8]. There are known seven species of this genus: *Hy. turanicum*, *Hy. isaaci*, *Hy. rufipes*, and *aegyptium*, *anatolicum*, *detritium* and *Hy. marginatum*. In our country there are found the species *Hy. marginatum*, *Hy. turanicum*, *Hy. anatolicum* dhe *Hy. aegyptium*. [8].

2. Material and Methods

The investigation began in rural area among the livestock while pasturing and during their stay in the stockyard. Stations were chosen and all the areas were controlled as well as animals, Tick samples and blood serums were collected in livestock such cows, sheep, goats and dogs. The study was conducted in 9 districts of the country. Dragging, collection from the host where the methods used for tick collection. Cows, sheep, goat and dogs are examined using gloves for the presence of ticks in ears, thighs, perineal region etc. Protective white clothes were used during the field work, to avoid tick bite and make possible to spot their movement on the body. In some cases, ticks can be found also in the upper part of the back. All the ticks were collected directly from the animals and only one tick during their standing-up. The ticks that were collected were transported to the Laboratory of Medical Entomology at the Institute of Public Health, alive for identification at species level (Estrada-Pena (ICTTD-2004). One part of the material (defined ticks and livestock's blood sera) was protocolled and kept in the refrigerator -70°C and sent to cooperating labs, for further molecular analysis to determine the presence of CCHF virus, to evaluate the infection rate.

3. Results and Discussion

Eleven ticks species have been identified during this study. *Boophilus annulatus* 1945 was the predominant collected species, followed by *Hyalomma marginatum* 1241 *Rhipicephalus bursa* 975, *Rhipicephalus turanicus* 133, *Ixodes ricinus* 53, *Rhipicephalus sanguineus* 25, *Dermacentor marginatus* 11, and *Hemaphysalis sulcata* 129, *Hyalomma detritium detritium*, *Hyalomma detritium scupense*, were found with very low prevalence.

Table 1. Total number of ticks and type of tick species by year and district.

Year	Species	No TOT	NR F	NR M
2010-2013	<i>Hyalomma marginatum</i>	1241	434	807
2010-2013	<i>Rhipicephalus bursa</i>	975	505	468
2010-2013	<i>Rhipicephalus sanguineus</i>	25	8	17
2010-2013	<i>Rhipicephalus turanicus</i>	133	70	63
2010-2013	<i>Ixodes ricinus</i>	53	45	8
2010-2013	<i>Haemaphysalis punctata</i>	129	58	71
2010-2013	<i>Dermacentor marginatus</i>	11	5	6
2010-2013	<i>Boophilus annulatus</i>	1945	1312	651

A total of 1813 samples were collected. The vast majority of samples were collected among cows 1096 (52.1%), 514 (52.6%) among sheep, 184 (67.4%) among goats and 25 (62.9%) among dogs. According to type of hosts the infestation rate was higher among goats (67.4%), followed by cows (52.1%), sheep (32.3%) and dogs (62.9%) *Hyalomma marginatum* was the dominant type of species in cows (32.8%) whereas *Rhipicephalus bursa* in sheep (61.2%) and goats (100%). (table 2).

Table 2. The numbers of hosts and number of infested hosts by district (infestation rate).

Species	No. of hosts	No. of infested hosts	Infestation rate (%)
Goat	184	124	67.4

Cow	1096	711	52.1
Sheep	504	186	32.3
Dog	25	17	62.9
Donkey	1	1	100.0
Field	1	1	100.0
HLC	1	1	100.0
Human	1	1	100.0

Hyalomma marginatum predominates mainly in districts Kukës (55.2%), Has (23.4%), Tropoje (13.2%) whereas, Berat (4.9%) and Kolonjë (3.3%).(table 3).

Table 3. Total number of *Hyalomma marginatum* ticks species by year and district.

District	Year	Species	NR_TOT	NR_F	NR_M
TROPOJE	2010	Hyalomma marginatum	41	15	26
HAS	2010	Hyalomma marginatum	266	96	170
KUKES	2010	Hyalomma marginatum	346	119	227
HAS	2011	Hyalomma marginatum	136	54	82
KOLONJE	2011	Hyalomma marginatum	2	0	2
KUKES	2012	Hyalomma marginatum	19	2	17
BERAT	2012	Hyalomma marginatum	18	6	12
KOLONJE	2012	Hyalomma marginatum	8	0	8
KUKES	2013	Hyalomma marginatum	350	119	231
HAS	2013	Hyalomma marginatum	55	23	32
			1241	434	807



Figure 1. A map showing the distribution of different types of ticks

All types have a spread all the country. *Boophilus annulatus* was the predominant collected species, followed by *Hyalomma marginatum*, *Rhipicephalus bursa*, *Rhipicephalus turanicus*, *Rhipicephalus sanguineus*, *Ixodes ricinus*, *Dermacentor marginatus*, *Hyalomma detritum detritum*, *Hyalomma detritum scupense*, and *Hemaphysalis sulcata*, in our country within the period 2010-2014. The cicatrices in the animal body showed a high infestation during the spring season and in the beginning of the summer. Different environmental factors influence the distribution and the abundance of ticks as vectors, and in the other side, they play an important role in the epidemiology of CCHF [1]. Ticks of *Rhipicephalus sanguineus* specie are found in dogs in the district of Gjirokaster, but it is spread almost all over the country in urban and rural areas [2]. We gathered the *Ixodes ricinus* (forest ticks) in all the areas, mostly in hilly-mountainous villages, forests, pastures, which are appropriate ambiences for this specie. They are the ideal ecosystems and provide suitable conditions of the soil, relative moisture and air temperatures for its development and proliferation [2,15]. *Dermacentor marginatus* is detected during staying up. This specie has a very low prevalence in our country. *Boophilus annulatus* is found only in the district of Has, but also *Hyalomma*.

4. Conclusions

During the study was viewed that *Hyalomma marginatum* is widespread in endemic areas of CCHF, such as the district of Kukes, whereas *Rhipicephalus bursa* is more diffused in Kolonje district, where lately CCHF cases are identified. Cows are the main host animals for *Hyalomma marginatum* and *Rhipicephalus bursa* for sheep and goats. The species that dominate in Albania, in the endemic area of CCHF are *Hyalomma marginatum* and *Rhipicephalus bursa*. *Hyalomma marginatum* is found with the largest abundance in the endemic areas of CCHF in Kukes district. *Rhipicephalus bursa* is in higher abundance in the district of Kolonje, where cases with CCHF are identified. CCHF is endemic in Albania, especially in the northeast part of the country. Potential factors that play an important role in the disease transmission are the contact and stinging by ticks, manipulation with domestic and wild animals. There exist the natural habitat and appropriate ecological conditions for developing the vectors of this disease, whereas other species are spread almost in all the districts, but in lower density.

5. References

1. Papa E, Velo E, Papadimitriou G, Cahani G, Kota M, Bino S: **Ecology of the Crimean-Congo Hemorrhagic Fever endemic area in Albania**. *Vector Borne Zoonotic Diseases* 2009, **9**(6): 713–716.
2. Velo E, Rogozi E, Tafaj L, Bino S: **Draft on vector and rodent control in Albania**: PHI, Tirana; 2013.
3. Gordon SW, Linthicum KJ, Moulton JR: **Transmission of Crimean–Congo hemorrhagic fever virus in two species of *Hyalomma* ticks from infected adults to cofeeding immature forms**. *American Journal of Tropical Medicine and Hygiene* 1993, **48**(4): 576–580.
4. Estrada-Pen A: **The relationships between habitat topology, critical scales of connectivity and tick abundance *Ixodes ricinus* in a heterogeneous landscape in northern Spain**. *Ecography* 2003, **26**: 661–671.
5. Estrada-Pena A, Vatansever Z, Gargili A, et al.: **The trend towards habitat fragmentation is the key factor driving the spread of Crimean-Congo haemorrhagic fever**. *Epidemiol Infect* 2010, **138**: 1194–1203.
6. Jameson LJ, Morgan PJ, Medlock JM, Watola G, Vaux AG: **Importation of *Hyalomma marginatum*, vector of Crimean-Congo haemorrhagic fever virus, into the United Kingdom by migratory birds**. *Ticks and Tick-borne Diseases* 2012, **3**: 95–99.
7. Papa A, Bino S, Papadimitriou E, Velo E, Dhimolea M, Antoniadis A: **Suspected Crimean Congo Haemorrhagic Fever cases in Albania**. *Scand J Infect Dis* 2008, **40**(11-12): 978-980.
8. Apanaskevich DA, Horak IG: **The genus *Hyalomma* Koch, 1844: V. Re-evaluation of the taxonomic rank of taxa comprising the H.(*Euhyalomma*) *marginatum* Koch complex of species (Acari: Ixodidae) with redescription of all parasitic stages and notes on biology**. *International Journal of Acarology* 2008, **34**(1): 13-42.

9. Estrada-Pena A, Farkas R, Jaenson TG, Madder M, Pascucci I, Tarrés-Call J: **Scientific opinion on the Role of Tick Vectors in the Epidemiology of Crimean-Congo Hemorrhagic Fever and African Swine Fever in Eurasia: EFSA Panel on Animal Health and Welfare.** *EFSA Journal* 2010, **8**(8): 1-156.
10. Papa A, Bino S, Llagami A, Brahimaj B, Papadimitriou E, Pavlidou V, et al.: **Crimean-Congo hemorrhagic fever in Albania, 2001.** *Eur J Clin Microbiol Infect Dis* 2002, **21**(8): 603-606.
11. Apanaskevich DA, Horak IG: **The genus *Hyalomma* Koch, 1844. II. Taxonomic status of *H.(Euhyalomma) anatoloicum* Koch, 1844 and *H. (E.) excavatum* Kock, 1844 (Acari, Ixodidae) with redescrptions of all stages.** *Acarina* 2005, **13**: 181–197.
12. Apanaskevich DA, Horak IG: (2006). **The genus *Hyalomma* Koch, 1844. I. Reinstatement of *Hyalomma (Euhyalomma) glabrum* Delpy, 1949 (Acari, Ixodidae) as a valid species with a redescription of the adults, the first description of its immature stages and notes on its biology.** *Onderstepoort Journal of Veterinary Research* 2006, **73**: 1–12.
13. Maltezou HC, Papa A: **Crimean-Congo hemorrhagic fever: risk for emergence of new endemic foci in Europe?** *Travel Med Infect Dis* 2010, **8**: 139-143.
14. Kampen H, Poltz W, Hartelt K, Wölfel R, Faulde M: **Detection of a questing *Hyalomma marginatum marginatum* adult female (Acari, Ixodidae) in southern Germany.** *Exp Appl Acarol* 2007, **43**: 227-231.
15. Al-Abri SS, Al Abaidani I, Fazlalipour M, Mostafavi E, Leblebicioglu H, et al.: **Current status of Crimean-Congo haemorrhagic fever in the World Health Organization Eastern Mediterranean Region: issues, challenges, and future directions.** *Int J Infect Dis* 2017, **58**: 82-89.
16. Messina JP, Pigott DM, Golding N, Duda KA, Brownstein JS, Weiss DJ, Nuttall PA: **The global distribution of Crimean-Congo hemorrhagic fever.** *Trans R Soc Trop Med Hyg* 2015, **109**: 503-513.
17. Lugaj A, Koni M, Mertens M, Groschup MH, Bërxfholi K: **Serological survey of Crimean-Congo hemorrhagic fever virus in cattle in Berat and Kolonje, Albania.** *Albanian J Agric Sci* 2014, **13**: 325-328.