

STATEMENT

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What makes ticks tick? Climate change, ticks and tick-borne diseases

In Europe 90 – 95 percent of all tick bite incidences in humans are caused by *Ixodes ricinus* (in Eastern Europe by *I. persulcatus*). Without considering a large number of unreported cases, of these incidences 100,000 to 150,000 become manifest as bacterial Lyme Borreliosis (LB) and between 10,000 to 15,000 as viral tick-borne encephalitis (TBE).

There is no TBE in the new world and between 17.000 – 23.000 cases of LB per year in the United States.

A humidity rate of >85 percent, air temperature of >6 to 7°C and a large number of blood delivering hosts are the basic requirements to make ticks 'happy'.

Unfortunately, these three basic requirements necessary for the well-being of ticks are changing to the worst in many areas in Europe and in Germany as well. In TBE risk areas in Germany the average temperature increased by >0.6 to 1.5°C between 1951 and 2000. According to prognosis there will be a further increase in temperature by >1.2°C in the period 2001 to 2055. The number of days with temperatures >25°C has increased while the number of days with temperatures <0°C decreased and rainfall has increased annually by 9 percent (90mm). Ticks have moved northwards and can be found in mountainous areas above 1000 metres above sea level. The northward movement of *Dermacentor reticulatus* is an additional sign for ecological changes in the environment. EU subsidies lead to a set-aside of agricultural land which turned into fallow and scrubland and as a consequence increased the amount of hosts for ticks.

A distinct sign of these changes in the environment is the fact that host searching *I. ricinus* have frequently been found on open land in Germany in November and December 2006 and again in January 2007, a fact which had not been noted in former years. It is believed that the number of life cycles of ticks will increase within

the next few years, and as a result of this the geographical distributions of ticks will expand and population density will rise.

The number of TBE cases of all European 'TBE-countries' with the exception of Austria (vaccination rate of 90 percent) had increased continuously in the last centuries. On average, the TBE incidence rate increased by approx. 400 percent in the years from 1974 to 2002. Most surprisingly, however, was the fact that in the Czech Republic, in Switzerland, in Poland and in Germany a new increase in TBE by 137.5 percent was found in the relatively short period between 2002 and 2006.

The Czech Republic reported on an entirely different epidemiological situation. About 500 out of more than 1000 reported cases in 2006 have been acquired in the last third of the year 2006, representing a completely different state yet again.

Further signs are the first occurrence of TBE in the most southern corner of Norway and the spread to Central Sweden, new foci in Central Europe, e.g. in Switzerland, France, Germany, Italy (north) and Austria.

Climate change in Central Europe means that many areas will have higher average temperatures and more precipitation. Higher precipitation is a favourable factor for vector ticks. As a consequence the risk of getting an infectious tick bite will rise in many areas. The number of TBE cases in 2007 was distinctly lower than in 2005 and 2006 in many European countries (here presented for Germany, Poland, Czech Republic and Switzerland). It is at present impossible to make a definite statement on the reasons but in 2007 a large part of the tick activity took place in winter and in early spring caused by the extremely mild weather. There was an extended drought in April and in early May which may have caused the death of many ticks. Moreover, the rainy summer of 2007 prevented many people from spending their leisure time in forests. So, the number of registered TBE cases decreased strongly in 2007. It is to assume that, beside the weather conditions, other unknown factors play a role in these interactions, i.e. further modifications of the development cycle of the ticks and other ecological circumstances.

It can be stated for certain that global warming causes some of these dramatic changes. However, there are additional factors to be considered such as social and political changes in agricultural production and in leisure time and an increase in travelling (in TBE areas) which in turn leads to a higher exposition rate.