



Vienna, Hotel Bristol, ISW-TBE Conference Participants 2007



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**9th Annual Meeting of the
International
Scientific Working Group on
Tick-Borne Encephalitis (ISW-TBE)
January 25-26, 2007**

From Epidemiology to Vaccination Report on the 9th Meeting of the ISW-TBE :

Among the members of the TBE virus serocomplex, three subtypes play an important role, i.e., the European, the Far Eastern, and the Siberian subtype. Their survival depends on two types of hosts, i.e., ticks, which act as virus transmitters, and vertebrates. While *Ixodes ricinus* is the most important transmitter of the European virus subtype, *Ixodes persulcatus* is the main vector of the Far Eastern and Siberian subtypes.

Non-endemic countries include the United Kingdom, Ireland, the Benelux countries, France, and Spain. TBE plays only a marginal role in Italy, Greece, and Denmark. It is more important in Croatia, Sweden, Finland, and Slovakia and most prominent in Austria, Germany, Poland, Hungary, and the Baltic states Estonia, Latvia, and Lithuania. Particularly during the 1990s, the number of autochthonous cases of TBE increased in all endemic regions.

TBE in the Baltic and Nordic Countries

The Baltic countries have been endemic since Soviet times. In Latvia, TBE incidence rates are among the highest worldwide. Morbidity increased until 1998, with an all-time high of 1366 cases in 1994. About two-thirds of those infected were retired or unemployed. However, the positive effects of the vaccination campaign initiated in response to this development have already become apparent, with 142 and 170 cases in 2005 and 2006.

In Lithuania, significant increases in morbidity were seen between 1993 and 2004, reaching a peak of 763 cases in 2003. With the TBE vaccine not paid for by the state, cost may well play a role, and many people may not be able to afford the vaccine. Among those who could, the socialist legacy still appears to suggest that, if vaccination is not state-funded, it is simply not important.

TBE also remains a serious public health problem in Estonia. In some highly endemic areas, both *I. ricinus* and *I. persulcatus* are present, and both the eastern and western virus subtypes have been found. The fact that the absolute number of TBE cases has been lowest in Estonia may at first sight suggest that this country carries the lowest risk of TBEV infection. However, the incidence rates in 2005 and 2006 suggest otherwise.

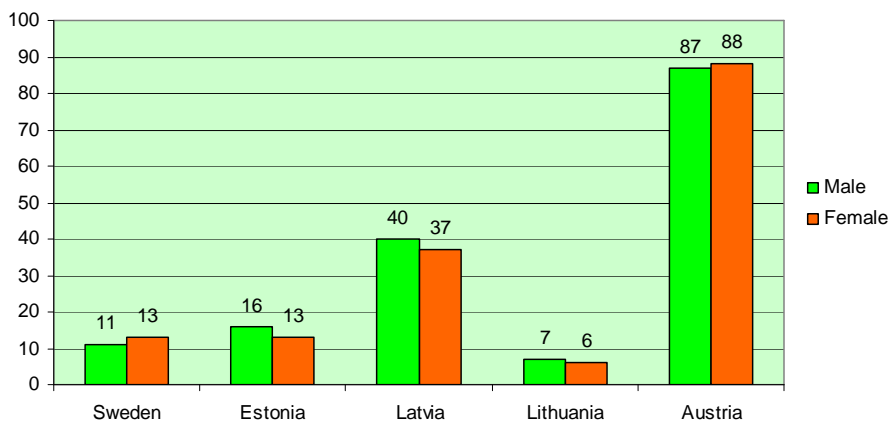
TBE incidence rate per 100,000 in Estonia, Latvia, and Lithuania

	2005 incidence rate per 100,000	2006 incidence rate per 100,000
Estonia	12.1	12.7
Latvia	6.2	7.4
Lithuania	7.1	13.4

Among the Nordic countries, TBE risk is highest in Sweden, the district with the highest incidence being Stockholm. Peak morbidity was reached in 2004 with 160 reported cases. Recently, some Swedish cases have also originated outside the known endemic regions. This is also true for both Denmark and Norway, where the first cases ever were reported in 1998, but morbidity has remained low.

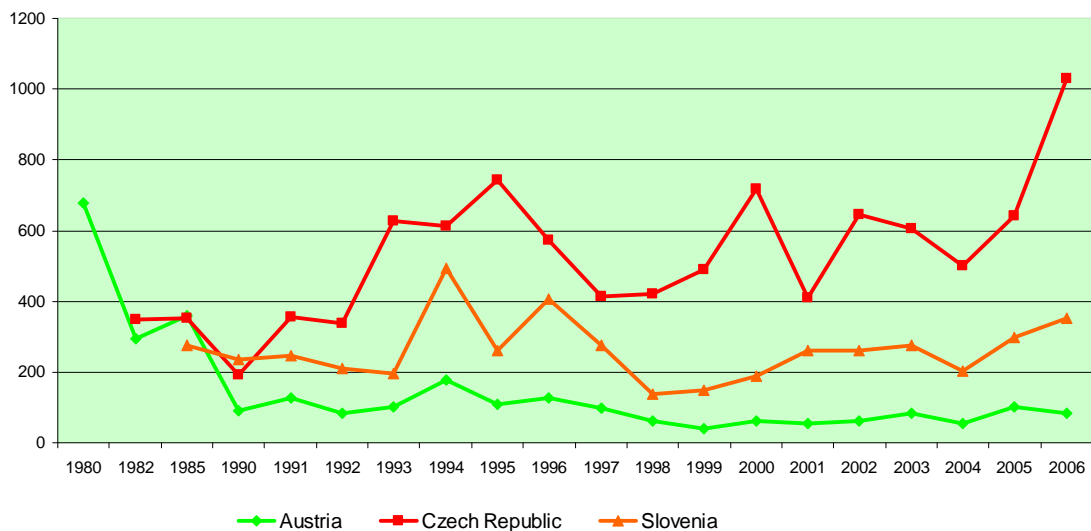
Dr. Asokliene also presented results of a cross-country survey of the vaccination rate in the Baltic countries and Sweden carried out in October and November 2006 based on 1000 computer-assisted telephone interviews in each country. The results showed that 20% of the Swedish population had never before heard about TBE. In the Baltic states, this proportion ranged between 2% and 9%. Overall, 30% of Swedes, 32% of Lithuanians and 9% of Estonians had never heard about the possibility to vaccinate against TBE. Interestingly, in the high-risk country Estonia, 100% of respondents stated that they were aware that a vaccination against TBE existed. Data on the vaccination rate largely corresponded with the level of information in each country, with vaccination coverage being highest in Latvia.

Vaccination coverage in percent in Sweden and the Baltic countries in 2006



TBE in the Czech Republic, Slovenia and Austria

Number of TBE cases reported in the Czech Republic, Slovenia and Austria up to 2006



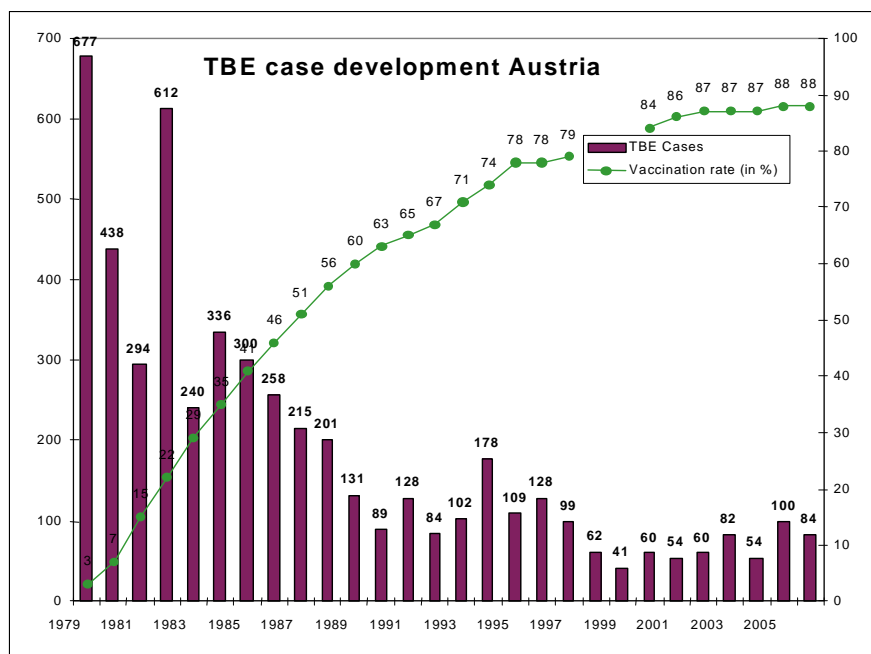
In the Czech Republic, TBE is present in virtually all parts of the country, with the highest morbidity traditionally reported in Southern and Western Bohemia. The past two decades have been characterized by steady increases in morbidity, reaching an alarming zenith of 1028 reported cases in 2006, three even taking a lethal course.

Slovenia still is the number one source of TBE cases in former Yugoslavia, with the number of cases having remained rather constant over the past two decades. After a record high of 492 cases in 1994, morbidity dropped to 136 cases in 1998. Since then, there has been a gradual increase to 350 cases in 2006, the highest since 1994.

Not surprisingly, Dr. Rendi-Wagner placed special emphasis on what has come to be called the Austrian success story in the fight against TBE. Just one year before the annual TBE vaccination campaign was introduced in 1981, a total of 677 cases were reported in Austria. Since then, this number has declined steadily and significantly, reaching an all-time low of 41 in 1999. The decrease seen in Austria is in sharp contrast to the significant increases seen in all other European countries. The explanation is obvious: The decrease in morbidity has gone hand in hand with an increase in vaccination coverage from approx. 6% in 1980 to 88% in 2006. In Styria and Carinthia, the federal provinces with the highest risk of TBEV infection,

vaccination coverage is even as high as 92%. The incidence rate per 100,000 Austrians in 2005 was 1.2.

TBE cases and vaccination rates in Austria between 1980 and 2006



By contrast, based on results of a survey carried out in 2005, the vaccination rate in the Czech Republic was as low as 11%. Even though somewhat higher in Southern Bohemia (20%) and Western Bohemia (14%), this proportion is still too low considering the 2005 incidence rate per 100,000 of 6.3.

The survey also sought to determine what it was that stood in the way of accepting TBE vaccination. When asked what the reasons for not being immunized were, 32% of respondents said they never or rarely went to a tick-contaminated area, 26% said they had never thought about it before, and 10% stated that they considered the risk of infection very low. For 8% of respondents, the immunization was too expensive, 4% stated fearing the side effects of vaccination, and 7% said they didn't know, because, really, immunization does make sense.

TBE in Germany, Poland and Switzerland

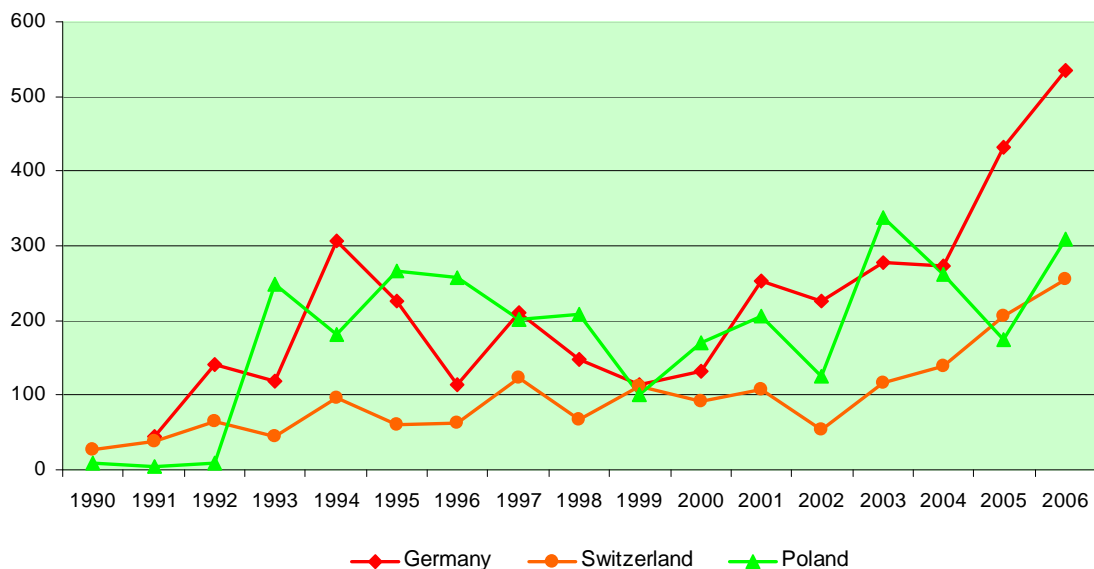
The sharp increases in TBE morbidity seen in the Czech Republic are mirrored by figures from both Germany and Switzerland. In his presentation, Univ.-Prof. Dr. Jochen Süß, Friedrich-Löffler Institute, Jena, Germany, not only presented data showing additional significant increases in TBE morbidity between 2003 and 2006. He also discussed some of the likely reasons responsible for the significant increases in TBE, among them global warming.

Increase in the number of TBE cases between 1993 and 2006

	Mean number of TBE cases between 1993 and 2002	2003	2004	2005	2006	Increase (%) between 2005 and 2006	Increase (%) between 1993-2002 and 2006
Austria	89	82	54	100	84	-16	-6
Czech Republic	566	606	500	642	1017	58	80
Germany	185	278	274	431	535	24	189
Poland	197	393	262	174	308	77	56
Switzerland	82	116	131	207	256	24	212

Even though, as Prof. Süss pointed out, the incidence of TBE between 1993 and 2002 had been subject to regional and annual variations, there has been a clear trend towards a general and continuous increase since 2003. As mentioned earlier, the only exception to this trend has been Austria. However, even Austria witnessed an increase from 54 cases in 2004 to 100 cases in 2005, an increase by 85%. In the Czech Republic, the number of cases increased by 28% between 2004 and 2005 and by 58% between 2005 and 2006. In Poland, the number of TBE cases in 2006 was the second-highest in recorded history. In Germany, the 2005 record high, representing an increase by 58% compared to 2004, was overshadowed by an additional 24% increase in 2006. Similar increases have been observed in Switzerland.

Number of TBE cases reported in Germany, Poland, and Switzerland between 1990 and 2006



Increase in the Morbidity of TBE: What are the Causes?

According to Prof. Süss, the increase in the number of TBE cases is the result of a complex interplay of social, economic, political, ecological, and climatic factors, the relative weight of which is not easily quantifiable. Of course, part of the increase may be explained on the basis of quality improvements in epidemiological surveillance and diagnostics. At the same time, awareness of TBE among physicians and the general public has also increased.

Other contributing factors include changes in lifestyle, which have resulted in more leisure time spent in nature. Particularly in affluent countries, most infections with TBEV are contracted during outdoor leisure-time activities, such as camping, hiking, or mountain biking. TBE has also become an international public health problem due to the increasing mobility of non-vaccinated persons from non-endemic areas traveling or relocating to high-risk areas.

In less affluent countries, soaring energy prices have caused people to enter the woodlands to pick berries or gather mushrooms and firewood for sale or personal consumption, increasing their exposure and risk of infection. For example, in some areas in the Baltic states and Russia, the incidence of TBE has been found to be highest among the unemployed or retired population.

Other factors include changes in agricultural production methods, such as reduced use of pesticides, the use of less toxic and more specific pesticides, or shrub encroachment as a result of European farmers being required to leave idle part of their land.

Finally, the increase in the incidence of TBE may also be due to climatic changes. Thus, moderate increases in temperature may accelerate the tick development cycle and increase

egg production and population density. Also, milder winters and extended spring and fall seasons prolong seasons of tick activity and, as a result, viral transmission.

Another result of climate changes has been an expansion of existing risk areas. For a long time, TBE was thought of as a problem limited to a few endemic regions. Generally, the geographical boundaries of TBE foci remain stable for many years or even decades. However, there have been signs indicating that new foci are developing and existing ones are expanding. In Germany, there have been single cases in Mecklenburg-Western Pomerania, Lower Saxony, Saxony-Anhalt, and Brandenburg, and in Austria, Vorarlberg may have developed into a new focus, with 3 autochthonous cases reported in 2006. Also, global warming appears to have pushed the borders of TBE endemicity further north. For example, the increase in TBE cases in the Stockholm area since 1984 has been related to milder winters and longer spring and fall seasons. Similarly, the first ever TBE cases in Denmark and Norway were reported in 1998.

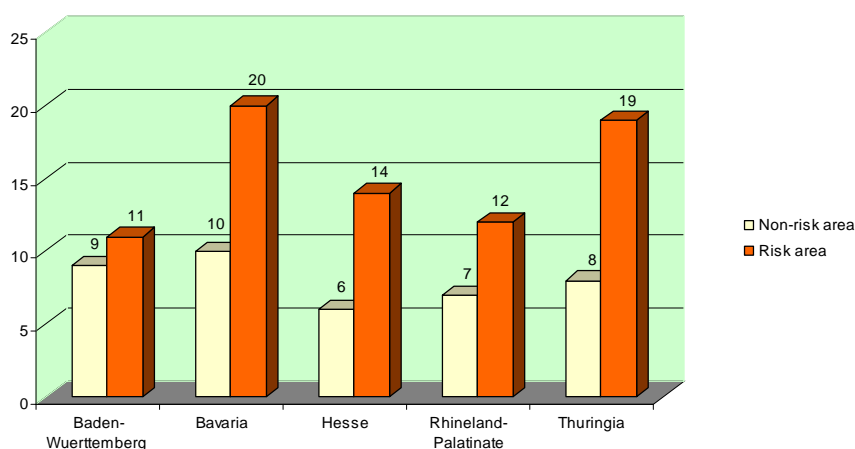
Conversely, high-risk countries such as Russia, Estonia, Latvia, and Lithuania, which had registered significant increases in TBE around the end of 1990s, have not seen any further increases or have even reported decreases unrelated to increased vaccination coverage. "What this shows," said Prof. Süss, "is that much research into the interdependencies between all factors implicated in the risk of TBE is still to be done."

Vaccination Coverage Too Low

In view of these epidemiological developments, it is puzzling why a mere 11-20% of Germans living in high-risk endemic areas are vaccinated against TBE. In non-risk areas, the proportion is as low as 6-10%.

The five German federal länder with the highest risk of contracting TBE are Baden-Württemberg, Bavaria, Hesse, Rhineland-Palatinate, and Thuringia. In 2005, the first German TBE vaccination study was carried out by the "Gesellschaft für Konsumgüterforschung (GfK)", asking 20,000 families, or 44,956 individuals, about their vaccination status.

Vaccination rate (%) in non-risk and risk areas in the five German länder with the highest TBE morbidity



In Switzerland, the mean vaccination coverage of 13% in both males and females likewise is very low. Even though somewhat higher in high-risk regions, where it ranges from 17-21%, vaccination rates are far too low considering the epidemiological situation.