

TBE in Croatia

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E-CDC risk status: endemic (last edited: April 2024, data from 2023)

History and current situation

In Croatia, TBE was reported for the first time in 1953 near Križevci (Stara Ves, northwestern region).¹ In addition to this first focus, several continental foci (Bjelovar, Pakrac, Koprivnica, Karlovac, Varaždin) have been recorded since 1961. Moreover, TBEV antibodies were detected in residents of the Croatian littoral near the islands of Zadar, Pula, and Brač.² In 1991, TBEV emerged in the mountainous area of Gorski Kotar.³ The disease is also endemic in northwestern and eastern regions between the Sava and Drava rivers. Endemicity is highest in northwestern counties, with average incidence rates ranging from 3.61 to 6.78 per 100,000 inhabitants.^{4,5} In 2015 and 2019, two TBE clusters after consumption of raw goat milk were observed.^{6,7}

TBE in Croatia shows a bimodal seasonality with a larger peak during the spring and summer months (April–August) and a smaller one in October–November. A recent study showed that the majority of TBE patients are in the age group of 40–69 years (58.3%) with a male predominance (70.2%). Males predominate in all age groups with male-to-female ratios ranging from 1.3:1 (for those under 20 years) to 5:1 (for those between 50 and 59 years). Meningitis (54.8%) and encephalitis (30.9%) are the main clinical presentations in hospitalized patients with TBE. The abortive form („febrile headache“) was reported in 13.1% of patients, and meningoencephalomyelitis in 1.2% of patients.⁸

In addition to human cases, 2.1% of TBEV asymptomatic seropositive individuals were detected in the same study (2017–2023). In contrast to acute cases, there is only a comparatively small difference in the seroprevalence between males (2.6%) and females (3.6%) as well as between age groups (2.5–3.7%). Recent serosurveys showed the presence of TBEV antibodies in animals as well. Seropositive horses were detected in continental Croatian counties in the period from 2017 to 2020. The overall seroprevalence rate was 12.1%, ranging from 7.3% to 17.1%. In 2022, 9.7% of sheep from the easternmost Vukovar-Srijem county tested positive for TBEV IgG antibodies.⁸

Ixodes ricinus ticks are the main vector of TBEV in Croatia. From 2017 to 2023, hard ticks were sampled using the dragging–flagging method and hand-picked from both dead wild and live domestic animals. Ticks were collected in the Medvednica and Papuk mountain areas, and in the area between the Drava, Sava, and Danube Rivers. In the Alpine biogeographic region, ticks were mostly collected in the Gorski Kotar area. The seasonal tick dynamic was similar to the reported human cases.⁸

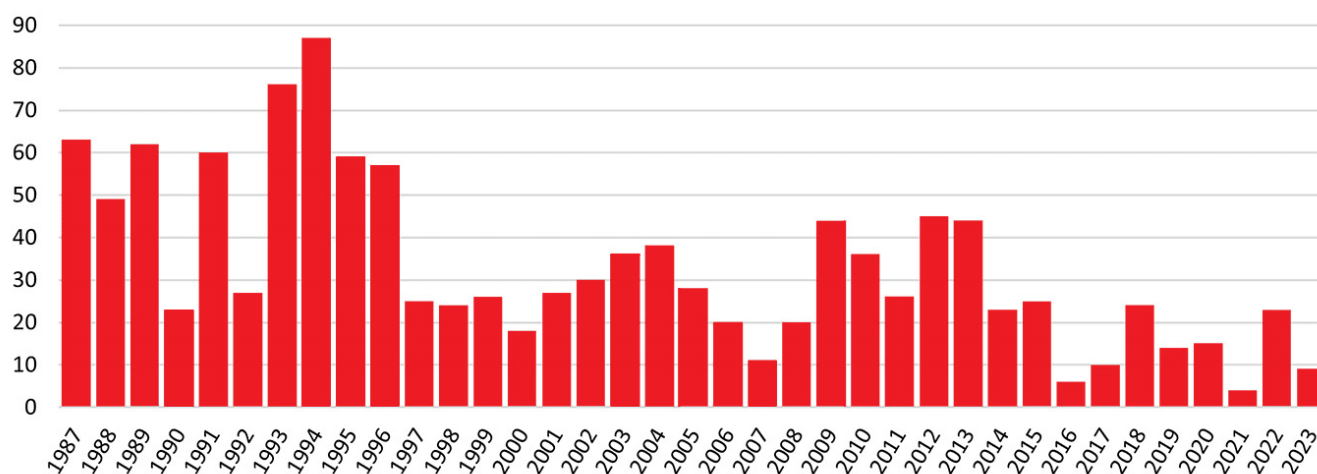
A study on the TBEV detection in ticks removed from red fox (*Vulpes vulpes*) carcasses hunted in endemic areas in northern Croatia was performed during two hunting seasons (2010–2011 and 2011–2012). TBEV was detected in adult *Ixodes ricinus* and *Ixodes hexagonus* ticks showing a prevalence of 1.6%. Furthermore, two spleen samples (1.1%) from 182 red deer (*Cervus elaphus*) were found positive for TBEV.⁹

Phylogenetic analysis of one TBEV strain detected in a urine sample from a patient with severe meningoencephalitis (2017) and strains from ticks and deer spleen showed that all clustered the TBEV European subtype.^{4,9}

Overview of TBE in Croatia

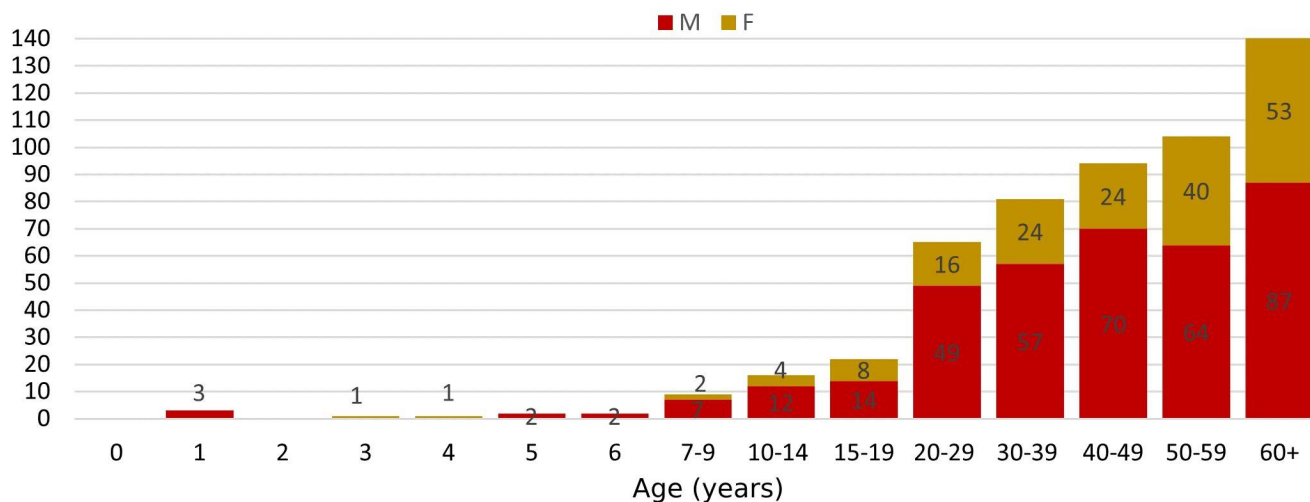
Table 1: TBE in Croatia	
Virus subtypes isolated	TBEV European subtype ^{4,8}
Reservoir animals	Rodents
Infected tick species (%)	1.6% in one study
Dairy product transmission	2015 – 7 cases of TBEV (Bjelovar region) after consuming fresh goat milk and cheese ⁶ 2019 – 5 cases of TBEV (Gorski Kotar region) after consuming raw goat milk from the same farm ⁷
Case definition used by authorities	ECDC case definition ¹⁰
Completeness of case detection and reporting	No data
Type of reporting	Mandatory ¹¹
Other TBE surveillance	Occasional serosurveys ⁸
Special clinical features	The majority of cases are in the age group 40–69 years. Meningitis (54.8%) and encephalitis (30.9%) are the most common clinical presentations in hospitalized patients. An abortive form “febrile headache” was detected in 13.1% of patients. ⁸
Licensed vaccines	FSME-IMMUN
Vaccine recommendations	Risk groups (forestry workers, hunters, people who reside in endemic areas/visit endemic areas)
Vaccine uptake	No data
National Reference Center for TBE	National Reference Laboratory for Arboviruses, Reference Center for Diagnosis and Surveillance of Viral Zoonoses of the Croatian Ministry of Health, Department of Virology, Croatian Institute of Public Health

Figure 1: TBE cases notified over time, 1987–2023



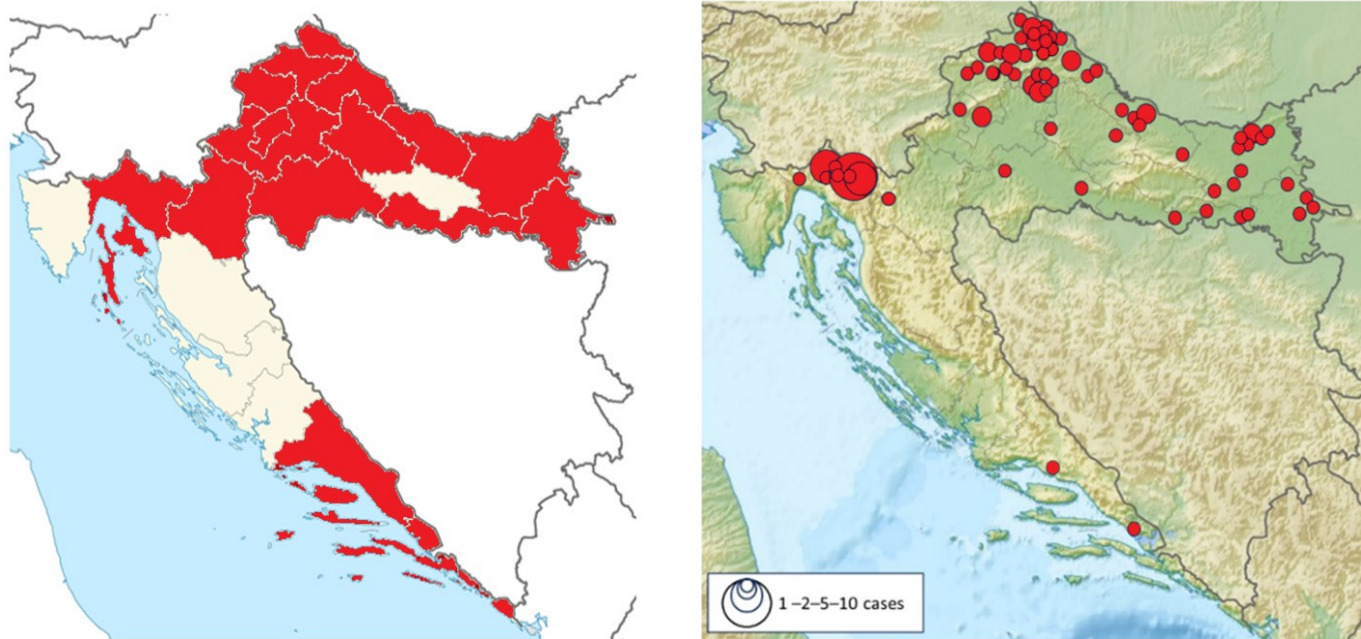
Preliminary data for 2023, reporting is still ongoing until April 2024; source: Reference Center for Epidemiology Croatian Ministry of Health; Croatian Institute of Public Health

Figure 2: Age and gender distribution of notified TBE cases in Croatia, 2000–2020



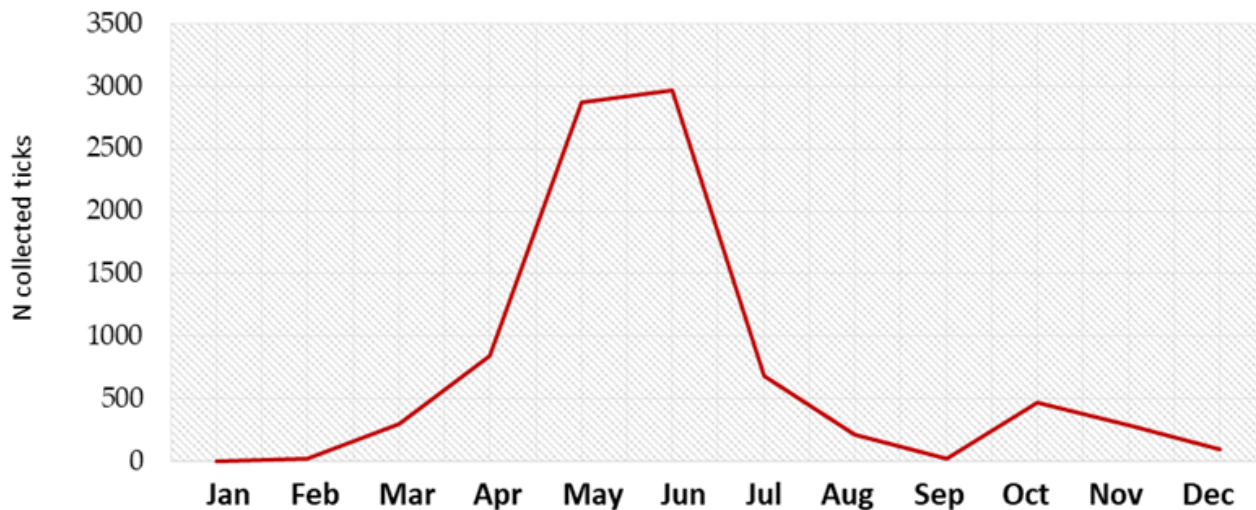
Source: Reference Center for Epidemiology Croatian Ministry of Health; Croatian Institute of Public Health

Figure 3: Sites of TBEV detection in Croatia, 2016–2023



Red shadowed areas: counties with reported cases; Red circles: Cumulative infection sites of TBE patients for the period from 2016 to 2023

Source: Vilibic-Cavlek T, et al. *Microorganisms* 2024; 12(2):386.

Figure 4: Seasonal dynamic of *Ixodes ricinus* ticks in Croatia, 2016–2023

Source: Vilibic-Cavlek T, et al. *Microorganisms* 2024; 12(2):386.

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