

Detection and genetic characterization of tick-borne encephalitis virus from sylvatic rodents from north-eastern Poland

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Tick-borne encephalitis virus (TBEV) is a flavivirus widespread in Baltic countries, Russia and Asia, capable of causing infection of the central nervous system, in humans and in vertebrate reservoirs. Morbidity and mortality vary greatly depending on the strain of the virus. Three TBEV subtypes are known - European (TBEV-Eur), Siberian (TBEV-Sib), and Far-Eastern (TBEV-FE) differing in clinical course and outcome. In Poland, 200-300 TBE cases are registered annually, of which, on average, 70% of reported cases come from north-eastern Poland - a region considered to be highly endemic. Although, up to this day, only the TBEV-Eur subtype was detected in Poland, all three subtypes of TBEV were detected for the first time in Estonia and Latvia. Rodents are recognized as one of the most important mammalian reservoir hosts of TBEV and are considered good indicators of TBEV circulation, carrying persistent latent infections.

Overall, 270 rodents from three ecologically similar study sites in north-eastern Poland were captured. Blood samples from the heart were tested for the presence of antibodies against TBEV using an immunofluorescence assay. Rodent brains were collected during the section, RNA was isolated and TBEV detection was carried out in samples using RT-nested PCR. TBEV-positive samples were subsequently sequenced and subjected to phylogenetic analysis.

We detected RNA of TBEV in 37 out of 270 brain samples with an overall prevalence of 13.7% (95%CL 10.5-17.5). The IgG antibodies were detected in 18 of 270 (6.7%) blood samples. Interestingly, 9 of 37 rodents with detected TBEV RNA in brain tissue had anti-TBEV antibodies and 9 antibody-positive rodents did not have detectable levels of TBEV RNA in the brain. 10 complete TBEV sequences were obtained. All detected TBEV strains belong to the European subtype, forming 2 clusters.

To the best knowledge, we report the first complete genomic sequences of TBEV strains in Poland. Our study brings novel data for understanding TBEV circulation in rodent populations. We believe that biomonitoring of rodents against zoonotic diseases is the best way to predict peak years and high-risk sites, helping preventing human cases of TBE and thereby contributing significantly to the public health.