

PART II. OTHER  
DZIAŁ II. RÓŻNE

EPIDEMIOLOGICAL SITUATION OF LYME BORRELIOSIS AND DIAGNOSIS  
STANDARDS IN POLAND AND UKRAINE

SYTUACJA EPIDEMIOLOGICZNA I STANDARDY DIAGNOSTYCZNE BORELIOZY  
Z LYME W POLSCE I NA UKRAINIE

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Summary

Lyme borreliosis (LB) is the most common tick-borne disease in Europe and the number of cases continues to grow. The aim of the following paper was to present the epidemiological situation and standards of LB diagnosis in the two neighboring countries of Central-Eastern Europe, i.e. Poland and Ukraine.

Lyme borreliosis is considered endemic both in Poland and Ukraine. In Poland, the surveillance system for LB was started in 1996, as the number of LB cases increases systematically. Presently, LB occupies a prominent place amongst occupational diseases. In Ukraine, registration of LB began in 2000, and the incidence of this disease in the country increases each year. At the same time, Ukraine does not officially recognize LB as an occupational disease, which would provide the sick with proper social guarantees.

Poland has available recommendations issued by the Polish Society of Epidemiology and Infectious Diseases for diagnosis and treatment of LB. In turn, common recommendations for methods of diagnosis and treatment of LB in Ukraine are still missing. In the absence of any guidelines on laboratory diagnostics of LB in Ukraine, some serious efforts should be made to harmonize standards in the diagnosis of Lyme disease in this country, which could be based on the guidelines in force in European countries.

**Keywords:** Lyme borreliosis, epidemiology, diagnosis, Poland, Ukraine

Streszczenie

Borelioza z Lyme (LB) jest najczęstszą chorobą przenoszoną przez kleszcze w Europie, a liczba zachorowań stale rośnie. Celem pracy było przedstawienie sytuacji epidemiologicznej oraz standardów diagnostycznych LB w dwóch sąsiadujących krajach Europy Środkowo-Wschodniej: Polsce i Ukrainie.

Borelioza z Lyme uważana jest za endemiczną zarówno w Polsce jak i Ukrainie. W Polsce system nadzoru dla LB rozpoczęto w 1996 roku, a liczba rejestrowanych przypadków zachorowań systematycznie rośnie. Borelioza z Lyme zajmuje czołowe miejsce wśród rozpoznawanych w Polsce chorób zawodowych. Na Ukrainie rejestracja LB rozpoczęła się w 2000 roku, a częstość występowania tej choroby rośnie z każdym rokiem. Brakuje jednocześnie oficjalnego uznania LB jako choroby zawodowej z odpowiednimi gwarancjami socjalnymi.

W Polsce dostępne są rekomendacje Polskiego Towarzystwa Epidemiologii i Chorób Zakaźnych dotyczące diagnostyki i leczenia LB. Zalecenia dotyczące metod diagnozowania i leczenia LB na Ukrainie są na dzień dzisiejszy nieobecne. W związku z brakiem rekomendacji dotyczących diagnostyki laboratoryjnej LB na Ukrainie, należy podjąć starania zmierzające do harmonizacji standardów w diagnostyce boreliozy z Lyme w tym kraju na podstawie wytycznych obowiązujących w krajach europejskich.

**Słowa kluczowe:** borelioza z Lyme, epidemiologia, diagnostyka, Polska, Ukraina

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## Introduction

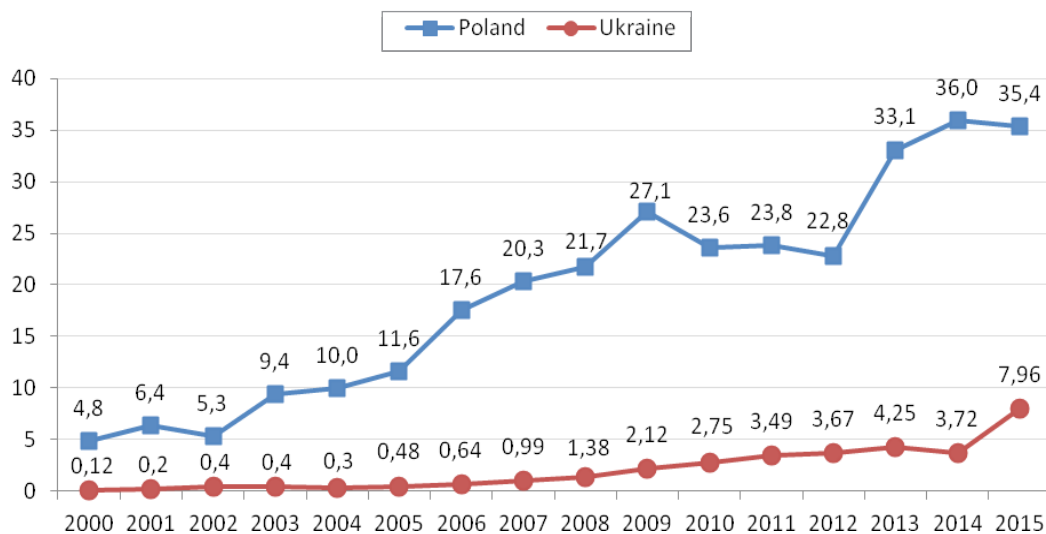
Lyme borreliosis (LB) is caused by a spirochete *Borrelia burgdorferi* sensu lato (*B. burgdorferi* s.l.), which is transmitted to humans by ticks, in Europe – mainly by the tick *Ixodes ricinus*. LB is the most common tick-borne disease in Europe. The number of the reported cases has increased steadily, with more than 360 000 cases reported over the last two decades. Central Europe is the region with the highest incidence of LB. Between 1990 and 2010, the highest average incidence rates among the reporting countries were found in Slovenia (< 130/100 000), the Czech Republic, Estonia, and Lithuania (< 36/100 000), Bulgaria, Finland, Hungary, Poland and Slovakia (< 16/100 000), Belarus, Belgium, Croatia, Norway, the Russian Federation and Serbia (< 5/100 000) [1].

During the last decades, ticks have spread into higher latitudes and altitudes in Europe simultaneously becoming more abundant in many places [1,2]. Such tick distribution and density changes have been shown to be related to changes in climate. Further, the incidences of LB and other tick-borne diseases have increased in Europe during the same time period. In some places this may be an effect of better reporting over time. However, studies from several localized areas that have reliable long-term surveillance data show that such incidence increases are real, and that they are related to the same climatic factors that have been shown to be linked to changes in tick abundance. Ticks are highly sensitive to changes in seasonal climate. Daily seasonal climatic conditions directly impact tick survival and activity. Indirectly, climate affects both tick and pathogen occurrence through affecting habitat conditions and reservoir animal density. In addition, climate-induced changes in land use and in recreational behavior influence human exposure to infected ticks and thus the disease prevalence [2]. Additionally, the reform of agricultural practices after the fall of Soviet rule in Central and Eastern European countries has led to significant alterations in land cover and land use, most of which act synergistically to improve the habitat for ticks and increase human contact with them [3].

The aim of paper was to present epidemiological situation and standards of Lyme borreliosis diagnosis in the two neighboring countries of Central-Eastern Europe, i.e. Poland and Ukraine.

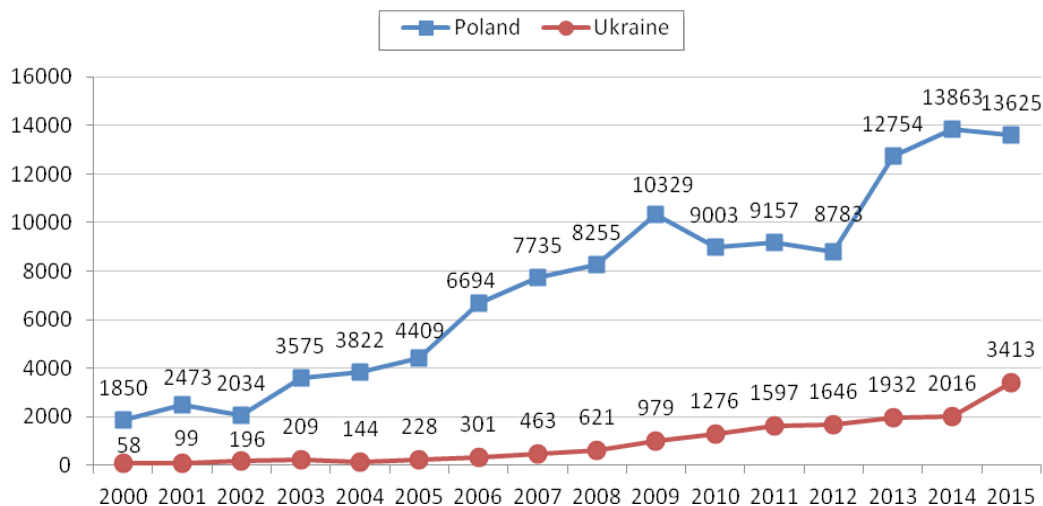
## Epidemiology of Lyme borreliosis

In Poland, the surveillance system for Lyme borreliosis was started in 1996. Further, in 2005 case definitions were implemented to allow a better comparability of data within the country and with other European states. This definition takes into account the case definitions adopted by the Centers for Disease Control and Prevention (CDC) in the USA and European Union Concerned Action on Lyme Borreliosis (EUCALB) [4]. According to the data of the National Institute of Public Health-National Institute of Hygiene (NIPH-NIH), the number of Lyme borreliosis cases is on a systematic increase in Poland (Fig. 1, Fig. 2). In 2015, a total of 13,625 infections were reported (incidence: 35.4/100 000) [5]. The increase trend in the number of LB cases is observed from the moment the disease was registered; that is, from the 2nd half of the 1990s, however, the dynamics of this process, even a surge in the number of cases occurred in 2013 (45% increase). It can be assumed that this increase is due to both an increased awareness of the disease occurrence and spread of vector-borne disease as well as the improved sensitivity of the surveillance system [6].



**Figure 1.** Incidence rates of Lyme borreliosis in Poland and Ukraine, 2000-2015 (per 100 000 inhabitants) [5,7]

According to the Order of the Minister of Health of Ukraine N133 of 19.07.1995, Lyme borreliosis is officially classified as a group of especially dangerous infections. The registration of Lyme disease in Ukraine began in 2000, and the incidence of this disease in the country is growing each year, with 58 cases (incidence: 0.12/100 000) reported in 2000, and 3413 cases (incidence: 7.96/100 000) in 2015 [7] (Fig. 1, Fig. 2).



**Figure 2.** Number of cases of Lyme borreliosis in Poland and Ukraine, 2000-2015 [5,7]

Lyme borreliosis occurs on the whole territory of Poland. Due to the fact that the *Borrelia burgdorferi* infection can occur all over the country, both in forest areas and in city parks, the whole country should be regarded as endemic as recommended by ECDC (European Centre for Disease Prevention and Control) [6]. The highest incidence of Lyme borreliosis is reported in Podlasie Province (north-eastern Poland). In 2015, the incidence rate in this area was 96.3/100 000 population (number of cases: 1146) [5]. In this area, there exist natural centers in which spirochetes *B. burgdorferi* circulate in biocenosis of their hosts – animals and their vectors – ticks. The fact that the above mentioned area cover Białowieża and Knyszyn forests additionally contributes to the increased incidence in the place. In general, the high incidence, above the national average of 35.4/100 000 population, occurred in nine provinces, indicating a gradual equalization of different territorial incidence of Lyme borreliosis [5,6].

The western part of Ukraine, including the Ternopil area, are endemic regions for Lyme borreliosis, as they are located in the region with fertile soils, moderate continental climate, and forest landscapes which favors maintenance of the main tick vectors of *Borrelia burgdorferi sensu lato* – *Ixodes ricinus* ticks in the wild. The territories of *Ixodes ricinus* ticks borreliosis are reduced to 57 settlements in 15 districts of Ternopil area [8]. The number of Lyme borreliosis cases in Ternopil area increased from 2 in 2005 to 115 in 2015 [9,10].

In Poland, Lyme borreliosis occupies a prominent place amongst occupational diseases and dominates amongst infectious occupational diseases. In 2014, there were recorded 2351 cases of occupational diseases, with 543 LB cases (23.1% of all cases of occupational diseases). Such high percentage indicates that some consensus guidelines need to be formulated to diagnose LB, which appears to be overrepresented among occupational diseases, and which results from the workers' place of residence, i.e. the one characterized by the highest risk (forests and farms); areas of high tick prevalence [11].

Forestry workers, fishermen, hunters belong to the group at risk of occupational exposure to Lyme borreliosis. However, Ukraine still does not officially recognize LB as an occupational disease, which would provide the sick with proper social guarantees [12].

### Diagnosis of Lyme borreliosis

According to the recommendations of the Polish Society of Epidemiology and Infectious Diseases, LB diagnosis should be based on clinical criteria of which the history of tick bite and clinical symptoms are the most important. Laboratory diagnostics is based on a "two-stage diagnostic protocol" involving detection of specific antibodies using an immunoenzymatic technique and Western blot, preferably with recombinant antigens (p100, p58, p41i, VlsE, OspC, DbpA) instead of cell lysate antigens.

IgM class specific antibodies may persist over several years, even after antibiotic treatment. Their presence in late Lyme disease has no diagnostic significance, as it does not indicate an active disease process and is not an additional indication for treatment. IgG class antibodies are usually maintained for many years after infection, however, a tendency towards a slow decrease may be observed in their ELISA titre or the number of strips in Western blot assay.

Absence of anti-*B. burgdorferi* antibodies in patients suspected of late Lyme disease virtually excludes the diagnosis.

*B. burgdorferi* DNA detection in skin specimen from *erythema migrans* or acrodermatitis chronica atrophicans of the limbs, synovial fluid and CSF using PCR method is recommended. It is not recommended though to perform blood PCR. Recommendations consider PCR tests of CSF up to 6 weeks after getting infected, i.e. period when immunoserological tests are still negative. The lack of standardization is a significant limitation of PCR in Lyme disease diagnostics [13,14].

Methods which have not been approved as having diagnostic significance, include the following procedures which should not be applied in the diagnostics:

1. determination of CXCL13 chemokines and B lymphocytes,
2. searching for *B. burgdorferi* antigens in CSF and urine,
3. searching for cysts, spheroplasts or *B. burgdorferi* L-forms,
4. assessment of CD57+/CD3 lymphocyte subpopulation,
5. lymphocyte transformation test (LTT) [13].

Serological diagnostics has no significant relevance in typical cases of *erythema migrans* as the presence of a characteristic skin lesion combined with a history of tick bite is sufficient for a diagnosis. Erythema of more than 5 cm in diameter is of diagnostic value. In case of atypical manifestations, laboratory confirmation may be useful, however, only two weeks after the appearance of the lesion.

Common recommendations for methods of diagnosis and treatment of Lyme disease in Ukraine are still missing. This is the reason why scientists of I. Horbachevsky Ternopil State Medical University, Ukraine, initiated writing "The unified clinical protocol of primary, secondary (specialized), tertiary (highly specialized) care and medical rehabilitation" Lyme borreliosis " for practical use by doctors across the country.

## Conclusions

Lyme disease is considered to be endemic in two neighboring countries of Central-Eastern Europe: Poland and Ukraine.

The whole territory of Poland and the western part of Ukraine, including Ternopil area, are an endemic region for Lyme borreliosis, as they are located in the zone with fertile soils, moderate continental climate and forest landscapes, which promotes maintenance of the main tick vectors of *Borrelia burgdorferi sensu lato* – *Ixodes ricinus* ticks in the wild.

Lyme disease domination (23.1%) among registered occupational diseases in Poland, and the absence of an official recognition of Lyme borreliosis as an occupational disease in Ukraine, requires further joint action and research for disease prevention and cooperation among professional groups of Poland and Ukraine.

Modern and relevant Recommendations of the Polish Society of Epidemiology and Infectious Diseases for laboratory diagnostics of Lyme borreliosis and the absence of similar ones in Ukraine, calls for making an effort to harmonize standards for diagnosis of Lyme disease in Ukraine based on the guidelines in force in European countries.

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