

3 Epidemiology



“TBE is endemic in regions of 26 European countries and every year we detect new risk areas.” (J. Süss, PHD, Jena)

Knowledge about the distribution, persistence and intensity of tick-borne diseases enables us to characterize and predict transmission foci, and to recommend preventive measures. To investigate the epidemiological situation of TBE several methods can be employed.

- Examination of ticks for TBEV presence (by PCR)
- Serological screening of tick-exposed persons
- Describing clinical cases and their geographical localisation

3.1. The distribution of TBE natural foci (TBEV in ticks and vertebrate hosts)

The distribution of the TBE virus covers almost the entire southern part of the nontropical Eurasian forest belt, from Alsace-Lorraine in the west to Vladivostok and the northern and eastern regions of China in the east (Figure 11). The true extent of TBE infections has only been revealed during the past few years. Little is known about the rate of infection in China. Recently an isolated endemic area was identified in Hokkaido/Japan.⁴⁹⁾

The development of new natural foci and the stability of known endemic areas are deter-

mined by the factors listed in Table 1. The number of infected ticks in known natural foci may vary from year to year.

Widely differing figures are also given for TBE virus prevalence in the tick populations in endemic areas of various European countries (Table 3). Usually, questing ticks are collected by flagging in special tick monitoring sites, and TBEV prevalence is investigated by examining individual ticks or by pooling ticks. When investigations are carried out on ticks removed

TBE virus prevalence in the tick population of endemic areas in several European countries

Country	Prevalence %	Source
Austria	>0.44 (max. 6.2)	54
Finland	0.07–2.56	55
Italy	0.05	56
Sweden	0.1–1	57
Switzerland	0.10–1.36	46
Germany (high risk areas)	0,3–5.3 (10-12)	52, 174
Latvia	1.7–26.6 (I. ricinus) 0–37 (I. persulcatus)	51, 52
Slovakia	13.7	15

Table 3

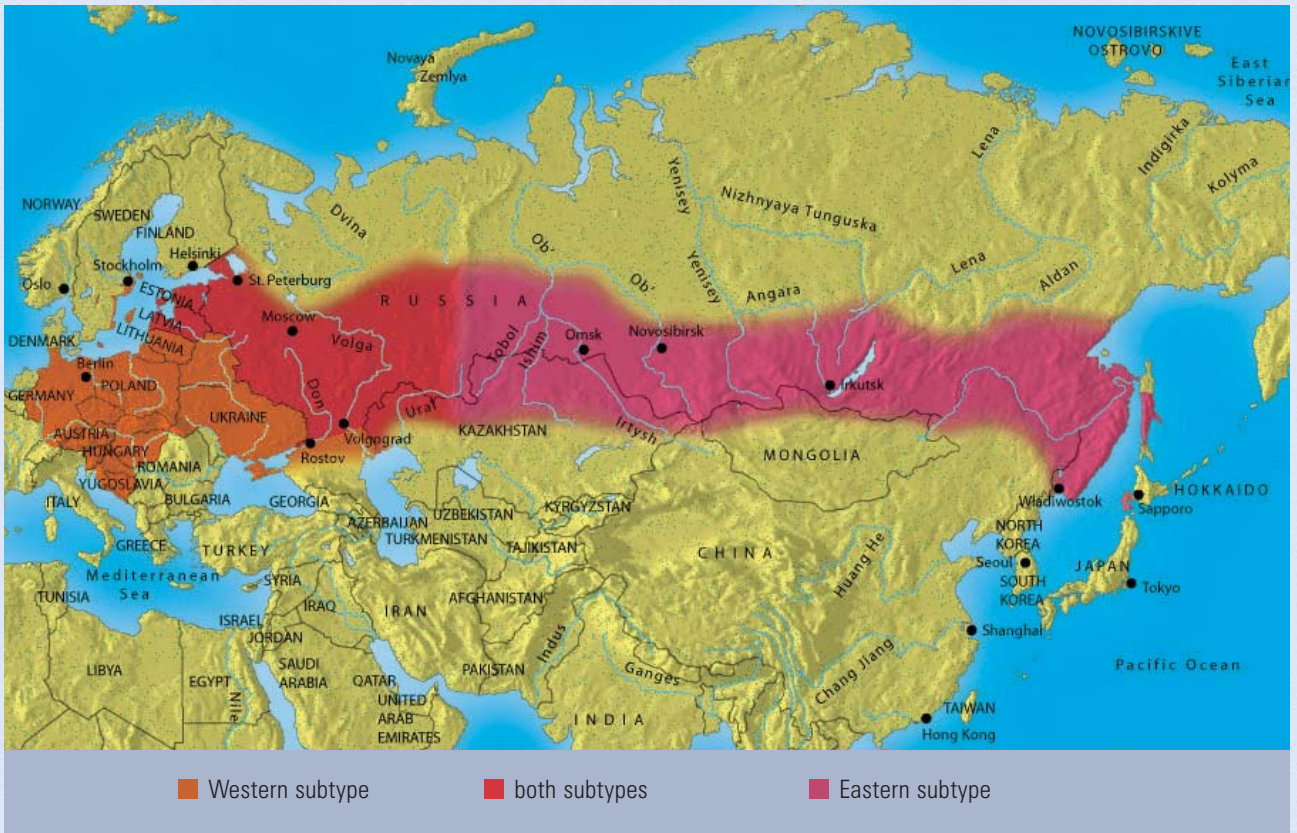


Figure 11: Distribution map of Western and Eastern subtype of TBE virus⁵⁰⁾

from humans, the TBEV prevalence could be up to ten times higher.⁵¹⁾ The techniques of investigating the TBEV prevalence in unfed versus partially engorged ticks are not standardised. Therefore, the prevalence values can't be compared across Europe.^{52, 53)}

As ticks are usually infected for life, it follows that the degree of virus prevalence increases during their development from the egg to the adult arthropod. Compared to nymphs, three to five times more adult ticks are infected with TBE virus.³³⁾

TBE virus or antibody prevalence among vertebrate hosts in TBE endemic areas

Hosts	Prevalence	Source
Yellow-necked field mouse	47,9%	54
Red-backed vole	29,4%	54
Fox	18,0%	30
Deer	83,0%	58
Dog	2,0–5,6%	59
Goat	44%	56
Cattle	35,5–91,0%	60, 61

Table 4

TBE virus prevalence is much higher in these hosts than in the tick populations (Table 4). On account of their longer life span, large mammals can be repeatedly infested by infectious ticks, and due to their size they often serve as feeding targets for several ticks at a time, either factor being conducive to the transmission of TBE virus.

The risk of contracting TBE in the most affected countries increased considerably between 1974 and 2003. In Lithuania, where incidence increased by 1,033%, and in Germany (with

an increase of 574%), TBE came to be a serious problem. In addition to the already known risk areas, new risk areas formed in Norway, and possibly in the southern part of Sweden. The only exception to this trend is Austria, where national campaigns leading to consistent immunization reduced the number of new infections from 600 to about 60.

The noted changes in the frequency of hospitalization are based on a multitude of factors. Evidently, there are various parallel factors working alongside, making interpretation of strongly differing annual hospitalization and/or virus prevalence patterns difficult. A possible warming of the climate is discussed as one of the reasons for an increased prevalence of ticks. Table 5 contains ascertained influencing factors.

Some factors augmenting the incidence, prevalence and distribution of vector-borne disease	
1.	The human population is increasing
2.	Increased population density (urbanization)
3.	Migration of populations to suburban areas
4.	Changing of leisure habits
3. + 4.:	Greater exposure to vectors (ticks !) Greater exposure to animal reservoirs of infections
5.	Displacement of human populations (conflicts); (introduction of exotic diseases)
6.	Changes in agricultural practices
7.	Increased reforestation
	– increased density of deer population
	– increased deer tick population
	– increased incidence of Lyme disease and Babesiosis

Table 5 ⁸³⁾

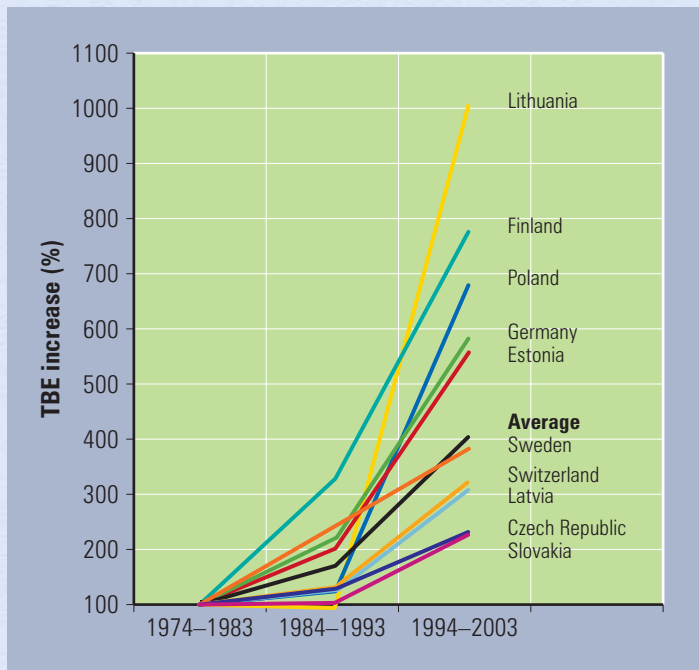


Figure 12: Increase (%) of the TBE incidence in Europe ⁸³⁾

3.2. TBE incidence in man

3.2.1. Seroprevalence

Data on TBE seroprevalence in the general population and among the inhabitants of endemic areas are presented in Table 6a and 6b.

In endemic areas of Austria and Southern Germany, TBE prevalence has been found to be 4–8%. Only in the most severely affected areas in the east and southeast of Austria figures of up to 14% may be reached. Prevalence is extremely high in some areas of the former USSR and former Czechoslovakia.

A much higher percentage of TBE positive individuals has been observed among risk groups such as :

- Individuals working in agriculture and forestry
- Hikers, ramblers, people engaged in outdoor sports
- Collectors of mushrooms and berries.

Table 6b surveys the situation of risk groups in areas endemic for TBE in some European countries. These figures mainly refer to individuals occupied in forestry. This risk group was most affected by outbreaks of the Eastern subtype of TBE or Taiga encephalitis in Siberia and, in Western Europe, also incurs the greatest risk of infection.

During the past two decades, however, the number of infections has substantially declined, particularly among individuals engaged in agriculture and forestry who have participated in the vaccination programs.

At present, mainly people who come to TBE endemic areas in pursuit of their recreational activities develop the disease. Recent increases of TBE cases in Central Europe and the Baltic states may have arisen largely from changes in human behavior that have brought more people into contact with infected ticks.⁶⁷⁾ On account of environmental concerns, the rigorous treatment of TBE natural focus territory in Russia was discontinued in the 1980s. That may partly explain the increase of the tick population and rate of infective ticks in this region.⁶⁸⁾

Infection with TBE virus may happen at home, when infected ticks are inadvertently carried in with bunches of wild flowers, Christmas trees,²⁸⁾ clothes, or by dogs. Moreover, TBE virus infections are more and more frequently reported to have occurred in the patients' own gardens, even in urban areas.

3.2.2. TBE incidence in different age groups

Every country reported TBE cases in children, the lowest incidence was found in small children less than three years of age. With increasing age, children showed higher incidences. The highest rate reported in children was in the Khabarovsk region in Russia, where 26% of TBE cases were in children aged 0–14 years.⁶⁹⁾ In Slovenia, children represented 23.5% of all confirmed TBE cases in the period of 1959 to 2000.⁷⁰⁾ In Austria, the 7- to 14-year-olds formerly were the age group with the greatest annual incidence of TBE (19% of all cases). At present, however, due to the Austrian vaccination program, and in particular the vaccination campaign in schools, children between 7 and 14 years are among the best protected age groups (Figure 13). In Austria,

TBE virus or antibody prevalence in the population

Country	Population in endemic areas (%)
Austria ^{50, 54)}	4–8 (14)
Slovenia ⁸⁸⁾	4–13
Finland ¹⁰²⁾	0.3–5
Poland ^{26, 63)}	5–17
Norway (south) ⁹⁹⁾	2.4
Sweden ⁵⁷⁾	4–22
France ²⁶⁾	1–2
Estonia ²⁶⁾	3–14
Germany (Baden-Württemberg) ⁶²⁾	0–43
Lithuania ⁶⁴⁾	3

Table 6a

TBE virus or antibody prevalence of risk groups in TBE endemic areas^{46, 65, 66)}

Country	Prevalence (%)
Austria	41
Switzerland	4–16
Czech Republic	15–54

Table 6b

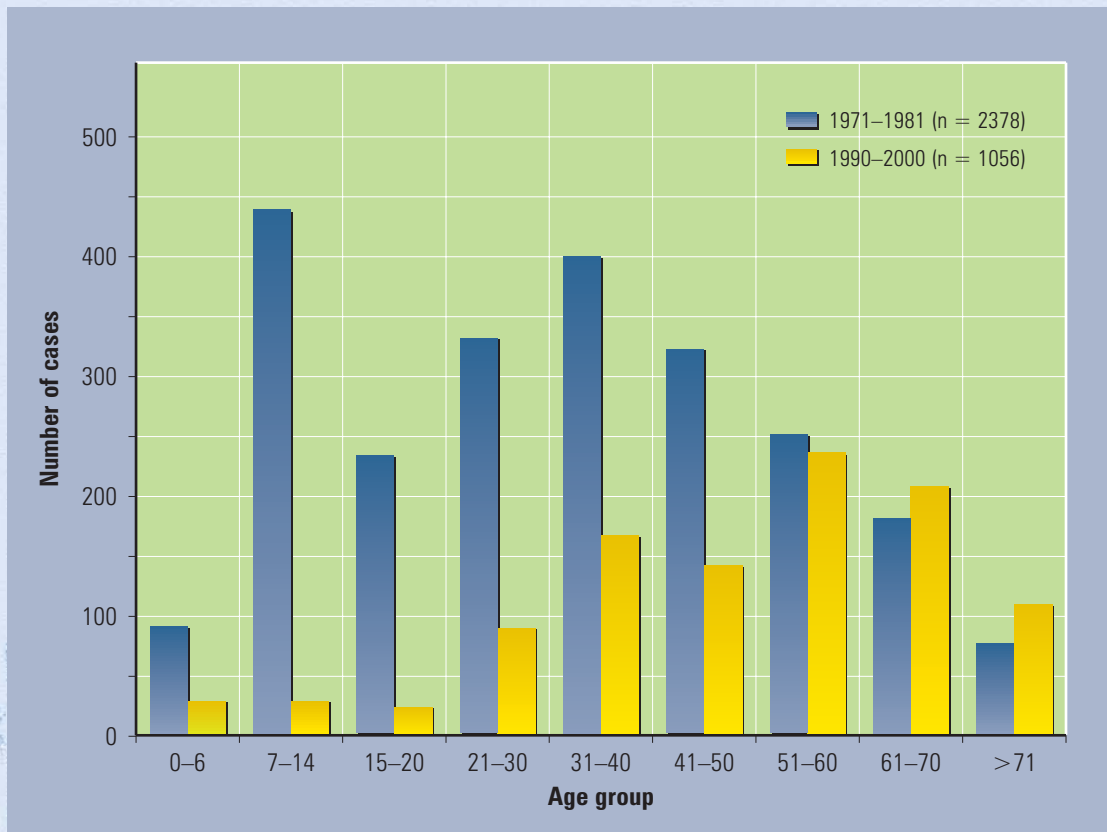


Figure 13: Austria – a comparison of the TBE cases before and after the start of the national school vaccination campaigns.

most cases of TBE now occur in older age groups.⁷¹⁾ In Sweden about 10% of the patients are younger than 15 years.⁷²⁾

The youngest patient known thus far was three months old; the oldest patient was 83 and died showing signs and symptoms of meningoencephalitis.^{73, 74)} As for TBE prevalence in the different age brackets, an increase with advancing age has been observed in TBE focal areas, although the prevalence in different endemic areas may vary.⁷⁵⁾

3.2.3. Seasonal variations of TBE incidence

In many countries, two peaks of seasonal tick activity in spring and fall are observed. The incidence of clinical cases of TBE lags about four weeks behind the seasonal tick

activity (Figure 14). In some countries including Poland, Baden-Wuerttemberg (Germany), Sweden, the Czech Republic and recently also in Austria just one peak of TBE incidence (July/August) has been observed.^{76, 77)}

3.2.4. Risk of contracting TBE

Exact calculations of the risk of infection and the resulting morbidity rate are extremely difficult, as tick bites are often not noticed.

Virus transmission may be estimated to occur in one of about 3–200 tick bites in areas endemic for TBE, depending on the prevalence of TBE virus in ticks (Table 3).



Figure 13a: Larvae and nymph are much smaller than the adult female. Humans rarely ever notice nymphs, but they are more frequent than adult ticks.

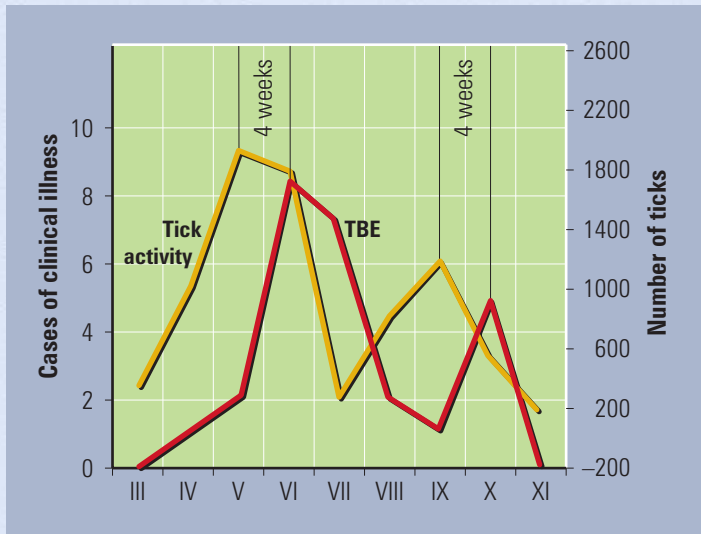


Figure 14: Relationship between tick activity and incidence of CNS disease in a TBE endemic area in Austria.^{78, 79)}

In the different endemic areas of TBE, the risk for infection of humans after a single tick bite varies between 1:200 and 1:1000.²⁶⁾

According to estimations by Roggendorf et al., the risk of infection in German endemic areas is 1:900.⁸⁰⁾ In a study of endemic areas in Sweden, the annual incidence (new infections within the studied population) was found to be 1.2 to 2.4%, the risk of infection following a tick bite was estimated to be about 1:600.⁵⁷⁾

3.2.5. Annual TBE morbidity

In the years 1997 to 2000, the average TBE incidence in Germany with 82.2 million inhabitants and 533 clinical cases was 0.17/100,000 per year. In the German high-risk foci, the average incidence rates were 0.29 in Bavaria and 0.87 in Baden-Wuerttemberg. In Latvia, with 2.6 million inhabitants and 2,797 cases in the last four years, the average TBE incidence was 26.9/100,000 per year. Latvia is in fact the country with the highest TBE incidence in the world.⁵²⁾

Table 7 gives data on the annual morbidity of TBE in several European countries. It is evident that, in the past, morbidity among forestry workers in Austria was much greater than in the population in general. Since regular vaccination campaigns have been organized by the vocational organizations concerned, morbidity of TBE in the most exposed groups has been impressively reduced (see also 3.2.1.). Before the annual vaccination campaign was introduced in 1981, the incidence of TBE in Austria was in the range of 600 cases per year. As a result of the vaccination campaign with the Austrian TBE vaccine, the incidence has been significantly declining and about 50 to 60 cases

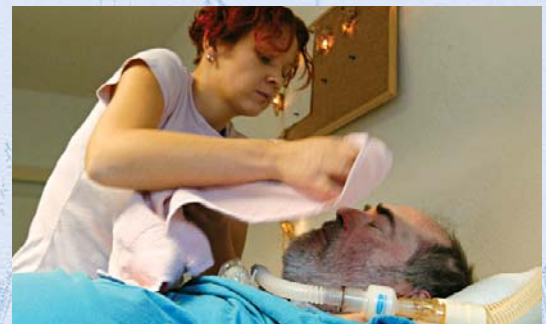


Figure 15a-c: A German TBE-patient – he too was in need of artificial respiration

per year are now recorded.⁸⁷⁾ These figures impressively demonstrate the effectiveness in the field of FSME-IMMUN vaccine from Baxter. At the time it was the only TBE vaccine in use.

3.2.6. Mortality

In fatal cases, death occurs within the first week after onset. It has been suggested that the Far-Eastern TBEV subtype is more pathogenic for humans as compared to the European TBEV subtype, because the mortality rate in areas where Far-Eastern TBEV subtype is prevalent has been reported to be significantly higher (5–20%) than in Europe (0–3.9%).⁵⁰⁾

However, the data of seroprevalence studies contradict these findings. The prevalence of antibodies to TBEV in populations living in the endemic areas in Europe and Russia are in the range from 1% to 20% and from 30% to 100%, respectively. This raises the suspicion that a large proportion of mild diseases may not be diagnosed or are underreported in some areas of Russia. The findings of different severity of TBE in different areas may either be the true difference in the clinical presentation or be a result of different diagnostic criteria and patient selection in the studies.⁸⁹⁾

3.2.7. Reported cases of TBE

Table 8 lists the number of TBE infections in those European countries, in which the disease poses a major problem to public health and/or such figures have been known for a long time. In many of those countries, morbidity has been continually increasing for years (Table 8). In highly endemic areas in which the majority of the population is vaccinated against TBE, as is the case for Austria and

Annual morbidity from TBE in various European countries

Country	Morbidity (incidence per 100,000)	Source
Austria		
• unvaccinated general population	5.0	81
• forestry workers	98–100	65, 82
Czech Republic	5.9	83, 84
Switzerland	0.4–7	85
Germany	0.2–5	52
Slovakia	0.2–1.6	15
Russia	1–6.5	86

Table 7

Bavaria, the number of reported cases of TBE doesn't give enough information about the actual risk of infection.

TBE is a notifiable disease in many European countries, such as Austria, Czech Republic, Finland, Germany, Hungary, Latvia, Lithuania, Poland, Slovenia, Slovakia, Sweden and Switzerland. The maps shown on pages 30 and 31 of this brochure give all regions in Europe and Asia where TBE infections have so far occurred.

The TBE epidemiology is very complex. There are low-risk areas, for example, in Finland, Sweden, Norway, and Switzerland with a growing trend towards spread and incidence. The emergence of new foci in Sweden and Norway has been reported, too. The example of Denmark (Bornholm) shows that risk areas can be forgotten and later rediscovered.⁵³⁾

Information on TBE in Europe is collected by the International Scientific Working Group On Tick-Borne-Encephalitis (ISW-TBE) and can be found at <http://www.tbe-info.com/>.⁹⁰⁾



Austria: In the pre-vaccination era, Austria had the highest recorded morbidity of TBE in Europe with up to 700 hospitalized cases per year. The increasing vaccination coverage (> 80%) led to a steady decline of TBE. In the period of 2000 to 2004 the 5 year average was 62 annual cases, an incidence rate of 0.8 per 100,000. The regions most affected by TBE are Styria, Carinthia,⁹¹⁾ as well as Upper Austria, the south of Vienna, and parts of Burgenland. In 2003

new endemic areas have been described around Mattsee, Wallersee and Thalgau, north of the city of Salzburg.

For an unvaccinated tourist staying in a highly endemic province of southern Austria (e.g. Styria), the risk of acquiring TBE was described to be 1/10,000 man-months of exposure. Based on total numbers of tourist overnight stays in Austria during the summer season, about 60 travel-associated cases of clinical

Number of reported cases of TBE from various European countries and Russia⁹¹⁾

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005*
Albania	8															
Austria	89	128	84	102	178	109	128	99	62	41	60	54	60	82	54	100
Belarus			2	20	50	66	97	67	78	26	23	61	18	25		
Croatia	23	60	27	76	87	59	57	25	24	26	18	27	30			
Czech R.	193	356	338	629	613	744	571	415	422	490	719	411	647	606	500	642
Denmark									1	4	3	1	1	4	8	4
Estonia	37	68	163	166	177	175	177	404	387	185	272	215	90	237	182	164
Finland	9		14	25	16	23	10	19	17	12	41	33	38	16	31	17
France	2	1	2	5	4	6	1	1	2	5	0	0	2	6	7	0
Germany		44	142	118	306	226	114	211	148	115	133	253	226	278	274	426
Hungary	222	288	206	329	258	234	224	99	84	51	45	76	80	114	59	90
Italy			2	2	8	6	8	8	11	5	15	19	6	14	23	
Latvia	122	227	287	791	1,366	1,341	716	874	1,029	350	544	303	153	365	251	142
Lithuania	9	14	17	198	284	426	309	645	548	171	419	298	168	763	425	
Norway									1	1	2	1	2	1	3	
Poland	8	4	8	249	181	267	257	201	209	101	170	205	126	339	262	174
Russia	5,486	5,225	6,301	7,893	5,593	5,982	9,548	6,539	6,987	9,955	5,931	6,339	5,150	4,770	4,235	
Slovak R.	14	24	16	51	60	89	101	76	54	57	92	76	62	74	70	28
Slovenia	235	245	210	194	492	260	406	274	136	150	190	260	262	275	204	
Sweden	54	75	83	51	116	68	44	76	64	53	133	128	105	105	160	130
Switzerland	26	37	66	44	97	60	62	123	68	112	91	107	53	116	138	206
Ukraine													12			

* Registrations not completed

Table 8

TBE could be expected to occur among holidaymakers after their stay in Austria.⁹²⁾



Germany: A map of TBE risk areas is updated periodically by the Robert Koch Institute. In Germany, 100 to 300 autochthonous clinical TBE cases have been recorded annually. There are high-risk areas in Bavaria and Baden-Wuerttemberg and ongoing low-risk areas in Hessen, Thuringia, and the Rhineland-Palatinate and single cases in Saxony.⁵³⁾ The TBE incidence in Bavaria and Baden Wuerttemberg has been stable on a high level for years; outside these areas increasing incidences were reported (Odenwald, Thuringia).⁵³⁾ In 2004, 274 cases of TBE were notified in Germany (2002: 239; 2001: 256). These occurred mainly in southern Germany in the federal states of Baden-Wuerttemberg (42%) and Bavaria (38%).⁹³⁾

Seventy nine of Germany's 440 counties are currently classified as TBE risk areas and nine as high risk areas. They are located in Baden-Wuerttemberg (30), Bavaria (47), Hessen (4), Thuringia (3) and Rhineland-Palatinate (1). A further five counties in Baden-Wuerttemberg are classified as endemic for TBE based on seroprevalence studies.⁹³⁾ 3 cases have been reported from areas previously not defined as risk areas: Brandenburg (2003), Mecklenburg-Vorpommern (2004), and Saxony Anhalt.



Switzerland, Liechtenstein:

In the period of 2000 to 2004 the 5 year average was 101 cases. In 2004 138 cases were reported.

There are mainly two high-risk regions, one big one covering the midland, with the exception of the far-western part, a second smaller one being located in the upper Rhine valley, including the principality

of Liechtenstein.⁹⁴⁾ A focus of TBE-virus-infected ticks is located on a much-used forest path near Vaduz, the capital of the principality.⁹⁵⁾ The canton Zürich became the most dangerous region for TBE⁸⁵⁾ in Switzerland, followed by Thurgau, St. Gallen, Aargau, and Bern.



France: There are some cases reported from the Alsace region and single cases of infections are documented from the region Nancy/Lothringen. New cases were recently reported from Faverges and Grenoble.²⁶⁾



Italy: A few clinical cases have been recorded in Northern Italy in the area of Florence, Trento and Belluno. Antibodies for TBE virus were found in about 1% of persons at potential risk (foresters, hunters, woodcutters, gamekeepers).⁹⁶⁾ Since the early 1990s 2 to 19 cases have been reported annually.



Denmark: The island of Bornholm has long been known for TBE cases. In total, 14 cases of TBE were found in the seven year period 1994 to 2000, giving an incidence of 3.81 per 100,000 inhabitants.⁹⁷⁾ Four cases were notified in the year 2003. The minimum level of prevalence of TBEV in ticks on Bornholm is similar to what has been found in other European countries where TBEV is endemic. The tick *Ixodes ricinus* was also found to carry the flavivirus Louping ill virus. The coexistence of TBEV and Louping ill virus in Denmark should be taken into account.⁹⁸⁾



Sweden: Since the end of the 1990s, around 100 cases have been reported annually. In the period of 2000 to 2004 the five year average

was 127 annual cases. In the year 2004 the high number of 160 cases was reported. Most of the infections were acquired in the counties of Stockholm (62%), Södermanland (13%) and Uppsala (8%). In the county of Västra Götaland (to the south of Lake Vänern), five to ten cases are notified annually. Sporadic cases occur in the rest of Sweden every year.



► **Norway:** In 1997 TBE was reported in the coastal area of Southern Norway for the first time.

All cases were acquired within a limited area on the southern coast, and four were diagnosed in the municipality of Tromøy, three of them in tourists. A study done among regular patients attending a health center in Tromøy: showed a seroprevalence of 2.4% with TBEV antibodies.⁹⁹⁾ In previous studies, IgG antibodies to TBE virus were found in 0.3 to 0.4% of persons from different parts of Agder counties,⁹⁹⁾ a region where TBE has previously not been seen.¹⁰⁰⁾



► **Finland:** In the period of 2000 to 2004 an average of 32 annual cases was reported with a record number of 41 cases in 2000.¹⁰¹⁾ The known endemic areas are situated mainly in Åland (66% of 125 cases 1987 to 1997, 80/100,000/year in 2000), Archipelago of Turku (10%), Kokkola region (6%) and Lappeenranta region (5%). According to antibody analyses, approximately every one in five Ålanders is infected during his or her lifetime.⁹⁰⁾ Recently, nine cases have been identified altogether from an island close to the city of Helsinki.^{102, 103)}



► **Lithuania:** TBE is present in all districts of Lithuania. In 2004 a total number of 425 hospitalized cases was reported. In 2003, the epidemiology of TBE in Lithuania was very unusual. The

incidence rate (763 cases, 22 per 100,000 population) was double the average incidence over the last ten years, and was the highest annual rate recorded since notification began at the end of the 1960s. This rate was also the highest of all the Baltic countries in 2003. Four lethal cases of TBE were notified in 2003. TBE is normally transmitted by a tick bite but, in 2003, 22 cases of TBE (four clusters) were acquired by consuming unpasteurised goat's milk – a well-recognized transmission route. The highest incidences of TBE, about 80% of all notified cases, are recorded every year in the northern and central part of the country – mainly in three counties: Kaunas, Panevezys and Siauliai. In 2003, the incidence rate in these areas was the same, but incidence rates were much higher in many other counties. Eight districts out of 44 reported a two to five times higher incidence rate than the average incidence in Lithuania. The highest incidence rate was in Panevezys, at about 100 per 100,000 population.¹⁰⁴⁾



► **Latvia:** Latvia is considered the TBE endemic country with the highest incidence rates in the world. Even in and around the city park of Riga TBE cases have been reported. Ticks in Latvia carry a higher number of TBE viruses than ticks in other risk countries. In 1993, annual incidence quadrupled from the mean level of the previous two decades (nearly eight cases per 100,000 population), reaching the highest levels in 1994 and 1995 at 53 cases per 100,000. Since 1999 the incidence has been significantly lower, down to 6.5 cases in 2002, but back up to 15.7 per 100,000 in 2003.¹⁰⁵⁾ Food-borne outbreaks (caused by dairy products, mainly goat milk) amounted up to 5% of total annual cases.



► **Estonia:** TBE morbidity in Estonia has been 199 annual cases (15/100,000).¹⁰⁶⁾ The highest TBE distribution rate is in West Estonia (Pärnumaa, Läänemaa), East Estonia (Ida-Virumaa), Saaremaa (island in west) and Southeast Estonia (Polvamaa, Tartumaa).¹⁰⁷⁾



► **Poland:** Since 1993, the number of reported cases at country level ranged from 100 to 350 cases per year. In 2003 the number of reported cases was 339 (incidence 0.89 per 100,000). In Poland, the north-east of the country (around Bialystok) is the main area of endemicity.⁷⁶⁾ 80% of cases occurred in two northeastern provinces adjacent to Lithuania and Belarus. Another important focus of the disease is in the southwestern part of Poland, in districts adjacent to the Czech Republic.⁹⁰⁾



► **Ukraine:** The foci of TBE were found throughout the whole of the mountain forest zone of the Crimea and coincided with the habitat area of *Ixodes ricinus*, the main vector of TBE.¹⁰⁸⁾ About a hundred patients with TBE were recorded over the decade 1980 to 1990 in the Crimea, where co-infections with TBE and Crimean-Congo hemorrhagic fever can be found.¹⁰⁹⁾



► **Moldavia:** Although reliable data is missing it is assumed that TBE is present.



► **Romania:** Risk of tick-borne encephalitis is reported for the Tulcea district and in Transylvania at the base of the Carpathian Mountains and Transylvanian Alps, but the information was never published, neither were details about annual numbers of TBE cases.¹¹⁰⁾



► **Slovakia:** The number of reported cases at country level has ranged from 54 to 101 cases per year in the last ten years. In 2002 the number of reported cases was 62 (incidence 1.15 per 100,000), and in 2003 the number of reported cases was 74 (incidence 1.38 per 100,000). Some of the reported cases were caused by drinking raw goat and sheep milk (home production). New foci have been identified in areas of eastern Slovakia traditionally thought to be free of the virus.¹⁵⁾



► **Czech Republic:** TBE exists in all parts of the country. In the period 2000 to 2004 an average of 577 cases of TBE occurred annually. Thus the Czech Republic has one of the highest numbers of diseases due to TBE in Europe - second only to Russia. The incidence is higher in regions south of Prague near the city of Ceske Budejovice. There has been constantly high incidence near the town of Pilsen in the western part of the Czech Republic. Recently, TBE foci have been identified in the northern part of the province of Bohemia. In the east of the country there has been a high incidence near Olomouc. Clinical cases of TBE are notified from April until November every year with one peak in July.¹¹¹⁾



► **Hungary:** The average yearly incidence between 1977 and 1996 was 2.5 per 100,000 population (range 1.3 to 3.8), with the highest incidences between 1981 and 1990. From 1997 to 2000, a significant decrease in the number of registered/diagnosed TBE cases was observed, with an incidence of 0.5 per 100,000 in 2000. Since 2001, the incidence has been increasing again. In the period of 2000 to 2003 an average of 79 cases was reported annu-

ally. Extended areas of high-risk are in western Hungary and along the danube region: the counties of Zala, Somogy, Vas (western Hungary), Nógrád (northern Hungary), and around the lake Balaton.



► **Slovenia:** Endemic foci of TBE are spread all over the country. In the period of 2001 to 2003 the 3 year average was 265 cases. The highest number of TBE cases was reported in the year 1994 with 530 cases.



► **Croatia:** Only one natural focus in the northern part of the country is described, between the rivers Sava and Drava. During the past ten years, the number of annual cases ranged from 23 to 87.²⁶⁾



► **Bosnia:** In the northern parts of the country there may be some cases. There is not enough information available about the number of cases.²⁶⁾



► **Serbia:** A few cases have been reported in the area near Belgrade, including food-borne outbreaks near the coastal regions of the Adria, but there is not enough information available.



► **Albania:** Natural foci are found in the whole of Albania. Older publications show a prevalence of TBE virus in the Albanian population of 22%. Alimentary cases of TBE have been reported. Before 1990, 25 new cases were registered annually. No further data are available after that time.²⁶⁾



► **Greece:** Single cases were reported in the north of the country (Thessaloniki).



► **Belarus:** About 20 to 80 cases of TBE occur annually in Belarus with a peak of 97 cases in 1996.⁹¹⁾ There is not enough information available about clinical cases in Belarus, which is believed to be a country with high risk areas and a high prevalence of TBEV in ticks. In 2003, 25 clinical cases were reported in the area of Minsk.¹¹²⁾



► **Kazakhstan:** Cases of TBE are supposed to have occurred but there is not enough information available.



► **Russia:** TBE is endemic from Kaliningrad to Vladivostok. The TBE morbidity rate in Russia recently increased dramatically from 6,000 to 10,000 persons per year. The highest morbidity rate is registered in the Ural, Perm, Sverdlovsk regions: 13.4/100,000 of population; Udmurt Republic: 53.5/100,000; West Siberia, Tomsk region: 72.5/100,000; East Siberia, Krasnoyarsky Krai: 37.0/100,000.¹¹³⁾ The most dangerous foci of TBE were found to be located in the southern Okhotsk region, where dark coniferous forests grow¹¹⁴⁾ and in the Sikhote-Alin Mountain range (near Vladivostok).¹¹⁵⁾ In the Primorye region (far-eastern part of Russia, on the coast of the Sea of Japan) 126 people were hospitalized between January and August 2004 with a diagnosis of TBE, 17 of whom were children.

A total of 8 people among those contracting TBE have died.¹¹⁶⁾ The total number of TBE patients in the Lake Baikal region between

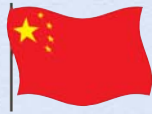
1996 and 1999 ranged from 460 to 780 cases per year and shows a tendency to increase. The relative index per 100,000 population varied between 2.6 and 18.1.¹¹⁷⁾

The Sverdlovsk Region has long been known as the natural nidus of tick-borne encephalitis. The majority of people are attacked in Yekaterinburg and in 2003 the number of tick attacks has increased, as compared to 2002. Other foci are in Nizhni Tagil, Kamensk-Uralsky, in Verkhnyaya Pyshma, Nizhnyaya Tura, Nevyansk, and Sukhoy Lo.¹¹⁸⁾

Ixodes persulcatus is the main vector of TBEV in the Asian and European parts of Russia. Lethal TBE outcomes were registered in Siberia (Irkutsk region and Krasnoyarsk territory) and in Russia's European part (Yaroslavl region).¹¹⁹⁾



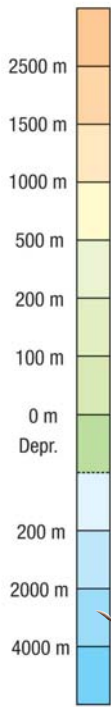
► **Mongolia:** In 2004 some endemic areas were described next to the Russian border in the north of the country (provinces of Selenga and Bulgan) and around the capital city Ulan-Bataar.



► **China:** Data on TBE morbidity is scarce. Natural foci are the Hunchun area, Jilin province and in the subtropical region of western Yunnan near the Burmese border.²⁶⁾



► **Japan:** TBE virus is endemic in Japan, where TBE virus was isolated from the blood samples of sentinel dogs, tick pools, and rodent spleens since 1995. In 1993, a case of TBE was reported in the southern part of Hokkaido. A sero-epidemiological survey was performed among humans and animals, and it was concluded that the TBE virus may be endemic in Japan, at least on the island of Hokkaido.¹²⁰⁾ The main principal vector on Hokkaido was identified as *I. ovatus* and genomic sequence and phylogenetic analyses of a virus isolate revealed a close relationship with the Far-Eastern subtype of the TBE virus.



Regions of TBE risk

- ◆ more than 5 000 000 inhabitants
- ◆ more than 1 000 000 inhabitants
- more than 500 000 inhabitants
- more than 100 000 inhabitants
- other towns and villages

100 0 100 200 300 400 km

Basemap © Ed. Hölzel, Vienna

TBE/FSME* in Europe 2006

*Tick-borne Encephalitis / FrühSommer-MeningoEncephalitis





References TBE/FSME in Europe, Epidemiological map 2006

The map is based on local reports and publications of documented cases of TBE virus infection, screening for TBE antibodies in healthy unvaccinated populations, and regional screening for TBE virus in ticks and hosts. Epidemiological information has been reported per district or region, e.g. Russia, Slovakia, Czech Republic, the Baltics and Germany; maps including reported locations, where infection occurred have been collected e.g. from Austria, Switzerland, Sweden and Denmark. The extent of epidemiological assessment of TBE cases varies between countries. The data presented here may therefore not be entirely complete, and it cannot be excluded that TBE viral infection – with subsequent development of the disease – won't occur in new areas.

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