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Entomological Study of Ticks in Albania during 2010-2015

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Abstract: ***During the period 2010-2015 ticks from hosted animals, have been collected from 20 districts in Albania. Dragging on the ground and direct collection from the host are the methods used for tick collection. They were transported alive in the laboratory, IPH, Tirana, were subsequently identification at species level has been carried out based on morphological characters using the identification keys by Estrada-Pena (ICTTD-2004). Hyalomma marginatum was the dominant species in cows (32.8%) and dogs (100%) whereas Rhipicephalus bursa in sheep (81.2%) and goats (100%). Hy.marginatum was the prevalent species in CCHF endemic areas in Kukes prefecture, while Rhp. bursa was prevalent in Kolonje district where CCHF cases have been recently indentified. Hyalomma marginatum and Rhipicephalus bursa are predominant in CCHF endemic areas in Albania. Eleven ticks species have been identified during this study. Identification of geographical distribution of ticks allows evaluation of the risks and prompt implementation of control measures for tick borne diseases.***

Keywords: tick, Hyalomma marginatum, entomology, Crimean-Congo Hemorrhagic Fever, virus

1. Introduction

In Albania the first cases of Crimean-Congo haemorrhagic fever was identified in 1986, and cases occur almost every year. 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. 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*. [1, 2]. During 2014, ticks were collected from domestic animals in 6 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. [4,5,6]. Ticks belong to phylum *Arthropoda* (the body is covered with exoskeleton and nodulated legs, separated in segments), Class *Arachnida* (missed antennas, 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*.[8,12,13]. Based on literature and CCHF cases , we undertook this study in certain areas in Albania.

2. Materials 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. Among the herds that resulted positive, tick samples and blood serums were collected in livestock such cows, sheep and goats.

The study was conducted in 20 districts of the country. Dragging, collection from the host and the environment are 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 [8]. One part of the material (defined ticks and livestocks blood sera) was protocoled 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

A total of 2162 samples were collected. The vast majority of samples were collected among cows 1218 (56.3%), 704 (32.6%) among sheep, 154 (8.5%) among goats and 52 (2.4%) among dogs ($p<0.01$). (table 1)

As shown in table 2 the total infestation rate is 52.4%. The lowest infectation rate is found in district of Mallakaster (0%) followed by distrit of Malesi e Madhe (5.2%) and Diber (9.5%).

According to type of hosts the infestation rate was higher among goats (67.4%), followed by cows (58.4%), sheep (39.3%) and dogs (32.7%) ($p<0.01$). (table 3)

As noted in table 4 the species of *Hyalomma marginatum* accounts for 27.1%) of total ticks [95%CI 26.07% to 28.14%], whereas 20.5% of ticks belong to the species *Rhipicephalus bursa* [95%CI 19.57% to 21.45%], with a significant difference between them ($p<0.01$).

Hyalomma marginatum predominates mainly in districts of Mat (88.9%), Kukes (73.8%), Lezhe (65.9%), Has (27.5%) and Vlore (23.2%) whereas *Rhipicephalus bursa* in Kolonje (79.7%), Berat (69.9), Sarande (76.2%) and Tropoje (48.6%).

Hyalomma marginatum was the dominant type of species in cows (32.8%) and dogs (100%) whereas *Rhipicephalus bursa* in sheep (81.2%) and goats (100%). (table 5).

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-montainous 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.* The species that dominate in Albania, in the endemic zones 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 abudance 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 transmition 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.

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Table 1: The total number of hosts by district

District	Nr. of hosts	Cow	Sheep	Dog	Goat	Donkey	Field	HLC	Human
Berat	315	52	263						
Diber	74	74	0						
Elbasan	9		9						
Fier	1		1						
Gjirokaster	326	68	256	2					
Gramsh	30	23	6			1			
Has	289	194	29		64		1		1
Kolonje	277	107	50		120				
Kukes	228	202	16	9				1	
Lezhe	10	8	2						
Malesi e Madhe	135	84	51						
Mallakaster	6		6						
Mat	10	10	0						
Sarande	1	1	0						
Shkoder	16	16	0						
Skrapar	92	52	5	35					
Tepelene	18	8	10						
Tirane	21	15	0	6					
Tropoje	187	187	0						
Vlore	117	117	0						
Total	2162	1218	704	52	184	1	1	1	1

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

District	Nr. of sampled animals	Nr. of infected animals	Infestation rate (%)
Berat	315	130	41.3
Diber	74	7	9.5
Elbasan	9	9	100.0
Fier	1	1	100.0
Gjirokaster	326	168	51.5
Gramsh	30	27	90.0
Has	289	211	73.0
Kolonje	277	155	56.0
Kukes	228	166	72.8
Lezhe	10	10	100.0
Malesi e Madhe	135	7	5.2
Mallakaster	6	0	0.0
Mat	10	5	50.0
Sarande	1	1	100.0
Shkoder	16	6	37.5
Skrapar	92	80	87.0
Tepelene	18	10	55.6
Tirane	21	11	52.4
Tropoje	187	70	37.4
Vlore	117	59	50.4
Total	2162	1133	52.4

Table 3: Infestation rate by type of species

Species	No. of hosts	No. of infected hosts	Infestation rate (%)
Goat	184	124	67.4
Cow	1218	711	58.4
Sheep	704	277	39.3
Dog	52	17	32.7
Donkey	1	1	100.0
Field	1	1	100.0
HLC	1	1	100.0
Human	1	1	100.0

Table 4: Total number of ticks and type of tick species by district

District	Total no. of ticks	N (%) of_Hy. marginatum	N (%) of Rhp. Bursa
Berat	569	2 (3.9)	398 (69.9)
Diber	10	9 (90	0
Elbasan	26	0	1 (3.8)
Fier	1	0	1 (100)
Gjirokaster	636	63 (9.9)	1 (0.2)
Gramsh	128	12 (9.4)	0
Has	3053	841 (27.5)	187 (6.1)
Kolonje	665	69 (10.4)	530 (79.7)
Kukes	963	711 (73.8)	131 (13.6)
Lezhe	41	27 (65.9)	10 (24.4)
Malesi e Madhe	11	0	0
Mallakaster	0	0	0
Mat	9	8 (88.9)	0
Sarande	21	3 (14.3)	16 (76.2)
Shkoder	21	17 (81)	3 (14.3)
Skrapar	137	0	31 (22.6)
Tepelene	34	0	0
Tirane	407	12 (2.9)	0
Tropoje	290	113 (39.0)	141 (48.6)
Vlore	56	13 (23.2)	0
Total	**7078**	**1920 (27.1)**	**1450 (20.5)**

Table 5: The dominant species of ticks by type of host

Host	Total no. of ticks	N (%) of_Hy. marginatum	N (%) of Rhp. Bursa
Cow	5294	1735 (32.8)	561 (10.6)
Sheep	776	146 (18.8)	630 (81.2)
Dog	36	36 (100.0)	0
Goat	259	0	259 (100.0)
Donkey	0	0	0
Field	1	1 (100.0)	0
HLC	1	1 (100.0)	0
Human	1	1 (100.0)	0