TBE EPIDEMIOLOGY IN TBE ENDEMIC AREAS

Susan Hills, MBBS, MTH
Medical Epidemiologist
Arboviral Diseases Branch
Centers for Disease Control and Prevention

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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

*Suss J. Vaccine 2003.

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 km^2)
- 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

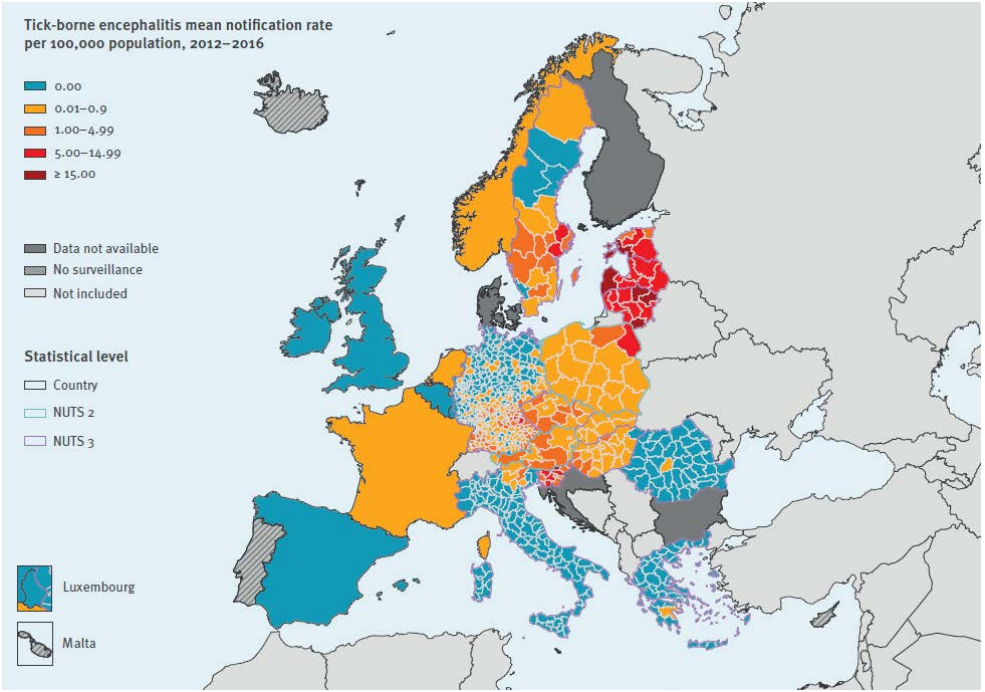
TBE Epidemiology - Europe

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

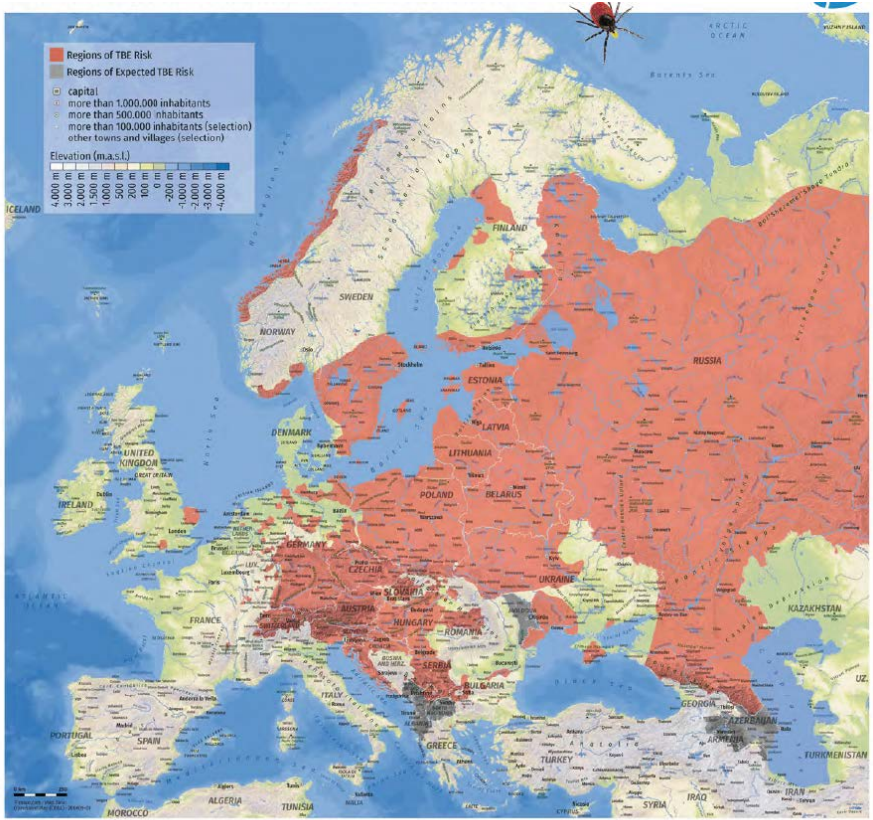
https://www.ecdc.europa.eu/en/tick-borne-encephalitis/surveillance-and-disease-data/annual-epidemiological-report

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



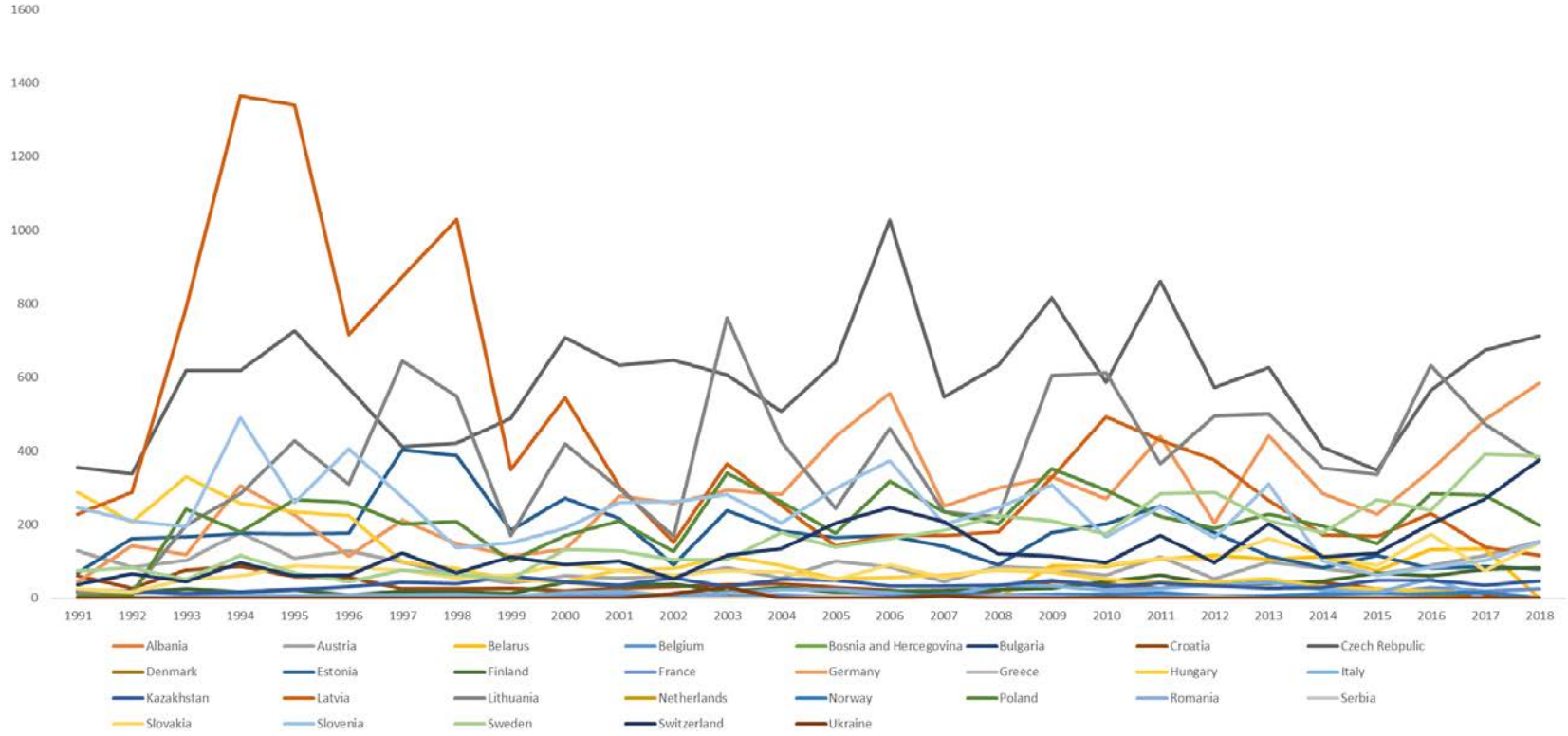
Source: Beaute et al, Euro Surveill 2018

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

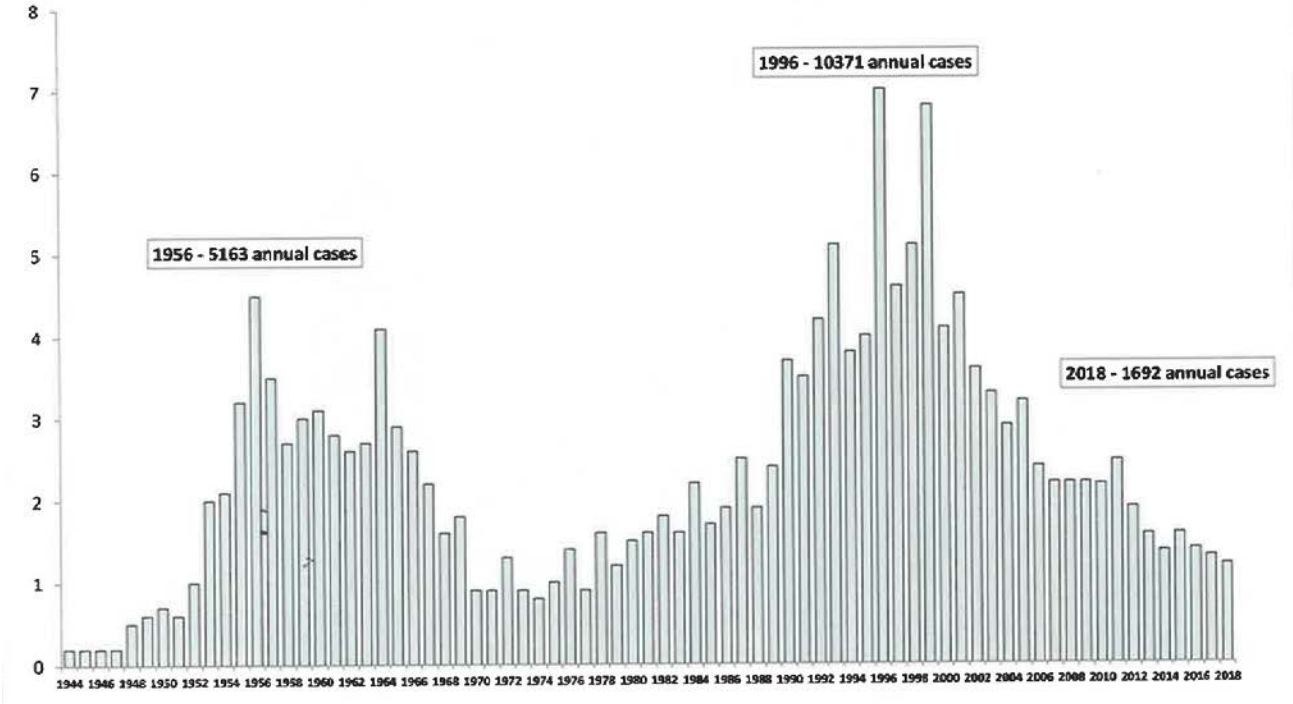


Source: Dobler et al, The TBE book, 2019 (Russia not included)

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

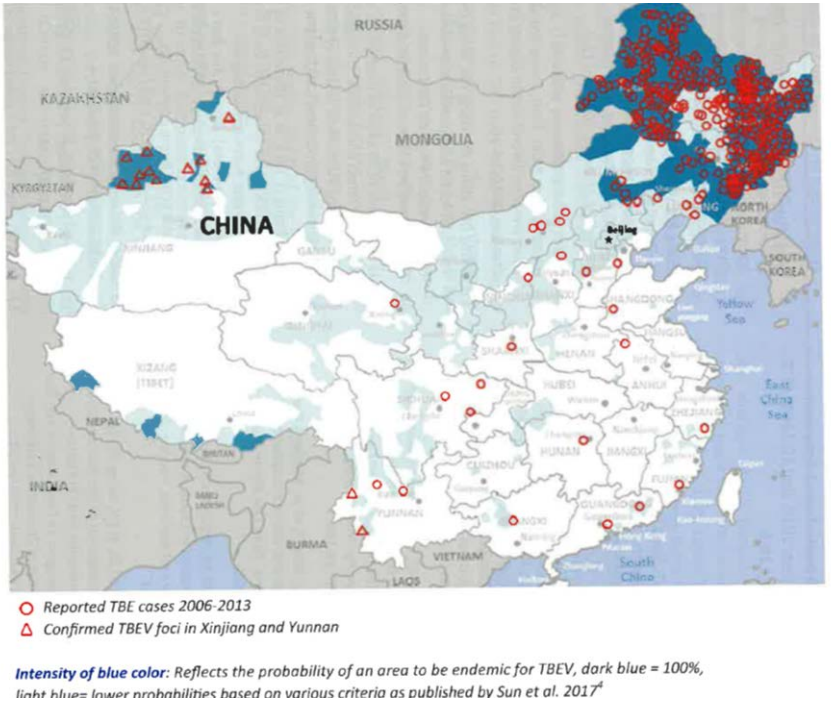
*Low incidence defined as <3 cases per 100,000 population, moderate incidence as 3–8.4 per 100,000, and high incidence as >8.4 pers 100,000 population

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

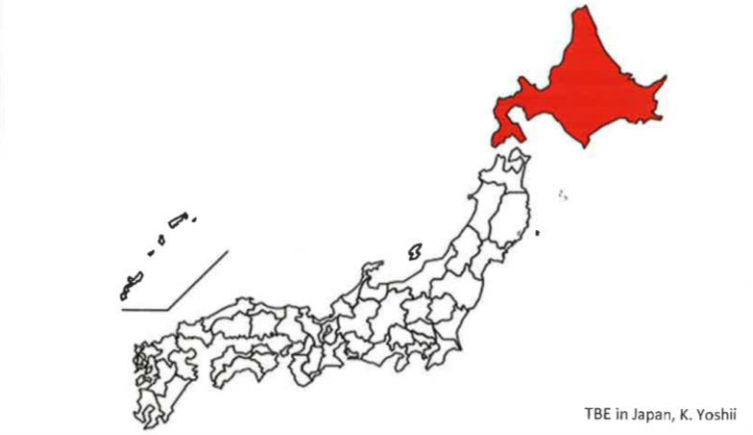


Source: Dobler et al, The TBE book, 2019

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

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.