

Tick-Borne Encephalitis Virus Fact Sheet

1. Disease overview

Tick-borne encephalitis is a **zoonotic infectious, non-contagious, vector-borne viral** disease, caused by the **tick-borne encephalitis virus (TBEV)**. The virus infects a wide range of host including small mammals, wild birds, and large mammals such as wild and domestic ruminants, horses and dogs. Domestic animals infected with TBEV typically remain asymptomatic, nevertheless, clinical signs, observed at a low frequency, have been reported predominantly in dogs, with occasional reports also in horses. While TBEV is primarily known for affecting humans, certain domestic animals such as dogs, horses, cattle, goats and sheep play an important epidemiological role by serving as potential source of human infection through close contact or consumption of raw milk.

Tick-borne encephalitis is not a **WOAH-notifiable disease**

Tick-borne encephalitis is **not listed** in the **European Animal Health Law**.

2. Agent

Tick-borne encephalitis virus is an **enveloped, positive sense single stranded RNA virus** that belongs to the *Orthoflavivirus* genus of the *Flaviviridae* family. It is one of the 53 species of virus in the *Orthoflavivirus* genus, which also includes West Nile virus (WNV), Louping ill virus (LIV), Japanese encephalitis virus (JEV), Yellow fever virus (YFV), *Zika virus* (ZIKV).

According to [World Organisation for Animal Health \(WOAH\)](#) there are **five known virus subtypes**: European (TBEV-Eu), Siberian (TBEV-Sib), Far Eastern (TBEV-Fe), Himalayan (TBEV-Him), and Baikalian (TBEV-Bkl).

The genome of TBEV encodes three structural (capsid (C), membrane (M) and envelope (E) proteins) and seven nonstructural (NS) proteins (NS1, NS2A, NS2B, NS3, NS4A, NS4B, and NS5). The E protein is the main protein inducing a humoral response and is the main antigen used for serological testing.

3. Geographical Distribution

The disease is **not reportable** in WAHIS.

For more detailed information and dynamic maps, visit the *Epidemiological Studies* section of the online **disease profile** (accessible via the button in the top right corner).

4. Animal hosts

4.1. Primary animal species affected

The virus infects a wide range of host including small mammals, wild birds, and large mammals such as wild and domestic ruminants, horses and dogs. Whilst many of these host species act as reservoirs or incidental hosts, domestic animals such cattle, sheep, goats, horses and dogs are of particular relevance for humans as they can contribute to virus transmission cycles and serve as source of infection through consumption of raw milk or close contact.

4.2. Clinical Signs

Clinical signs have been more often observed and described in **dogs**. Described signs included hyperthermia, behavioural changes, apathy, ataxia/vestibular signs, cranial nerve deficits, cervical pain, paresis of one or more limbs, convulsion and seizures.

Livestock do not commonly show clinical disease but can develop robust, long-lasting, and specific antibody response to infection. A rare event of diseased in sheep has been reported with an affected animal showing pyrexia, acute neurological signs, ataxia, torticollis, tremor, nystagmus, salivation and finally somnolence with inappetence and recumbency

Clinical manifestation has been occasionally reported also in in horses, including ataxia, tonic-clonic seizures, apathy and stupor, inappetence, mydriasis, convulsions of the legs, skittishness, bruxism, and altered reactions to environmental stimuli.

An experimental study on bank voles (*Myodes glareolus*) reported distress and rapid weight loss as clinical signs in four out of 96 infected voles.

4.2.1. Incubation Period

The incubation period, defined as the interval between infection and the onset of clinical signs, can vary in animals, but it is estimated to be 5 to 9 days in dogs.

4.2.2. Morbidity and mortality

Seroprevalence studies indicate frequent infections in dogs, mostly asymptomatic, and data to estimate morbidity rates are scarce. In one study, 159 randomly selected dogs presented to a veterinary clinic were sampled and tested for the presence of TBEV genome, resulting in 20 positive dogs (12.6%). Among these, seven (35%) exhibited neurological symptoms typical of TBE. Reported mortality rates in clinically affected dogs range from 16% to 50%. A retrospective study conducted at a veterinary hospital evaluated 54 clinically affected dogs and documented a mortality rate of 33%.

In experimentally infected voles a morbidity rate of 4.17% (4/96) was observed. Similarly, one study experimentally infected lambs with TBEV and no clinical signs following infection were observed.

4.2.3. Zoonotic Potential

Tick-borne encephalitis is a **zoonosis**.

5. Transmission

TBEV is transmitted to vertebrate hosts through the bite of certain species of **ticks**, belonging to the genus Ixodes, Dermacentor, Haemaphysalis, and Hyalomma. In a natural cycle, small mammals like rodents and insectivores act as reservoir hosts.

- Tick vectors have been reported in the EU in the past 2 years.
- For more information on vector distribution, visit the *Vector* section in the online disease profile.

Transmission to humans might occasionally occur through the consumption of raw milk from infected cattle, sheep or goat.

6. Diagnostic tests

There are no WOAH-recommended tests for TBEV. Nevertheless, there are diagnostic tests available for detection of either TBEV or specific antibodies against it.

For the **detection of the agent**, RT-PCR is used to identify viral RNA in various matrices, including blood, serum, organs, and both bulk tank and individual milk samples. Virus isolation is also employed for the detection of the virus.

For **immune response detection**, the virus neutralization test is available, along with commercial ELISAs and indirect immunofluorescence assays. Serological tests have also been used to detect antibodies in milk samples.

The following table presents data on the sensitivity and specificity of diagnostic tests from studies deemed eligible according to [EFSA’s systematic literature review protocol](#); values of sensitivity and specificity are only included when explicitly stated in the publications:

Target	Test	Species	Specificity	N studies	Sensitivity	N studies
Antibody	Competitive ELISA	Wild boar	84%	1	20%	1
Antibody	Indirect ELISA	Wild boar	88%	1	23%	1

7. Prevention and control

7.1. Vaccination

There are currently no licensed vaccines for TBEV in animals. Control strategies rely on limiting exposure to ticks.

7.2. Treatment

There is currently **no specific antiviral treatment** for TBEV infection, and management in dogs and horses relies on supportive care tailored to the severity of the clinical signs.

Tick control with acaricides and repellents remains the most important preventive measure.