

Tick-Borne Encephalitis Virus Seropositive Dog Detected in Belgium: Multi-species Screening of Sentinels for Public Health

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Introduction (Roelandt et al., 2010)

Tick-borne encephalitis virus (TBEV) is an important emerging tick-borne viral infection of humans and dogs in Europe. The Western TBEV subtype is transmitted by *Ixodes ricinus* ticks and occasionally by unpasteurized milk from domestic ruminants. Western TBEV is currently the most important arthropod-borne viral infection in humans in Europe, causing tick-borne encephalitis (TBE), a biphasic disease with fever and multifocal neurological signs, including meningo-encephalitis. All neurological patients need intensive care hospitalization and many develop permanent sequelae called 'post-encephalitic syndrome'. TBE is an increasing public health risk in several European countries and despite low mortality rates it results in a very high risk to society and health care.

TBE is also emerging among Europe's canine population and its distribution is steadily expanding over Western Europe in parallel with human TBE. Consequently, a higher number of canine TBE cases are likely to be diagnosed as awareness increases in the veterinary community. Although in 50% of dogs seroconversion occurs without any clinical signs, TBEV can cause pyrexia, lethargy, loss of appetite, and multifocal neurological signs. Most dogs develop a strong IgG immune response, which is detectable in cerebrospinal fluid and serum.



The best diagnostic tests for TBEV are indirect IgG enzyme-linked immunosorbent assay (ELISA), hemagglutination inhibition (HI), seroneutralization assay (SN), rapid fluorescent focus inhibition test (RFFIT), or immunoblotting tests. SN and RFFIT tests are considered to be highly specific confirmation/reference tests, whereas ELISA is more prone to cross-reactions and false positives. In Belgium, TBE is still considered an exotic disease and medical and veterinary TBEV surveillance is currently virtually nonexistent. Therefore, CODA-CERVA conducted a first serological screening of Belgian dogs for TBEV.

Canine Study (Roelandt et al., 2011)

A commercial ELISA test (Immunozyt FSME/TBE IgG All Species-ELISA®, Progen Biotechnik, GmbH, Heidelberg, Germany) was adapted for the detection of TBEV-specific IgG antibodies in canine sera. Serum samples of Belgian dogs (Fig.1) were obtained from three diagnostic laboratories from Northern (n = 688) and Southern Belgium (n = 192) and were tested alongside positive and negative human and dog control samples. ELISA-positive and borderline samples were subjected to a TBEV RFFIT confirmation test, as well as SN and HI tests to rule out West Nile and Louping Ill viruses. One Flemish dog was confirmed TBEV seropositive by RFFIT.

The clinical history of the seropositive but asymptomatic dog included traveling close to (but not within) known endemic areas abroad, as well as tick exposure at home and insufficient tick prevention, but since these risk factors did not seem to occur simultaneously in space and time and since the travelling occurred many years before the TBEV serological testing, this could not explain with certainty where and when TBEV infection was acquired. It was concluded that further surveillance would be necessary to determine whether this dog remains a single travel-related case or whether it represents an early warning of a possible future emergence of TBEV in Belgium.

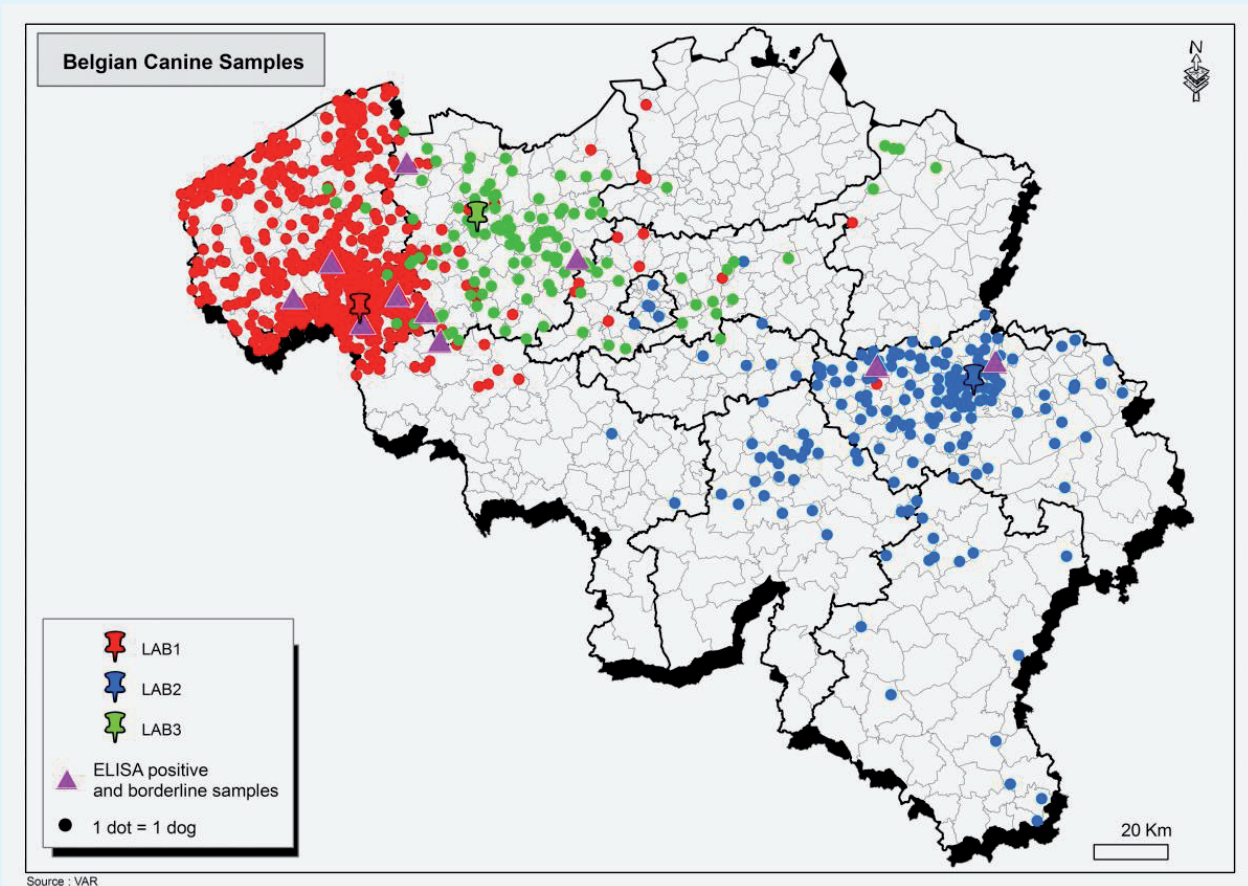


Figure1: Belgian canine samples (n = 880) were used in this study. Three colored pins represent the three participating laboratories. One dot represents one dog. Purple triangles represent enzyme-linked immunosorbent assay (ELISA)-positive and borderline samples.



Screening animal sentinels for TBEV (Roelandt et al., 2010)

It is known that the TBEV tick vector, *I. ricinus*, has more than 300 known natural hosts, including small and large mammals, birds and reptiles. Most of these hosts are subclinically infected with TBEV and become immune for life. Additionally, pets as well as farm animals and wildlife can be used as sentinels for TBEV detection, offering a practical index for public health surveillance and risk assessment. Larger mammals such as wild boar, roe deer, dogs and domestic ruminants (cattle, sheep, and goats) have already proven to be good TBEV sentinels in European TBEV surveillance, since the prevalence in these hosts can be much higher than in the local tick or human populations.

Taking into account these epidemiological features and the findings from the canine study, it would be prudent to further validate and standardize an ELISA screening test for estimating prevalence of infection or exposure to TBEV in several species. Such a diagnostic test would be needed to enable a data-based risk analysis for TBE in Belgium. Continued serological screening of TBEV in dogs and other domestic and wild sentinels is advisable to gain more insight into the current situation and could contribute in a cost-effective way to a continuous public health epidemiosurveillance program for TBE(V). Finally, since a recent analysis showed that in Europe between 30% and 80% of human viral meningo-encephalitis cases remain unexplained, such a program should also include targeted clinical and risk-based surveillance in the human population.

Currently, a targeted multi-species screening and ELISA validation study is being conducted by a Belgian consortium. Serum samples of humans, as well as from domestic and wild species will be tested in ELISA and SN, and hereby species-specific seroprevalences as well as ELISA test accuracy will be evaluated.

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