

Vector-Borne Diseases: Impact of Climate Change on Vectors and Rodent Reservoirs
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What makes ticks tick? Climate change, ticks and tick-borne diseases*

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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 Lyme Borreliosis (LB) and between 10,000 to 15,000 as tick-borne encephalitis (TBE).

As you all know, 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 is 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. Agricultural [land set aside](#) because of EU subsidies leads to fallow and scrublands which in turn increases 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 epidemiological development of TBE is accordingly. On average, the TBE incidence rate of all European 'TBE-countries' with the exception of Austria (vaccination rate of 90 percent) increased by approx. 400 percent in the years 1974 to 2002. Most surprisingly, however, was the fact that in the Czech Republic, in Switzerland, in Poland and in Germany anew an 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 incidences 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.

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 increase in travelling (in TBE areas) which in turn leads to a higher exposition rate.

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