

## STUDY REGARDING THE EVOLUTION OF LYME DISEASE MONITORED FOR A PERIOD OF FOUR YEARS IN OLTENIA, FROM 2013 TO 2016

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**Abstract.** Lyme disease (Lyme borreliosis) groups the clinic manifestations due to the infection with *Borrelia burgdorferi*. Lyme disease, caused by infection with *Borrelia burgdorferi*, is the most frequently reported arthropod-borne disease in the United States. In Europe, the vector of transmitting the disease is represented by the tick *Ixodes ricinus*. In Romania, there have been identified 27 species of ticks, 25 species of ixodids and 2 species of argasids. Not all ticks are infected with *Borrelia burgdorferi*. The incriminated stages in transmitting Lyme borreliosis are the nymphs and adults. The epidemiologic analysis regarding the supervised cases of Lyme disease from Oltenia taken into consideration for 2010-2012 period when the number of supervised Lyme disease progressively increased, on one side, but also the increase of confirmed cases made us continue the analysis for the next years. In the year 2013, the number of supervised cases of Lyme disease from Oltenia decreased very much and the period 2014-2016 shows variations: increase of cases in the year 2014, their decrease in 2015 followed by an increase in 2016. The lowest number of cases was recorded in 2014, a single case. We notice then a progressive increase of Lyme disease cases in the period 2015-2016. The highest number of Lyme disease cases confirmed in Oltenia was recorded in 2012, and the lowest number in the year 2013.

**Keywords:** Lyme disease, *Borrelia burgdorferi*, tick, epidemiologic analysis, confirmed cases.

**Rezumat. Studiu privind evoluția cazurilor de boală Lyme luate în supraveghere în Oltenia pentru o perioadă de patru ani, din 2013 până în 2016.** Boala Lyme (borrelioza Lyme) grupează manifestările clinice datorate infecției cu *Borrelia burgdorferi*. Boala Lyme, cauzată de infecția cu *Borrelia burgdorferi*, este cea mai frecventă boală transmisă de artropode în Statele Unite ale Americii. În Europa, vectorul de transmitere al bolii îl reprezintă căpușa *Ixodes ricinus*. În România, au fost identificate 27 specii de căpușe, 25 specii ixodide și 2 specii argaside. Nu toate căpușele sunt infectate cu *Borrelia burgdorferi*. Stadiile incriminate în transmiterea borreliozei Lyme sunt: nimfele și adulții. Analiza epidemiologică privind cazurile de boală Lyme luate în supraveghere din Oltenia realizată pentru perioada 2010-2012 când numărul de cazuri de boală Lyme intrate în supraveghere în Oltenia a crescut progresiv, pe de o parte, dar și creșterea numărului de cazuri confirmate, ne-a determinat să continuăm analiza pentru anii următori. În anul 2013 numărul de cazuri de boală Lyme intrate în supraveghere în Oltenia a scăzut foarte mult, iar perioada 2014-2016 prezintă fluctuații: creșterea numărului de cazuri în anul 2014, scăderea lor în 2015, urmată de o creștere în anul 2016. Cel mai mic număr de cazuri de boală Lyme intrate în supraveghere în Oltenia s-a înregistrat în anul 2014, un singur caz. Se remarcă apoi o creștere progresivă a numărului de cazuri de boală Lyme confirmate în Oltenia în perioada 2015-2016. Cel mai mare număr de cazuri de boală Lyme confirmate în Oltenia, s-a înregistrat în anul 2012, iar cel mai mic număr în anul 2013.

**Cuvinte cheie:** boala Lyme, *Borrelia burgdorferi*, căpușă, analiză epidemiologică, cazuri confirmate.

### INTRODUCTION

The syndrome known today under the generic denomination of Lyme disease was reported in many regions from Asia, Australia, England, Europe, Mexico, North America, Russia and South Africa (WHITE, 2005). Lyme disease, caused by infection with *Borrelia burgdorferi*, is the most frequently reported arthropod-borne disease in the United States. (DAVID et al., 1998). Lyme disease (Lyme borreliosis) groups the clinic manifestations caused by the infection with *Borrelia burgdorferi* (CIOLPAN, 2008). Many of the researches done to identify the etiological agent of the disease coincided with the efforts to determine the potential vector and the natural cycle of the disease (WHITE, 2005).

In Europe, the vector of the disease transmission is the tick *Ixodes ricinus*. In Romania, 27 species of ticks, 25 species of ixodids and two species of argasids were identified (COIPAN et al., 2011). Not all the ticks are infected with *Borrelia burgdorferi*. The incriminated stages in transmitting the Lyme borreliosis are the nymphs and adults (VLADIMIRESCU, 2012). According to the researches done by COIPAN & VLADIMIRESCU, 2011 approximately 18% of the ticks analyzed through molecular methods presented *Borrelia burgdorferi* *sensu lato* and the prevalence of infection did not differ significantly between nymphs (19.1%) and adults (15.4%). The borrelioses persist in the *Ixodes* ticks genus also through trans-stages and transovarian transmission (CIOLPAN, 2008).

Lyme borreliosis, present also in Romania, is a part of the supervised transmissible diseases. The epidemiologic analysis regarding the supervised cases of Lyme disease from Oltenia taken into consideration for 2010-2012 period when the number of supervised Lyme disease progressively increased, on one side, but also the increase of the confirmed cases, made us continue the analysis for the next years. In the year 2013, the number of the supervised Lyme disease cases decreased very much and the period 2014-2016 shows variations - increase of the cases in the year 2014, their decrease in 2015 followed by an increase in the year 2016. The lowest number of the supervised Lyme disease was recorded in the year 2014, a single case. We notice then a progressive increase of Lyme disease confirmed cases in the period 2015-2016. The highest number of Lyme disease cases confirmed in Oltenia was recorded in 2012, and the lowest number in the year 2013.

## MATERIAL AND METHODS

The used data for this analysis are extracted from the yearly *Reports regarding The Analysis of the transmissible Supervised Diseases Evolution* from 2013-2016 period and *Lyme disease - The descriptive epidemiologic analysis of Lyme diseases supervised* for 2013-2016 period, realized by the National Institute for Public Health Romania/ National Center of the Surveillance and Control of Transmissible Diseases. The data extracted were registered in tables. The data processing was done through mathematic methods, and the graphs were realized using Microsoft Excel.

## RESULTS AND DISCUSSIONS

### Stage II. The analysis of the supervised Lyme disease cases in Oltenia in 2013-2016.

The cases of the supervised Lyme disease in the year 2013 in Oltenia represent 25% of the total number of cases from 2012, their significant decrease being pointed out (Table 1). Regarding the number of cases confirmed in the year 2013, we notice a significant decrease, representing 38.09% from the number of cases confirmed in 2012. As a consequence of the supervised cases reported in Oltenia compared to the supervised cases at the national level (2013) we notice the next aspects: supervised cases: 1.71% from the cases at the national level; confirmed cases: 1.95% from the ones at the national level; infirmed cases: 1.74% from the ones at the national level.

Table 1. Lyme disease cases supervised in Romania in 2013-2016 period.

Years	Confirmed	Infirmed	Probable	Suspected/possible	Total
2013	409	572	70	1	1052
2014	248	441	17	52	758
2015	330	386	27	30	773
2016	250	392	20	26	688

In the next year, 2014, the supervised Lyme disease cases in Oltenia represent 83.33 % from the number of 2013 year cases, a slow decrease being pointed out. Speaking about the number of the confirmed cases in the year 2014, we notice a significant decrease, these representing 12.5 % from the number of cases confirmed in the year 2013. As a result of the analyses of the supervised cases reported in Oltenia compared to the ones at the national level (2014) we observe the following aspects: supervised cases: 1.97 % from the ones at the national level; confirmed cases: 0.40 % from the ones at the national level; infirmed cases: 2.97 % from the ones at the national level; probable cases: 5.88 % from the ones at the national level.

In Oltenia, the supervised Lyme disease cases in 2015 represent 73.33 % from the number of cases in the year 2014, a slow decrease being noticed. The number of cases confirmed in the year 2015 in Oltenia, shows a significant increase, four times higher than the number of the confirmed cases in 2014. Thus, the number of the confirmed cases in the year 2015 in Oltenia represents 36.36 % from the supervised Lyme disease cases in that year at Oltenia level. Analyzing the supervised reported cases compared to the ones at the national level (2015), we underline the following aspects: supervised cases: 1.42 % from the ones at the national level; confirmed cases: 1.21 % from the ones at the national level; probable cases: 3.33 % from the ones at the national level; infirmed cases: 1.55 % from the ones at the national level.

In the year 2016, in Oltenia, the supervised Lyme disease cases increased with 36.36 % compared to the ones from 2015. Speaking of the confirmed cases in the year 2016 in Oltenia, we also notice here a significant increase, 75 % compared to the confirmed cases in the year 2015. The number of the confirmed cases in the year 2016 in Oltenia represents 46.66 % from the supervised cases in that year at the level of Oltenia. As a conclusion of the supervised cases reported from Oltenia compared to the ones at the national level, we notice the following aspects: supervised cases: 2.18 % from the ones at the national level; confirmed cases: 2.8 % from the ones at the national level; infirmed cases: 1.78 % from the ones at the national level; possible cases: 5% from the ones at the national level.

For the period 2013-2016 the supervised Lyme cases in Oltenia is presented in the below table (Table 2).

Table 2. Lyme disease cases supervised in Oltenia in 2013-2016 period.

Years	Confirmed	Infirmed	Probable	Suspected/possible	Total
2013	5	0	0	0	5
2014	1	13	0	1	15
2015	4	6	1	0	11
2016	7	7	0	1	15
<b>Total</b>	<b>17</b>	<b>26</b>	<b>1</b>	<b>2</b>	<b>46</b>

After the analysis of these data we notice the fact that the lowest number of supervised cases was in 2013 and the highest in 2014 and 2016. Speaking of the number of confirmed cases, the highest number was recorded in 2016 and the lowest number in 2014, when, at the level of Oltenia, only one case of Lyme disease was confirmed.

In the period 2013-2016, the number of the supervised Lyme disease cases in Oltenia was 46, and the number of the confirmed cases was 17 that represents 36.95 % from the total supervised cases. We notice a variation in this period of the supervised cases in Oltenia, with the decrease of the number in the years 2013 and 2015 on one side and the increase of the cases in the years 2014 and 2016 on the other side.

We shall further analyse the distribution on counties of the supervised Lyme disease cases in Oltenia for the period 2013-2016. From the analysis of the graph (Fig.1), we notice that the highest number of the confirmed Lyme disease cases in the year 2013 was recorded in Vâlcea County, followed by Olt and Gorj Counties. We also notice that there was no case in Dolj and Mehedinți counties. In Vâlcea County, there were not infirmed, probable or possible cases, and in the counties Olt and Gorj there were not any probable or possible Lyme disease cases.

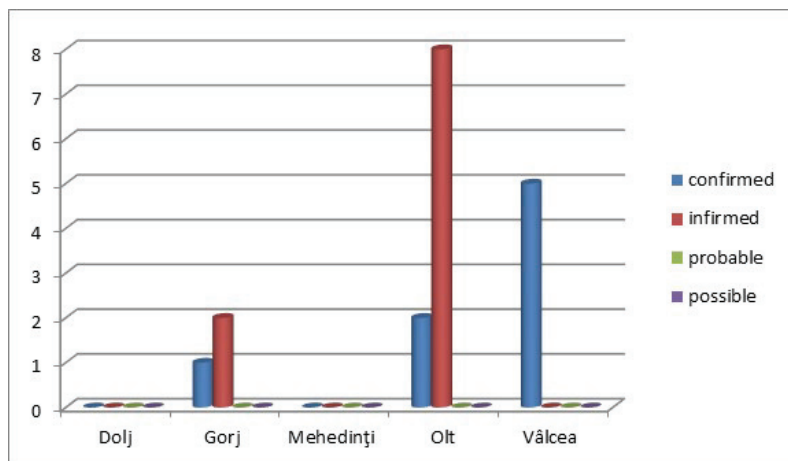


Figure. 1 The distribution on counties of the supervised Lyme disease cases in Oltenia 2013.

In 2014, we notice the fact that the highest number of the confirmed Lyme disease cases was recorded in Vâlcea County, being in fact the only county in Oltenia where there were confirmed cases. In the graph below (Fig. 2), we also notice that there was no case of Lyme disease in Dolj County and in the counties Gorj, Mehedinți and Olt there were not confirmed cases.

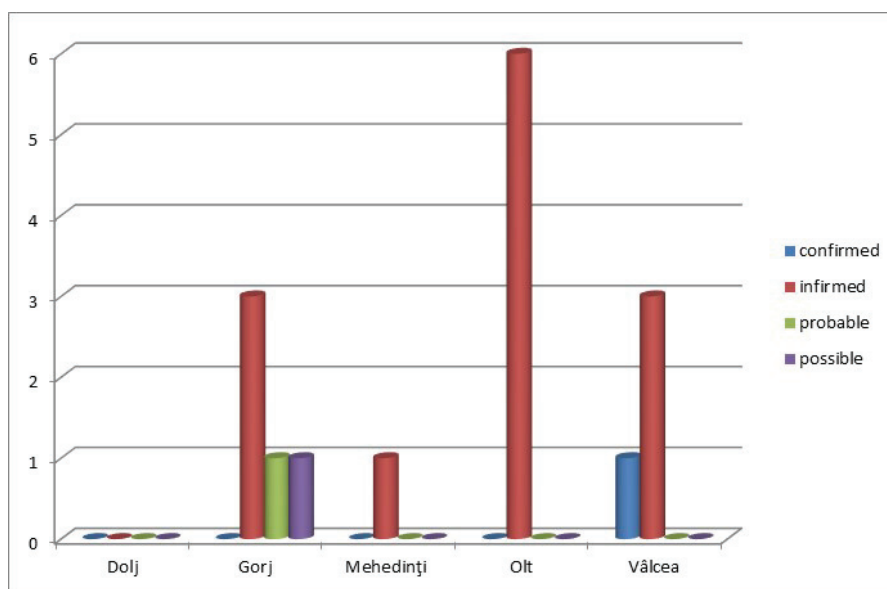


Figure 2. The distribution on counties of the supervised Lyme disease cases in Oltenia 2014.

For the next year, 2015, in Gorj County, it is remarked the highest number of confirmed Lyme disease cases in Oltenia. From the analysis of the graph (Fig. 3), we notice the fact that the number of cases is equal in Olt and Vâlcea counties. We notice that in Mehedinți County there was not recorded any case and in Dolj County there were not confirmed cases. In Gorj County, there were not infirmed, possible or probable cases.

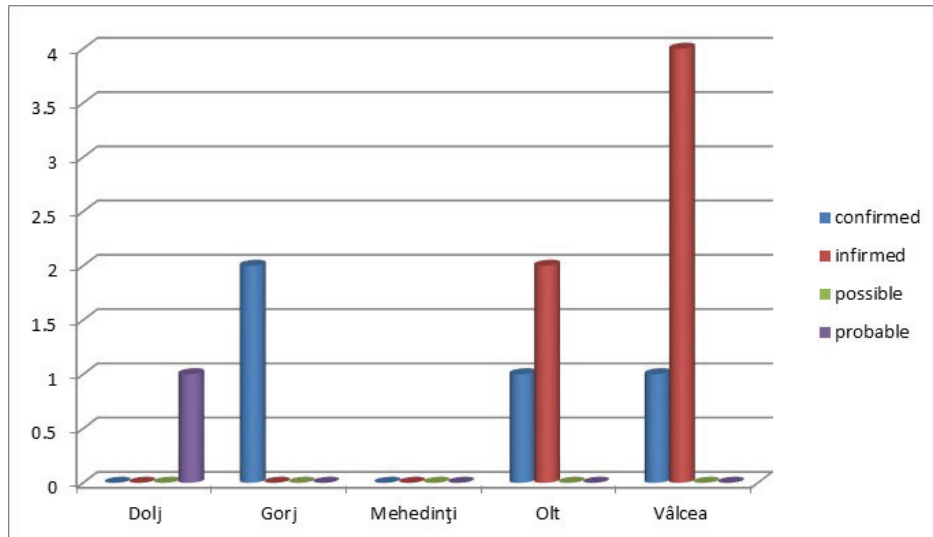


Figure 3. The distribution on counties of the supervised Lyme disease cases in Oltenia 2015.

In Oltenia, in 2016, there were supervised Lyme disease cases, in all the counties. Thus, according to the graph (Fig. 4), we notice that the highest number of the confirmed Lyme disease cases in the year 2016 was recorded in Mehedinți County followed by the counties Dolj, Olt, Gorj and Vâlcea that had the same number of cases. In Vâlcea County, there were infirmed most of the cases, followed by Olt and Gorj counties. In the counties Dolj and Mehedinți, there were not any infirmed, probable or suspected Lyme disease cases.

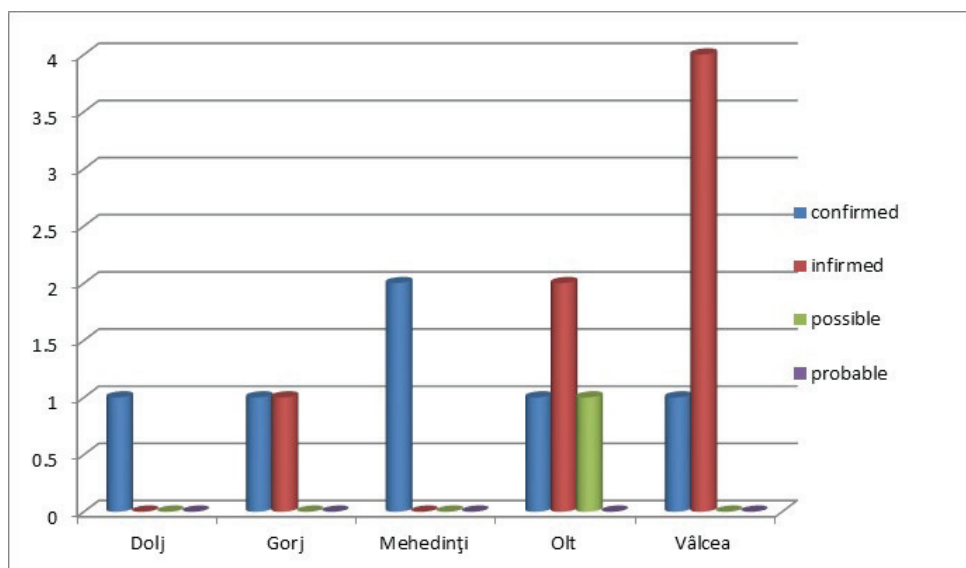


Figure 4. The distribution on counties of the supervised Lyme disease cases in Oltenia 2016.

From the graph (Fig. 5) we notice that the highest number of the confirmed Lyme disease cases in the period 2010-2016 was recorded in the year 2012 (21 cases). In the period 2010-2012, the number of confirmed cases in Oltenia progressively increased and in the period 2013-2014 the number of confirmed cases decreased. We notice then a progressive increase of the confirmed cases in Oltenia in the period 2015-2016. The lowest number of confirmed cases was recorded in 2013 that is 5 cases.

In the period 2010-2012, (Fig. 6) the number of the supervised cases progressively increased and in 2013 the cases decreased very much. We noticed the period 2014-2016 with variations, an increase of the cases in the year 2014, their decrease in 2015 followed by an increase in 2016. The lowest number of the supervised cases in Oltenia was in 2014 that is a single case.

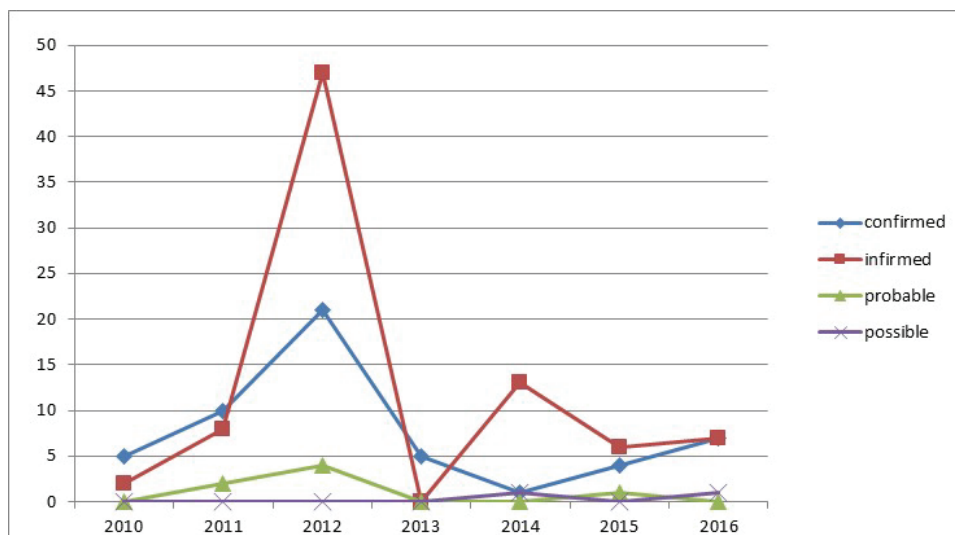


Figure 5. The evolution of the supervised Lyme disease cases in Oltenia (2010-2016).

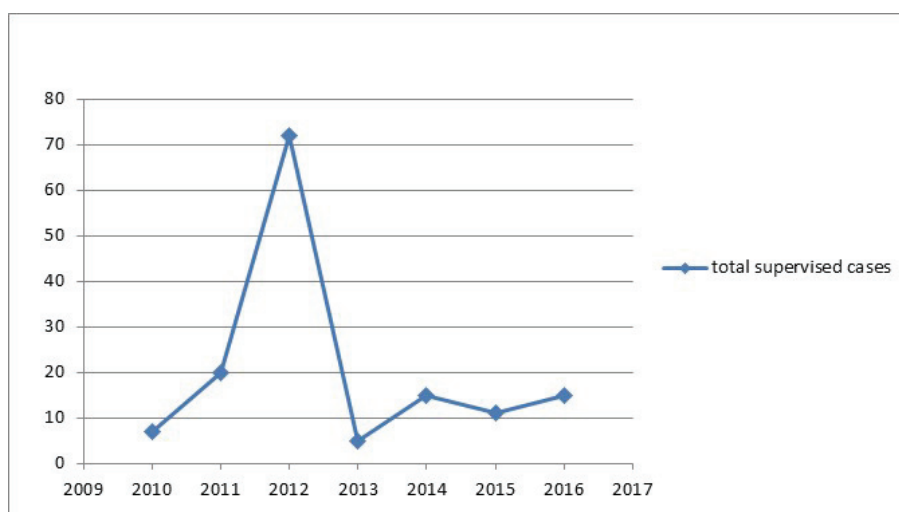


Figure 6. The evolution of the supervised Lyme disease cases in Oltenia (2010-2016).

### CONCLUSIONS

The epidemiologic analysis regarding Lyme disease cases supervised in Oltenia, is realized for the 2010-2016 period, in two stages: the first one for the 2010-2012 period and the second stage, 2013-2016 period.

In conclusion, we underline some important aspects related to Lyme borreliosis for the 2010-2016 period in Oltenia region. The number of the supervised cases in Oltenia in 2011 is 2.85 times higher than in 2010 and in the next year, 2012, the number of the supervised cases in Oltenia is 3.6 times higher than in 2011. But in the year 2013, the number of the supervised cases in Oltenia is 14.4 times lower than in 2012. In the next year, 2014, the number of the supervised cases in Oltenia is three times higher than in 2013. The number of the supervised cases in 2015 is 1.36 times lower than in 2014. The number of the supervised cases in Oltenia in 2016 is 1.36 times higher than in 2015.

Taking into consideration the continuous increase of Lyme disease cases in the period 2010-2012, in the second stage of the study, the period 2013-2016, when the supervised Lyme disease cases were analyzed, we started to collect ticks from pets, especially dogs, stray dogs or from shelters, domestic animals (goats), as well as from the people present at the emergency room of the Hospital no.1 from Craiova. The collected ticks were preserved in ethyl alcohol 96 degrees for further studies in order to identify the pathogens transmitted by them.

The ticks *Ixodes ricinus* are recorded in Romania with two peaks of activity: a maximum in spring (March-May) and another one of a lesser intensity in the fall (September-November) (VLADIMIRESCU, 2012). The development of the ticks is highly depended on the climate conditions. The rainfalls are important in the expansions of the vectors and/or the increase of their populations (CODREANU-BĂLCESCU & CODREANU, 2010). As a result, the years in which temperatures abruptly increased and abundant rains from March-May were followed by high temperatures gave a fast development of the vegetation and the appearance of a great number of ticks. The recreational areas, the parks and the places with rich vegetation, the forested areas are good places for the spreading of ticks.

Thus, a walk in the park or a picnic can be very annoying or even dangerous; in order to protect the population present in parks, playgrounds and recreational areas, disinsectization is advisable on one side and on the other side, for individual protection, suitable clothes and different repellents for ticks are recommended.

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