



TBE EPIDEMIOLOGY IN TBE ENDEMIC AREAS

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TBE virus overview

- Family: *Flaviviridae*; Genus: *Flavivirus*
- Three subtypes: Far eastern, Siberian, and European
- Endemic to Europe and Asia
- Transmitted predominantly by ticks
- Other modes of transmission
 - Unpasteurized dairy products
 - Slaughter of animals
 - Transfusion or transplantation
 - Breastfeeding
 - Laboratory exposure



Clinical disease and outcomes

Clinical features of TBE

- Asymptomatic infection common
- Clinical presentations
 - Biphasic illness with fever then neurologic illness (European subtype)
 - Monophasic neurologic illness (Far Eastern and Siberian subtypes)
- Non-specific febrile illness which lasts 2–4 days
- Neurologic illness
 - Meningitis, encephalitis, or meningoencephalomyelitis

Outcome

- Case fatality rates
 - 1–2% (European subtype)
 - 6–8% (Siberian subtype)
 - 20% (Far Eastern subtype)
- Neurologic sequelae
 - 10% to 80%
- Severity highest in older persons

TBE in children

- Usually milder than adults
- Meningitis > meningoencephalitis > meningoencephalomyelitis
- Neurologic sequelae in <10%
 - Mostly not severe
 - Cognitive problems possibly underrecognized
- Death very rare

TBE in special populations

- Pregnancy
 - Women have mild to severe illness
 - Infants healthy even when severe illness in mother
 - Reports of adverse infant outcomes not supported by laboratory evidence
 - Transplacental transmission of TBE virus not yet confirmed
- Breastfeeding
 - One case of TBE virus transmission by breast-feeding*
 - Infant had severe illness and sequelae
- Immunocompromised persons
 - Severe illness and higher risk of fatal outcome

TBE and ticks

Tick habitats and infection rates

- *Ixodes* species ticks transmit TBE virus to humans
- Natural foci
 - Locations relatively stable over time
 - Can be small areas (<1 km²)
- Preferred sites
 - Edges of forests
 - Areas with deciduous trees, low-growing dense bush, and low ground cover
- Tick infection rates
 - Low and variable over time

Risk for exposure to ticks

- Recreational activities
 - Camping
 - Hiking
 - Fishing
 - Cycling
 - Bird-watching
 - Foraging for mushrooms, berries, or flowers
- Occupational risk
 - Forestry workers
 - Military personnel
- Limited risk in urban areas



Photo credit: CDC public health image library



Ixodes ricinus (Photo credit: ECDC/Guy Hendrickx)

TBE Epidemiology - General

Difficulty in assessing and comparing TBE cases in endemic areas

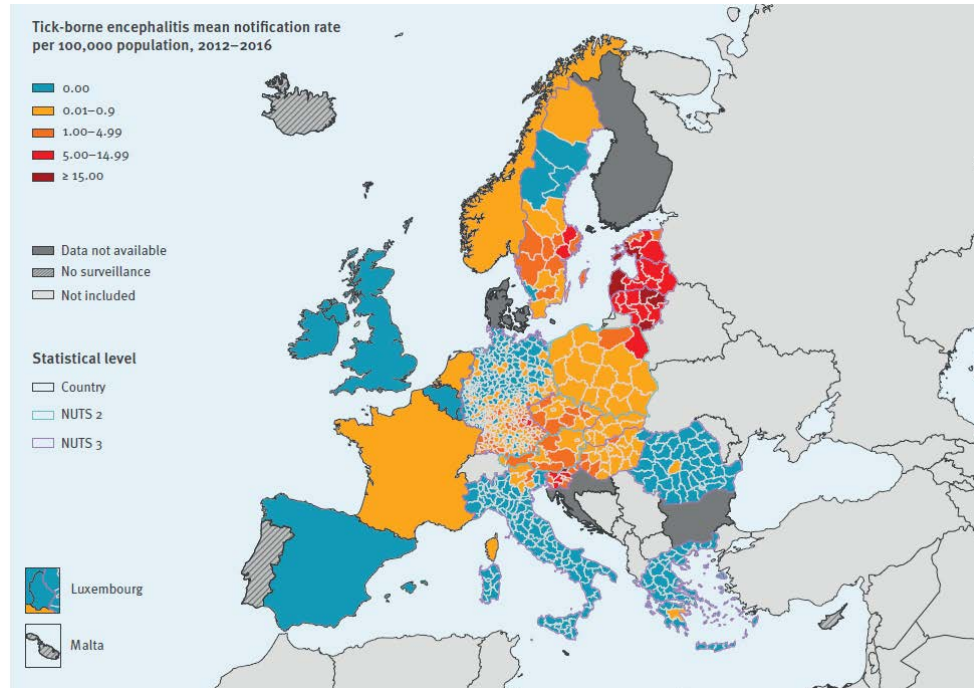
- Diagnostic tests not routinely available in many areas
- Differences in reporting practices
- Surveillance quality variable by country and over time
- Data must be considered over appropriate time frame
- Vaccination impacts case numbers

TBE Epidemiology - Europe

TBE epidemiology in Europe

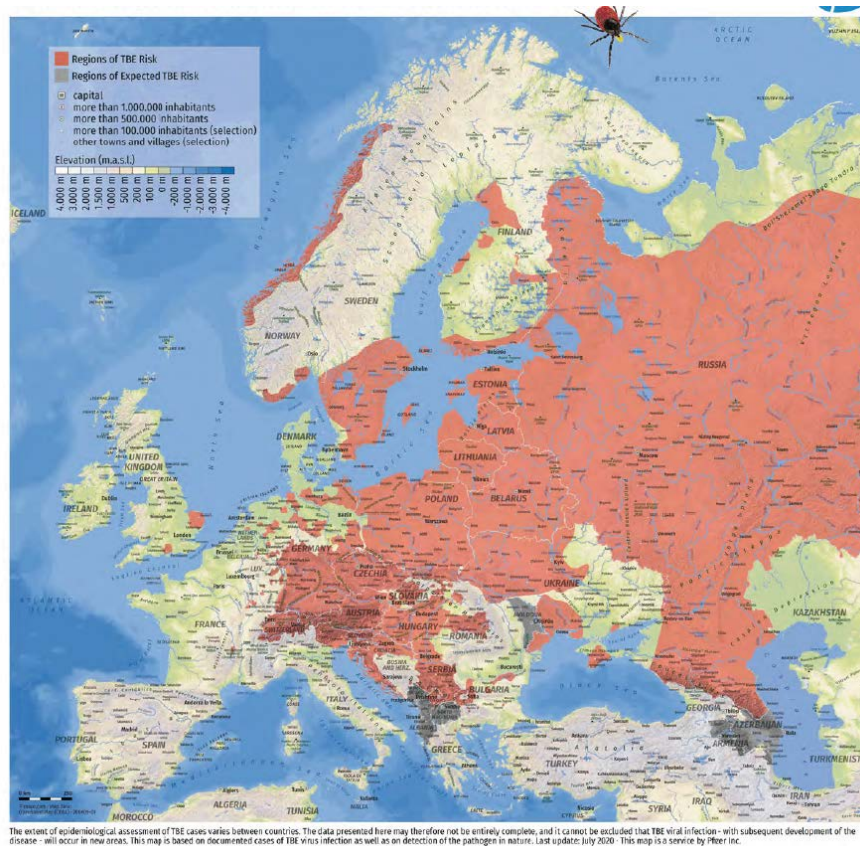
- TBE became a notifiable disease in 2012
- During 2014–2018
 - Reported cases approximately 2,000–3,000 annually
 - Reported incidence 0.4–0.6/100,000 population
- Almost all cases during April–November
- Predominant in males (ratio 1.5:1)
- Highest rate in adults aged 45–64 years

Reporting rate of locally-acquired TBE in Europe, 2012–2016



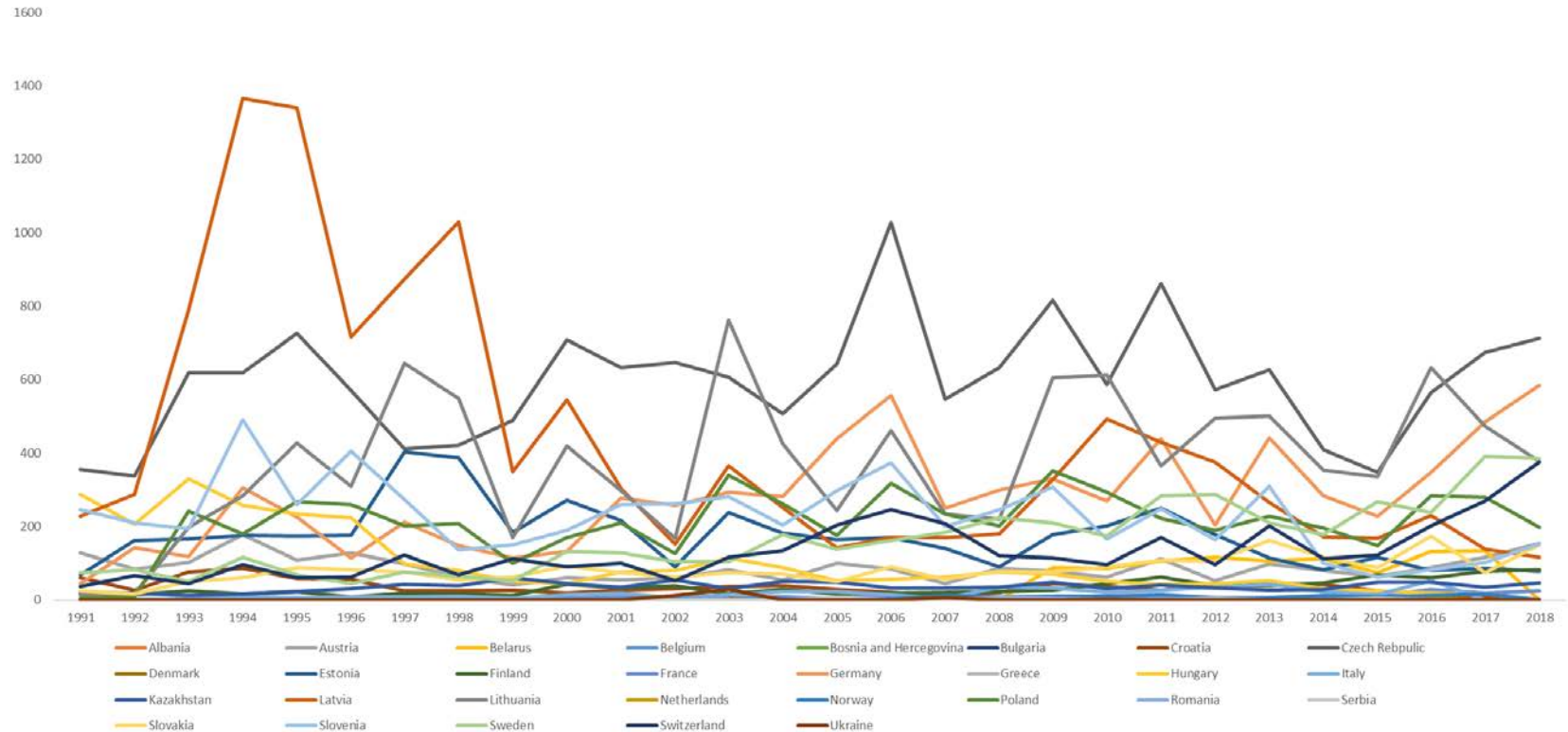
Source: Beaute et al, Euro Surveill 2018

Recognized area of TBE virus transmission, 2020*



*Based on human TBE cases and TBE infections in ticks and animal hosts; Source: <https://iswtbe.com/>(Pfizer)

Reported TBE cases in Europe by country and year, 1991–2018

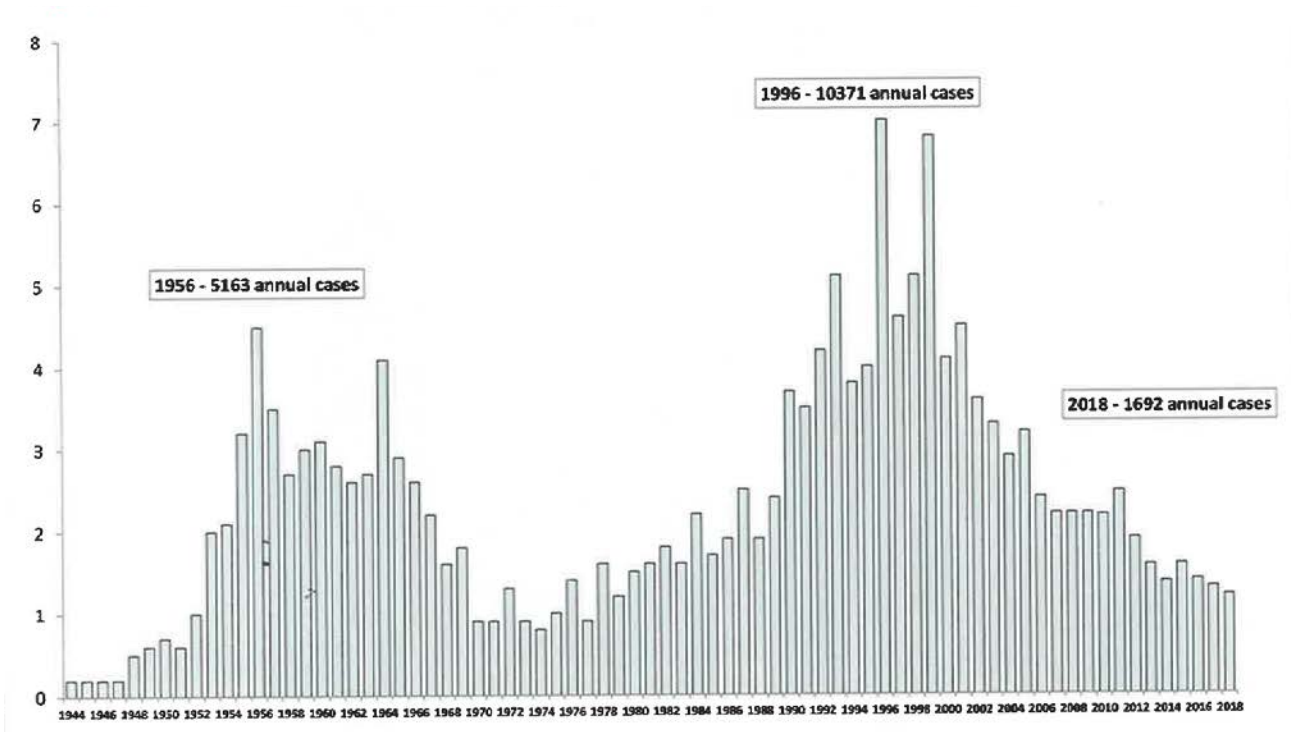


Source: Dobler et al, The TBE book, 2019 (Russia not included)

Expansion in range of TBE virus in Europe

- Area at risk increased during past 30 years
 - Locations further north and west
 - Higher altitudes >5,000 feet
 - New foci within countries
- Reasons unknown and likely complex variety of factors affecting ticks and their hosts
- Not always associated with increased risk for humans or establishment

TBE incidence in Russia per 100,000 population, 1944–2018



Source: Dobler et al, The TBE book, 2019

Recent TBE situation in Russia

- Approximately 2,000 reported cases per year
- Average incidence 1.9 per 100,000 population from 2007–2016
 - Low incidence* = 23 regions
 - Moderate incidence* = 14 regions
 - High incidence* = 6 regions

*Low incidence defined as <3 cases per 100,000 population, moderate incidence as 3–8.4 per 100,000, and high incidence as >8.4 per 100,000 population

TBE Epidemiology - Asia

TBE in China

- Incidence ~0.3 per 100,000 population
- Three foci in northeast, northwest, west
- Epicenter in northeastern China

Geographic distribution of TBE virus in China

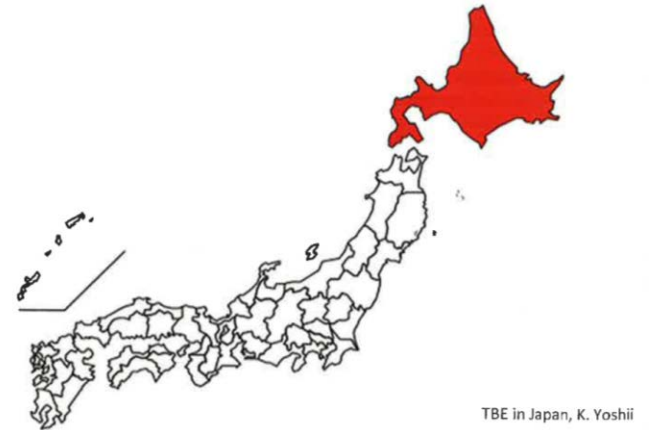


○ Reported TBE cases 2006-2013
△ Confirmed TBEV foci in Xinjiang and Yunnan

Intensity of blue color: Reflects the probability of an area to be endemic for TBEV, dark blue = 100%, light blue = lower probabilities based on various criteria as published by Sun et al. 2017⁴

TBE in Japan

- Human cases reported only from Hokkaido
- Five cases diagnosed*
 - 1993 (n=1)
 - 2016 (n=1)
 - 2017 (n=2)
 - 2018 (n=1)



Source: Dobler et al, The TBE book, 2019

TBE in South Korea

- No human cases identified
- TBE virus in ticks and rodents in dispersed areas of country

Summary

- Severe clinical illness with potentially high mortality and sequelae rates
- Virus transmission in focal areas during season when ticks are active, but risk variable over place and time
- Main risk from exposure to ticks when recreating or working in tick habitats

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

