

Healthcare industry BW

New TBE transmission pathways discovered

Researchers have discovered two new TBE transmission pathways: the first related to the consumption of raw milk and raw milk cheese that can cause encephalitis, and the second is another tick species that can pass on the TBE virus, thus increasing the risk of contracting the disease even in winter.



Female (top) and male (bottom) specimens of the *Dermacentor reticulatus* tick, also known as the ornate cow tick, ornate dog tick, marsh tick and meadow tick © University of Hohenheim

Spring is coming and with it ticks, small arachnids that can pass on TBE and other diseases. In future, the risk of year-round, not just summer, infection now looks possible. Researchers have recently discovered that, along with *Ixodes ricinus*, another tick species called *Dermacentor reticulatus* is also able to pass on a virus that leads to tick-borne encephalitis (TBE), a disease affecting the central nervous system. However, unlike *Ixodes ricinus*, which is the major cause of TBE, *Dermacentor reticulatus* is active at low temperatures. Therefore, this particular tick species presents a TBE risk in mild winter weather, and hence year round.

Dermacentor reticulatus as a carrier of TBE viruses was first discovered in a woman from Saxony who had contracted TBE. When the health authorities asked her where she had been, she was able to give detailed information of footpaths and roads. The authorities then proceeded to collect ticks along these roadsides and paths using a method called flagging and examine them for the presence of TBE viruses. Dr. Gerhard Dobler and his team from the

Bundeswehr Institute of Microbiology (IMB) in Munich discovered something completely unexpected: several ticks infected with the TBE virus. “Until then, no one had suspected that *Dermacentor reticulatus* had the capacity to pass on TBE. And as this tick species hardly ever bites human beings, it was previously considered harmless,” says Prof. Dr. Ute Mackenstedt, head of the Department of Parasitology at the University of Hohenheim.

Dermacentor reticulatus occurred originally mainly in Austria, Northern Italy and Hungary and spread further north in the 1970s. It is assumed that the ticks were spread by dogs. The researchers have many questions to answer: Did the tick species recently become a TBE agent, or had it simply been overlooked? When do people become hosts? And, above all, how are *Dermacentor reticulatus* ticks infected with TBE?

Targeted search for TBE-infected ticks

Only 0.5 to 1.5 percent of *Ixodes ricinus* ticks, also known as castor bean ticks, are infected with the TBE virus. The so-called virus prevalence is therefore quite low. It also varies considerably: “Although ticks can be found throughout Germany, infected ticks are not equally distributed across the country; they are usually found in specific local areas, so-called hotspots. These hotspots can be very small, for example the size of a football pitch,” says Mackenstedt. Identifying such hotspots is therefore quite tricky. Ticks were previously collected on a large scale. Mackenstedt comments: “We often checked 30,000 ticks without detecting a single infected one.”



All stages of *Ixodes ricinus* (castor bean tick): larva (around 0.5 mm), nymph (around 1.5 mm), males (2.5 – 3.5 mm), females (3.5 – 4.5 mm) © University of Hohenheim

Nowadays, the search for TBE-infected ticks has become more targeted. The analysis of people infected with TBE has proven quite successful. Like the case of the woman from Saxony, TBE-infected *Dermacentor reticulatus* ticks were identified as the cause of disease in a family where the father and the son were diagnosed with encephalitis after consuming goat cheese and milk from an organic farm in the administrative district of Reutlingen. “We collected ticks from the path that the goats took from one pasture area to another, and found a TBE-positive tick,” says Mackenstedt. The researchers from Hohenheim also found that many goats had antibodies against TBE. Two goats had such a high antibody titre that the researchers assumed that they

had just been infected. The researchers will now look for ticks near the organic farm at regular intervals. "We will compare ticks from different hotspots to find out how they differ," says Mackenstedt.

The TBE transmission pathway is well known from Eastern European countries where raw milk consumption is high. According to the Robert Koch Institute, six raw milk-related TBE cases were recorded in Austria in 2008. In Germany, TBE from raw milk consumption had not previously been known, despite the popularity of organic produce and raw milk. "In general, it is difficult to become infected via raw milk and raw milk products," says Mackenstedt. After a tick has bitten a goat or a cow, the virus circulates in the animal's blood for up to 14 days. The viruses are only excreted in the milk during this so-called viraemic phase. When the milk from this phase is used to make cheese, the viruses will survive for a period of time, although exactly how long is still unclear.

TBE vaccination is recommended



Tick (*Ixodes ricinus*) on a domestic cat. © Juliette Irmer

Pasteurisation, i.e. heating milk to kill certain germs, considerably reduces the risk of infection with the TBE virus. According to current knowledge, people vaccinated against TBE can safely consume raw milk products. "In general, I would recommend vaccination. In contrast to Lyme disease, TBE cannot be treated," says Mackenstedt. "Whenever you step outside, you enter tick habitat, even in your own garden." The perfect example is Austria, which is plagued by ticks. Here, information campaigns have led to a high vaccination rate, and the number of TBE cases has consequently fallen.

In Germany, TBE-infected ticks continue to spread. While the southern part of Germany is still affected to a larger degree than the rest of Germany – 80% of all TBE cases occur in the south – the number of TBE cases is also on the increase in northern Germany. The reasons for this are manifold: the climate and many other factors such as beech mast. "Rodents also play a big role in the life cycle of TBE viruses and ticks. If they find a lot of food, they propagate, and so do the ticks," says Mackenstedt.

Mice are the perfect target when it comes to using a biological tick extinction method in gardens. This method involves using so-called tick tubes containing cotton balls that the mice use to make nests. The cotton balls are laced with a poison called permethrin, which is harmless to mice but kills the ticks. The effectiveness of the method is currently being

assessed in cooperation with researchers from the University of Hohenheim.



Article

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