

## SURVEILLANCE

## Reported incidence of Lyme disease in Slovakia and antibodies to *B. burgdorferi* antigens detected in healthy population

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### Abstract

The reported incidence of Lyme disease in Slovakia is indicative of the cyclic character of its appearance, which in the last 10 years rated 12.7/100 000 of the population with typically summer seasonality, prevalence (+20 %) in women, and relative high incidences in the 5–14 and 45–64 age groups. Early forms of the disease were manifested in 70 % of all reported cases. Geographically, the spread of the disease shows major differences in the number of cases reported in the individual districts. Antibodies persist long after the original attack, and there is a high incidence of antibodies in the healthy population in endemic areas. The presence of antibodies to *B. burgdorferi* antigens was proven in the serum of 250 blood donors by 3 different screening tests in 4.4–15.6 % of all persons, signifying different sensitivity as well as specificity levels. Subsequent immunoblot examination confirmed the presence of specific antibodies in 12.8 % of all persons, implying high exposure of the population in Slovakia to this infection, although it obviously proceeds in inapparent forms in the majority of cases (Tab. 2, Fig. 4, Ref. 14).

**Key words:** Lyme disease, reported incidence, antibodies in the healthy population.

Lyme disease is among the most frequent tick-transmitted diseases found in the temperate zone of the northern hemisphere. Slovakia, through its geographic characteristics, represents a very suitable biotope for the tick *Ixodes ricinus*, the most often detected vector of this infection. Monitoring the over infestation of ticks and other reservoir animals with borreliae confirmed the appearance of all pathogenic *Borrelia* spp. in Slovakia, – *B. burgdorferi* s.s., *B. garinii*, *B. afzelii*, including *B. valaisiana* and *B. lusitanae* which had initially been considered nonpathogenic (8). Over infestation of ticks with borreliae was found in the whole territory of Slovakia at varying dominance levels of the individual genospecies and considerably varying incidences, with uprush periods cyclically appearing every 3–5 years (10, 12).

Erythema migrans, the essential clinical picture of Lyme disease has been for long time known but information indicating upon the heterologous and frequently mutually overlapping symptomatology of this multisystem disease was gradually accumulated only after discovering the corresponding pathogen in 1982. Confirmation of the infection by laboratory methods is accompanied by many difficulties due to the low sensitivity of direct detection tests for the pathogen. Problems in serologi-

cal diagnostics appear primarily as the result of pathogen heterogeneity, presence of antibodies in the healthy population, and absence of a test enabling to differentiate between antibodies inductive of a current infection and those persisting from old attacks (4).

Our work is targeted on the evaluation of available data indicative of the distribution of the disease in Slovakia.

### Materials and methods

Lyme disease case data were obtained from the regional Public Health Service database of reported Lyme disease contractions.

The presence of antibodies to *B. burgdorferi* s.l. antigens in healthy population was determined by serum examination of 250 blood donors (3). Antibodies were determined using three different tests: indirect IF, Elisa 1 recombinant antigen (Elisa Biotest

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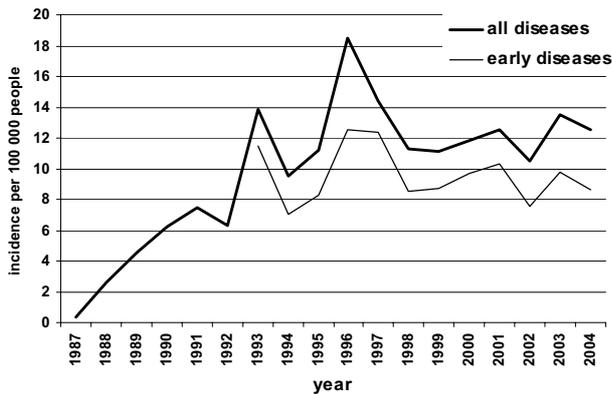


Fig. 1. Incidence of Lyme disease in Slovakia, 1987–2004.

Recom IgG) and Elisa 2 sonified antigen test (Elisa Euroimmun IgG). Positive tested sera were subsequently examined by immunoblot (Euroimmun *B. burgdorferi* IgG).

## Results

Lyme disease has been reported in Slovakia since 1987 (Fig. 1). The number of reports grew in the following years concurrently with the expansion of diagnostics and peaked in 1996. Overall incidence of the disease is of cyclic nature, obviously correlated to the cyclic character of overinfestation of ticks with borreliae. Average morbidity was 12.7/100 000 population (Tab. 1) in the last 10 years. Approximately 70 % of all cases were detected in early forms, most often as erythema migrans. Incidence by gender shows a prevalence of women by approx. 20 % (Fig. 2). Occurrence reviewed by months points upon a typical summer uprush of the disease from June to September (Fig. 3). The seasonal curve started to increase in May, peaked in June and declined thereafter, returning gradually to the lowest level in November. Sporadic cases were reported also in winter months. The disease equally affects all age groups (Fig. 2), with relatively high incidence in the 5–14 age group and gradual growth in the adult population. A review of incidences in indi-

Tab. 1. Reported cases of Lyme disease in Slovakia, 1995–2004.

Year	Abs.	Inc.
1995	602	11.2
1996	991	18.5
1997	777	14.4
1998	605	11.3
1999	600	11.1
2000	636	11.8
2001	675	12.5
2002	568	10.5
2003	726	13.5
2004	675	12.6
Total	6855	12.7

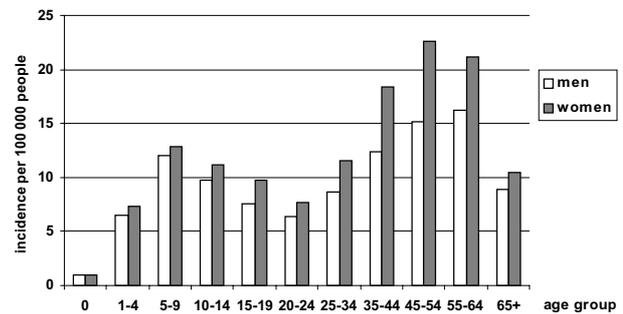


Fig. 2. Incidence of Lyme disease, by gender and age, Slovakia, 1994–2003.

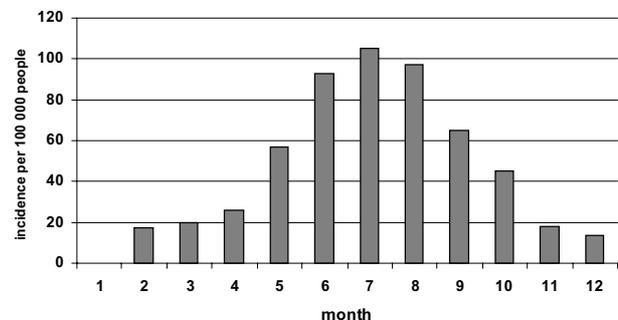


Fig. 3. Seasonal incidence of Lyme disease, Slovakia, 1993–2002.

vidual districts (Fig. 4) shows significant relative differences in the reported cases.

Antibodies to *B. burgdorferi* s.l. antigen were followed in the sera of 250 blood donors, using three screening tests (Tab. 2). Positive results of the individual tests were found in the 4.4–15.4 % range. The highest sensitive IF test showed the lowest specificity, and the lowest sensitive ELISA 2 the highest specificity. 53 persons were positive for serum anti-borrelia antibodies; of those, 34 were positive in a single test, 13 in two tests (most often in the indirect IF and Elisa 1), and 6 sera were positive in all three tests. Antibody specificity was confirmed by subsequent immunoblot examination. Examination of sera positive in all three tests or in two tests, respectively, confirmed the presence of specific antibodies. Immunoblot testing confirmed specificity in 13 cases out of the 34 positives in only one test for anti-borrelia antibodies. In all, specific serum antibodies were found in 32 persons, i.e. 12.8 % of the donor group.

## Discussion

While reported epidemiological data do not provide a precise image of current incidence of the disease in the population, they do carry some valuable information. The incidence of reported Lyme disease cases is influenced by several facts. Data

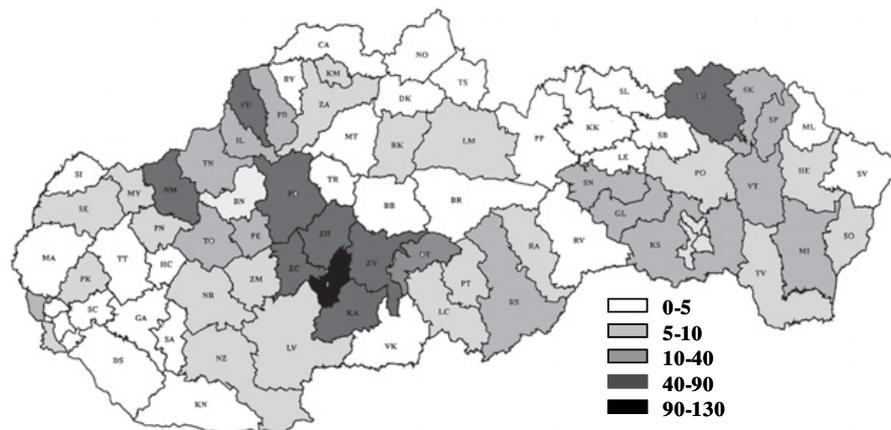


Fig. 4. Geographic incidence of Lyme disease, Slovakia, 1994–2003.

may be underestimated as the result of insufficient reporting, coincident with the fact that high over infestation levels in high ecological index areas (13) fail to be reflected in their morbidity reports. Conversely, overestimation of the diagnosis has also been observed, often due to difficulties involved in the diagnostics (11). Comparing the number of reported infections in a specific area with others is complicated, as the conditions prevailing in the individual endemic regions are dissimilar. The Czech Republic reported substantially more cases over the last 10 years compared to Slovakia, ranging between 20.77 and 60.98/100 000 population (14). High incidences are reported in the endemic area of Connecticut, USA (6) with 133.82/100 000 population in 2002, while the total United States level remained at 8.24/100 000.

Tab. 2. Antibodies to *Borrelia burgdorferi* in the sera of 250 blood donors screened with 3 various tests and confirmed with immunoblot.

Test	Posit (%)	of those, immunoblot-posit (%)	
ELISA 1	28 (11.2)	20 – 71.5	
ELISA 2	11 (4.4)	9 – 81.8	
IFT	39 (15.4)	18 – 46.2	
Serum responses-individual			
<i>Single-test posit</i>			
IFT	Total	21	8
ELISA 1		9	4
ELISA 2		4	1
		34	13
<i>Two-test posit</i>			
ELISA 1 + IFT	Total	12	12
IFT + ELISA 2		0	
ELISA 1 + ELISA 2		1	1
		13	13
<i>Three-test posit</i>			
ELISA 1 + ELISA 2 + IFT	Total	6	6
		6	6
		53	32(12.8%)

Both in the Czech Republic (9) and in the USA, the proportion of early forms of the disease in the total number of reported cases was approximately 70 %, corresponding with the reported percentage in Slovakia. Other characteristics, e.g. seasonality, or the age dependence were also similar. However, there is a higher gender dependent difference, with higher incidence in women, between Slovakia and the Czech Republic on one hand, and the United States where a moderate prevalence of men was observed (53 %) on the other hand.

One of the indicators of the high exposure of the population is the determination of anti-borrelia antibodies in the healthy population. These data are also not easily comparable due to differences in the tests used for the determination and to differences in the exposure of the population to ticks (7, 2). Generally, there is significant difference in the endemic areas between clinically manifested cases of the disease and the presence of antibodies in the sera of healthy persons (1), indicative of the high incidence of subclinical forms of the attack. Although many inhabitants of the endemic areas report exposure to ticks, their infected proportion is insubstantial, signifying the effects of other potential factors that limit the incidence of Lyme disease and provide a certain level of protection to persons repeatedly exposed to ticks (5). Our examination of the sera of blood donors for anti-borrelia antibodies disclosed different test results, consequently to their different sensitivities and specificities. Healthy, obviously inapparently infected persons probably do not abundantly develop antibodies as in the case of clinically apparent forms of the disease, which may be one of the reasons of the wide variance of results. The high (12.8 %) incidence of specific antibodies in healthy persons confirms the substantial exposure of the Slovakian population to this infection.

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## INFORMATION

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# Sepsis and Czech and Slovak Forum for Sepsis

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Physicians have known about the existence of sepsis for centuries. The disease was sometimes called “blood poisoning” because invading organisms could often be detected in a patient’s blood. The problem of sepsis is highly actual even these days not only for its high incidence but also for high mortality rate and considerable financial costs for the treatment of such a patient. The signs and symptoms of sepsis may be subtle and the early disease recognition might be difficult. Just so early recognition, diagnosis and appropriate treatment can greatly improve survival rates.

In effort to improve this unfavourable situation an institutional collaboration of three the most important societies for intensive care medicine was set up on the 15th European Congress of Intensive Medicine in Barcelona in a form of “Surviving Sepsis Campaign”. Its main goal that is officially presented in “Barcelona’s declaration” is to decrease the relative mortality for sepsis by 25 % during next five years.

As follows, the Czech and Slovak Forum for Sepsis (CSFPS) was established in Ostrava in January 2003. This is a voluntary association of predominantly intensivists but also other specialists – surgeons, infectologists, microbiologists, immunologists, pediatricians, internists and others from both Czech and Slovak republic. The aim of this organisation is to concentrate as much as possible specialists in order to take advantage of all medical branches. In order to ameliorate the care about septic patients a “Budget of precautions” within the ambit of “Surviving Sepsis Campaign” was accepted in Ostrava in January 2005. Information about activities of CSFPS as well as possibility to register to this organisation (so far without financial demand) can be obtained at web site [www.csfps.cz](http://www.csfps.cz).

I would like to put into attention one very noteworthy activity of this organisation – Postgradual course “Sepsis and MODS (multiorgan dysfunction syndrome)” that is held in Ostrava yearly at the end of January. Everybody is invited.