

SURVEILLANCE OF LYME BORRELIOSIS IN GERMANY, 2002 AND 2003

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Lyme borreliosis is a potentially serious infection common in Germany, but little data about its incidence, distribution, and clinical manifestations are available. Lyme borreliosis is not a notifiable disease in Germany, but six of Germany's 16 states – Berlin, Brandenburg, Mecklenburg-Vorpommern, Sachsen, Sachsen-Anhalt and Thüringen, have enhanced notification systems, which do include Lyme borreliosis. The efforts made in these states to monitor confirmed cases through notification are therefore an important contribution to understanding the epidemiology of Lyme borreliosis in Germany.

This report summarises the analysis of Lyme borreliosis cases submitted to the Robert Koch-Institut during 2002-2003.

The average incidence of Lyme borreliosis of the six East German states was 17.8 cases per 100 000 population in 2002 and increased by 31% to 23.3 cases in 2003, respectively. Patient ages were bimodally distributed, with incidence peaks among children aged 5-9 and elderly patients, aged 60-64 in 2002, and 65-69 in 2003. For both years, 55% of patients were female. Around 86% of notified cases occurred from May to October. Erythema migrans affected 2697 patients (89.3%) in 2002 and 3442 (86.7%) in 2003.

For a vector-borne disease, like Lyme borreliosis, the risk of infection depends on the degree and duration of contact between humans and ticks harbouring *Borrelia burgdorferi*. As infectious ticks probably occur throughout Germany, it is likely that the situation in the remaining 10 German states is similar to that of the states in this study.

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Introduction

Lyme borreliosis (LB) is caused by the spirochete *Borrelia burgdorferi* and is transmitted through bite(s) of *Ixodes spp* ticks. Like syphilis, LB is a multi-system infection, which occurs in stages and mimics other infections. The characteristic bull's eye rash now known as erythema migrans was first reported in Sweden in 1909 [2]. LB was recognized as a distinct disease in 1975-1976 in people living around Old Lyme, Connecticut, United States (US). Over the past two decades, incidence of LB has increased and now constitutes an important health problem in US and many parts of Europe. In Europe, very few countries have made LB a mandatory notifiable disease and therefore, case rates give only an approximate estimation of European LB incidence [3] [TABLE 1].

TABLE 1

Estimated Lyme borreliosis annual incidence in selected European countries*

Country	Incidence per 100 000 population
United Kingdom*	0.3
Ireland	0.6
France	16.0
Germany**	25.0
Switzerland**	30.4
Czech Republic*	39.0
Bulgaria	55.0
Sweden (south)	69.0
Slovenia	120.0
Austria	130.0

* Based on Report of WHO workshop on Lyme Borreliosis Diagnosis and Surveillance, Warsaw, Poland, 20-22 June 1995, WHO/CDS/VPH/95. (1996) 141-1.

** No published figures available.

Across Europe the incidence of LB generally increases from west to east. For Germany, precise incidence data of LB do not exist. It is estimated that there are around 60 000 new cases a year in Germany [4].

Materials and Methods

LB is not a notifiable disease in Germany, but six of Germany's 16 states have extended notification systems. The six East German states – Berlin, Brandenburg, Mecklenburg-Vorpommern, Sachsen, Sachsen-Anhalt and Thüringen, – have a more comprehensive list of notifiable infections, which include LB [5]. Physicians in these states have to notify LB cases to the local health authorities. The local health authorities send the data to the federal (Bundesland) state authorities, who then forward these to the Robert Koch-Institut (RKI).

In 2002, the RKI published case definitions for LB surveillance [5]. The case definitions used by local health authorities include clinical, laboratory and case-exclusion criteria. Since 2002, data on cases of LB submitted to RKI have been confined to cases with erythema migrans and/or early neuroborreliosis. The LB cases are checked for missing data on essential criteria for clinical and laboratory evidence at RKI. When requested by RKI, missing data are subsequently collected by the local health authorities [TABLE 2].

TABLE 2

Case definitions of Lyme borreliosis - essential criteria for clinical and laboratory evidence of erythema migrans (EM) and early neuroborreliosis (NB)

Disease	Clinical inclusion criteria	Essential laboratory evidence criteria
Erythema migrans (EM)	Expanding reddish or bluish-red patch, often with advancing edge, typically distinct	None
Early neuroborreliosis (NB)	At least one of the following findings: either acute painful radiculoneuritis or acute paralysis of cranial nerves or meningitis	Lymphocytic pleocytosis in cerebrospinal fluid (CSF) and at least one of the following findings: either detection of intrathecally produced specific antibodies or of <i>B. burgdorferi</i> by culture or of nucleic acids (e.g. PCR) from CSF

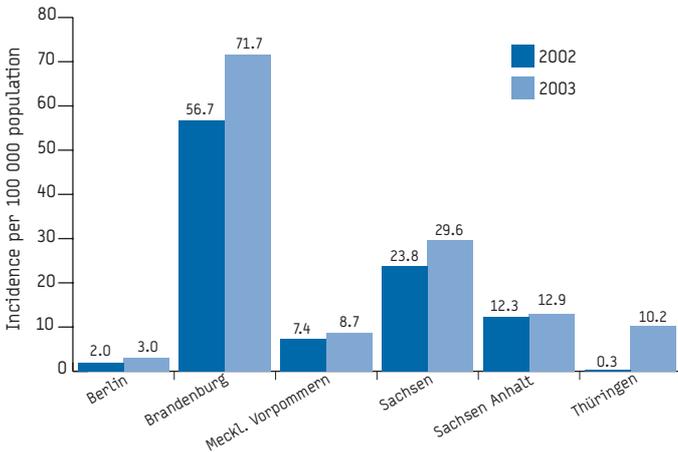
Results

In 2002, 3029 cases of LB were submitted to the RKI. In 2003, the number of submitted cases increased by 32% to 3986 cases. Of these, only cases declared by the local health authorities as satisfying the inclusion criteria were included in this analysis. A total of 3019 cases (99.7%) in 2002, and 3968 (99.5%) in 2003 fulfilled the criteria and were included.

The incidence of LB of the six East German states was 17.8 cases per 100 000 population in 2002. This increased by 31% to 23.3 cases in 2003. During 2002-2003, LB case reports increased in all of the six East German states with the highest relative increase in Thüringen [FIGURE 1]. Two states (Brandenburg, Sachsen) accounted for 81% of the cases submitted by all six states.

FIGURE 1

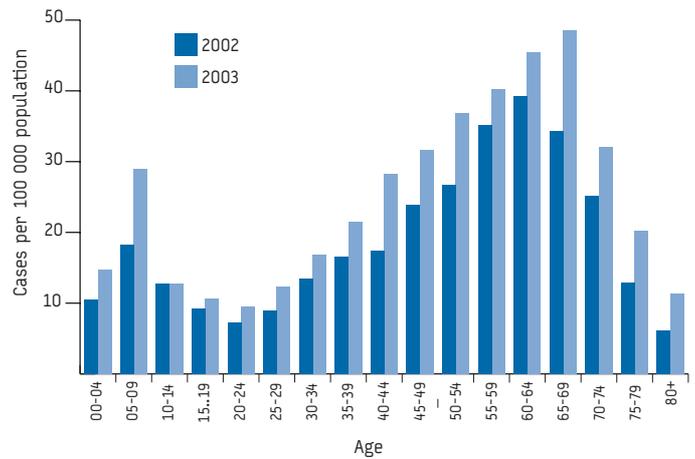
Incidence of Lyme borreliosis, 6 East German states, Germany, 2002 and 2003 (2002 n=3 019 cases, 2003 n=3 968 cases)



Patient ages were bimodally distributed, with incidence peaks among children aged 5-9 years (18.3 cases per 100 000 population per year in 2002, 28.9 in 2003 respectively) and elderly patients, aged 60-64 in 2002 (39.2 cases per 100 000 population per year), and 65-69 in 2003 (48.6 cases per 100 000 population per year) [FIGURE 2].

FIGURE 2

Age-specific incidence of Lyme borreliosis, 6 East German states, 2002 and 2003 (cases with information about age provided in 2002 n=3 009; in 2003 n=3 966)



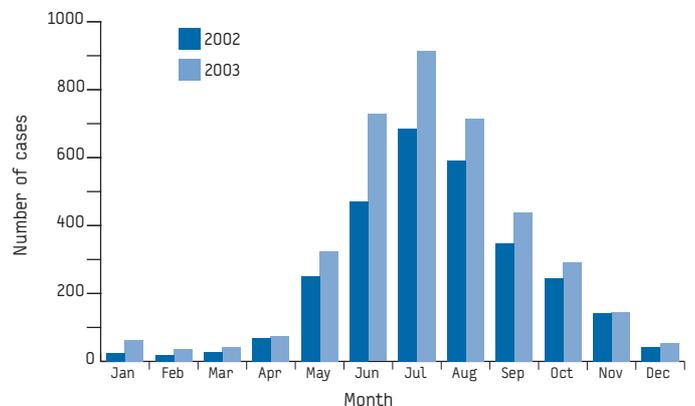
One explanation for the age distribution in adults may be the obvious higher likelihood of exposure to tick-bites and the leisure behaviour of individuals, aged between 25 and 64, which may influence the likelihood of their exposure (more outdoor activities, sport, camping and others). Relatively few cases occurred in people aged over 65 in 2002 and over 70 in 2003, possibly because their activities are less likely to expose them to ticks. The observed shift of the age peak to the right in 2003 and the incidence peak in children aged 5-9 cannot be explained and needs further monitoring in the future.

During 2002-2003, incidence increased in both sexes, in females (20.9 cases per 100 000 population per year in 2002, 27.6 in 2003); in males (18.0 cases per 100 000 population per year in 2002, 23.6 in 2003). In both years, 55% of patients were female.

A total of 97% of reports for 2002 and 2003 had a date of onset of illness provided. Around 86% of submitted cases occurred from May to October. The peak (70% of submitted cases between June and September) coincides with periods of maximum tick activity and summer-related leisure behaviour. Fewer than 5% were submitted to have the onset of illness from December to March.

FIGURE 3

Date of illness onset of Lyme borreliosis - 6 East German states, (2002 n=3 019 cases, 2003 n=3 968 cases)



Erythema migrans affected 2697 patients (89.3%) in 2002, and 3442 (86.7%) in 2003. Early neuroborreliosis affected 97 patients (3.2%) in 2002 and 97 (2.4%) in 2003 respectively. Table 3 shows the number of cases of early neuroborreliosis with paralysis of the facial nerve, radiculoneuritis and meningitis in 2002 and 2003.

TABLE 3

Number of cases of NB with paralysis of the facial nerve, radiculoneuritis and meningitis in 2002 and 2003 - 6 East German states

Year	2002	2003
Early neuroborreliosis with	n	n
paralysis of the facial nerve	34	36
radiculoneuritis	36	39
meningitis	20	16

During 2002-2003 no deaths due to LB were submitted. In this period, the diagnosis of LB was supported in a high percentage of cases by the detection of specific immunoglobulins: IgM > 85%, IgG > 35%. Other submitted diagnostic criteria (e.g. direct pathogen detection by culture or molecular diagnostic methods [PCR] and investigation of cerebrospinal fluid) were almost negligible (~ 1%).

Conclusions

LB is a potentially serious infection and common in Germany, but few data about its incidence, distribution, and clinical manifestation are available. The efforts made in some federal states to monitor confirmed cases through notification are therefore an important contribution to the understanding of the LB epidemiology in Germany.

The incidence of LB has increased markedly over the past two decades in various European countries. Changes in the natural dynamics of European tickborne zoonoses appear to have occurred towards the end of the 20th century, largely brought about by human impact on the habitat and wildlife hosts of ticks. Purely climatic factors may have played some part. At the same time, raised awareness of ticks as vectors, and the intense interest in LB have undoubtedly stimulated surveillance and protective measures [6].

For a vector-borne disease like LB, the risk of infection depends on the degree of contact between humans and infected vectors, as

well as the time span the tick is attached to the skin of the human. As infectious ticks are likely to occur throughout Germany [7], it is likely that the incidence in the remaining ten western German states has also increased.

Special advice and information is needed for individuals at risk - in particular with respect to avoiding exposure, (e.g. areas or environments with tick populations, garden places near to forests, grass, bushes, red deer, mice, squirrels etc.), to inspect skin for ticks after possible exposure, to remove the tick as soon as it is detected or as fast as possible, and to seek medical advice if symptoms develop after a tick bite [8], [9]. In addition, removal of grass or other vegetation as well as eliminating host animals, such as deer have been used as methods to control the spread of LB.

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References

1. Robert Koch-Institut. Zur Situation bei wichtigen Infektionskrankheiten in Deutschland: Erkrankungen an Lyme-Borreliose in den sechs östlichen Bundesländern in den Jahren 2002 und 2003. *Epidemiologisches Bulletin*. 2004; 28: 219-222. (<http://www.rki.de/INFEKT/EPIBULL/EPI.HTM>).
2. Afzelius A: Verhandlungen der dermatologischen Gesellschaft zu Stockholm. Archiv für Dermatologie und Syphilis, Berlin, 1910, 101: 104.
3. World Health Organization. The vector borne human infections of Europe, their distribution and burden on public health. WHO Regional Office for Europe, Copenhagen 2004. publicationrequests@euro.who.int
4. Lyme Borreliose. 2002. (Accessed 23.04., 2004, at <http://pollux.mpk.med.uni-muenchen.de/alpha1/nrz-borreliosa/lb/lb.html>).
5. Falldefinitionen für meldepflichtige Infektionskrankheiten. *Epid. Bull* 2002; 2: 9-13.
6. Randolph SE. The shifting landscape of tick-borne zoonoses: tick-borne encephalitis and Lyme borreliosis in Europe. *Philos Trans R Soc Lond B Biol*. 2001; 356(1411):1045-56.
7. Wilske B, Steinhilber R, Bergmeister H, Fingerle V, Schierz G, Preac-Mursic V, Vanek E, Lorbeer B: Lyme-Borreliose in Süddeutschland. *DMW*. 1987; 112: 1730-1736.
8. Robert Koch-Institut. Risikofaktoren für Lyme-Borreliose: Ergebnisse einer Studie in einem Brandenburger Landkreis. *Epidemiologisches Bulletin*. 2001; 21: 147-149.
9. RKI Ratgeber-Merkblätter für Ärzte „Borreliose“ http://www.rki.de/INFEKT/INF_A-Z/RATGEBER/RAT4.HTM