

# Tick-borne encephalitis

**Tick-borne encephalitis (TBE)** is a disease caused by the tick-borne encephalitis virus (TBEV), which is an arbovirus. The disease can lead to meningitis, meningoencephalitis, and severe encephalomyelitis. The course is variable- from abortive forms (with few symptoms) to a typically two-phase course with central nervous system involvement. The clinical picture manifests as a febrile illness with headaches and neurological symptoms. There is no specific antiviral therapy: the treatment is only symptomatic. TBE mortality is low, but permanent neurological sequelae are relatively common. It is possible to vaccinate against TBE.

TBEV is one of the most common causes of aseptic neuroinfections in the Czech Republic. The clinical picture of meningitis prevails in children with up to 2/3 of children showing cognitive deficits after having KME and have memory problems.

## Epidemiology

Tick-borne encephalitis is an endemic local seasonal neuroinfection.

- **Originator:** arbovirus (arthropod-borne virus, enveloped RNA virus) of the family *Flaviviridae*.
- **Infection reservoir:** small rodents and larger forest animals, sheep, goats.
- **Transmission (vector):** by sucking blood of infected nymphs or adult ticks (*Ixodes ricinus*)
  - the virus is in the saliva of ticks, so a short suction time is enough to transmit the virus.
  - the virus survives in the salivary glands of the tick and in the tick there is also a transovarian transmission of the virus
  - rarely, transmission is via the alimentary route- by consuming unpasteurized milk from infected goats and sheep.
- **Incubation period:** 3-28 days.

The reported incidence of tick-borne encephalitis in the Czech Republic in the years 2000–2009 is 500–1000 cases per year, i.e., 5-10 patients per 100,000 population per year. It has been known in the Czech Republic only since 1945 and its occurrence is most frequent in the Vltava, Berounka, and Sázava river basins, in Central and Southern Bohemia, most often from April to October.

## Clinical symptoms and course

The incubation period of the disease is 7–14 days, with an extreme variation of the duration of symptoms (3–30 days). Most infections are inapparent. After 1–3 weeks of incubation, a two-phase course is usually typical:

**Phase 1 ("flulike")** - Viremia with headache and muscle pain, fever, fatigue. The condition improves in a few days. An apparent recovery in the form of an afebrile period (2–7 days) follows. The asymptomatic period that lasts 1–20 days.

**Phase 2** - meningeal symptoms: headache, photophobia, **encephalomyelitic symptoms:** alterations of consciousness (sleepiness to coma), cranial nerve disorders, bulbar syndrome, weak limb paresis, high fever, sleep disturbance, vomiting, and tremors.

## Based on the predominant disability, we can divide encephalitis into several forms:

- inapparent (specific antibody production only)
- abortifacient (nonspecific symptoms similar to influenza illness)
- meningeal (viral meningitis)
- encephalic (gray and white brain disease with neurological symptoms)
- encephalomyelitic (involvement of gray, white matter and anterior horns); weak paresis, especially of the brachial plexus as segments C5–7 are most often affected by the process.
- bulbo-cervical (involvement of the medulla oblongata), **bulbo-cervical forms can also lead to the failure of vital centers and thus to death.**

## Diagnosis

- positive meningeal symptoms in people living in the endemic area;
- a history of a typical two-phase course;
- tick bite data - indicates only a part of patients with TBE;
- detection of specific antibodies from serum - ELISA with detection of early IgM antibodies, IgG class antibodies are formed very quickly, for which their avidity can be determined
- other serological methods: specific virus neutralization test, rise of specific antibodies
- cerebrospinal fluid examination: aseptic inflammation with a leukocyte count ranging from 100–200 leukocytes/ $\mu$ L, slightly elevated protein levels
- EEG in the acute phase: diffuse pathological recording with a predominance of slow waves.

## Treatment

So far it is only symptomatic (analgesics , antiemetics , antipyretics). Resting is especially important. Relieving lumbar puncture can be performed (tens to hundreds of lymphocytes in the CSF, slightly higher protein). We treat paresis by administering **vit. B** and **rehabilitation**. **Anti-edematous treatment** (mannitol) and corticoids also have a positive effect. It is recommended to avoid the sun, prolonged television and higher mental strain.

## Prevention

Vaccination with an inactivated virus vaccine (FSME-IMMUN (Baxter) approved since 1976 and Encepur (Novartis) approved since 1991). The basic vaccination schedule consists of 3 doses. Vaccines are well tolerated, the most common adverse reactions being a fever in the range of 38.0-39.0 °C (20% of children; most often in the age group of 1-3 years; most in the period from February to March, i.e., in the period of frequent respiratory infections), injection site pain and, rarely, muscle weakness. The World Health Organization recommends vaccination against tick-borne encephalitis to all people living in the endemic area, including children.

The disease prevention includes regimens including appropriate clothing covering the entire body, the use of repellents, early removal of the tick and disinfection of the injection site.

Drinking of pasteurized milk is also a prevention (it is also spread by the milk of infected animals, including cow's milk).

## Prognosis and consequences

More severe forms have convalescent period lasting weeks to months. Residual symptoms persist (in 10% of patients) in the form of peripheral weak paresis, and memory, concentration, and sleep disorders.

## References

- ws:Klíšťová encefalitida

## Related articles

- Lyme disease
- Encephalitis
- Lumbar puncture
- Neuroinfections
- Tick-borne encephalitis virus

## External links

- Klíšťová meningoencefalitida; Chmelík 2008; medicinapropraxi.cz (<https://www.medicinapropraxi.cz/pdfs/med/2008/03/04.pdf>)

## Citations

1. Rozsypal, Hanuš. . *Basics of infectious medicine*. - edition. Charles University in Prague, Karolinum Press, 2015. 572 pp. 341–342. ISBN 8024629321 .
2. ↑ Jump up to:a b c d e PETROUŠOVÁ, L a A ZJEVÍKOVÁ. Tick-borne encephalitis in childhood, the importance of vaccination. *Pediatrics for practice* [online] . 2014, vol. 15, vol. 2, pp. 67-69, also available from < <https://www.pediatricpropraxi.cz/pdfs/ped/2014/02/02.pdf> > .
3. ↑ Fowler A, et al. Tick-borne Encephalitis Carries a High Risk of Incomplete Recovery in Children. *J Pediatr*. 2013; 163(2): 555–560.
4. ↑ Schmolck H, et al. Neurologic, Neuropsychologic, and Electroencephalographic Findings after European Tick-borne Encephalitis in Children. *J Child Neurol*. 2005; 20(6): 500–508.
5. ↑ SEIDL, Zdeněk and Jiří OBENBERGER. *Neurology for study and practice*. 2nd edition. Prague: Grada Publishing, 2004. ISBN 80-247-0623-7 .
6. ↑ STATE HEALTH INSTITUTE ,, et al. *Selected infectious diseases in the Czech Republic in the years 2000-2009* [online]. © 2010. [feeling. 2010-08-15]. < <http://www.szu.cz/publikace/data/vybrane-infekcni-nemoci-v-cr-v-letech-1998-2007-absolutne> > .
7. ↑ Galský J. Tick-borne meningoencephalitis. In: Beneš J. *Infectious Medicine*. Prague: Galén, 2009: 125–127.
8. ↑ Rostasy K, et al. Tick-borne encephalitis in Children. *Vienna Med Wochenschr*. 2012; 162: 244–247.
9. ↑ Barrett PN, et al. Tick-borne Encephalitis Virus Vaccines. In Plotkin S, et al. *Vaccines*. 6th Edition: Elsevier; 2013: 773–788.
10. ↑ VERETA, LA, VZ SKOROBREKHA a SP NIKOLAEVA. *The transmission of the tick-borne encephalitis virus via cow's milk* [online]. ©1991. [cit. 2010-01-14]. <<https://www.ncbi.nlm.nih.gov/pubmed/1770888>> .
11. ↑ POVÝŠIL, Ctibor and Ivo ŠTEINER, et al. *Special pathology*. 2nd edition. Prague: Galén-Karolinum, 2007. pp. 297-299.
  - BENEŠ, Jiří. *Study materials* [online]. © 2007. [feeling. 2010]. < <http://jirben.wz.cz> > .
  - HRODEK, Otto and Jan VAVŘINEC, et al. *Pediatrics*. 1st edition. Prague: Galén, 2002. ISBN 80-7262-178-5 .
  - ŠAŠINKA, Miroslav, Tibor ŠAGÁT and László KOVÁCS, et al. *Pediatrics*. 2nd edition. Bratislava: Herba, 2007. ISBN 978-80-89171-49-1 .

