Tick-Borne Encephalitis

FACT SHEET 18-018-0718

Tick-borne encephalitis (TBE) is a serious disease of humans that affects the central nervous system. It is transmitted by certain species of ticks in the genus Ixodes*. In different regions, TBE goes by a variety of names, including Central European TBE, Far Eastern TBE, Russian spring-summer encephalitis, viral meningoencephalitis, biphasic meningoencephalitis and diphasic milk fever.*

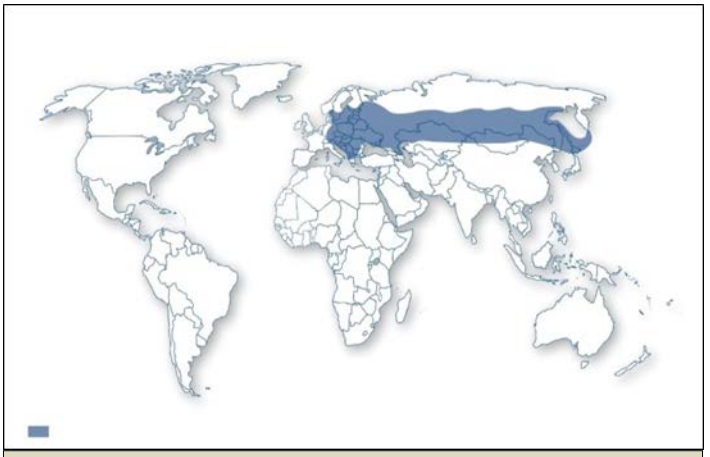
How is TBE transmitted?

Humans typically acquire TBE through the bite of an infected tick, primarily the castor bean or European sheep tick (*Ixodes ricinus)* in Central and Western Europe, and the taiga tick (*Ixodes persulcatus)* in Russia and the Far East. These ticks become infected with TBE by feeding on small rodents, which are their preferred blood source, and maintain the disease throughout their lifetime. They will feed on large animals and humans, but neither is part of the disease transmission cycle. TBE can also be acquired by consuming unpasteurized dairy products (especially raw milk from sheep and goats). Person-to-person transmission has not been reported. Transmission from mother to fetus has rarely occurred. Infection with TBE gives lifelong immunity.

Ixodes ricinus, from right to left: Adults (female and male), nymph, larva. Photo: Fedor Gassner, Wageningen Universiteit

How common is TBE?

TBE occurs in temperate regions of Europe and Asia, which extends from western France to northern Japan. The different types of TBE and the ticks that transmit them overlap in Eastern Europe (see map). The ticks are most active in warm, moist conditions; therefore, there are two peaks of disease in Central Europe: May/June and September/October. In cooler climates, there is a single summer peak. The countries most heavily impacted by TBE include Austria, Belarus, the Czech Republic, Estonia, Germany, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovenia, Slovakia, Sweden, Switzerland, and the Ukraine. Latvia has the highest incidence rate of TBE in the world while Russia reports the largest number of cases at several thousand per year. The reliability of reporting varies, and overall, the disease is thought to be under-reported. Personnel who spend extended periods of time outdoors for work or recreation, including hunters, forest workers, and military personnel, are at the greatest risk of tick bites and TBE.



Blue-shaded areas represent areas at risk for TBE. Adapted from Linquist, L and O Vapalahti. "Tick-borne Encephalitis." The Lancet, 371(2008):1861-71.

What are the symptoms of TBE?

The incubation period for TBE is usually 4-28 days. The disease then progresses in a biphasic (two-phase) pattern. The initial, mild phase (known as the viremic phase) lasts 2-4 days and is marked by general flu-like symptoms that may include fever, headache, fatigue, muscle aches, nausea, vomiting, and general malaise. After an asymptomatic (symptom-free) period of about 8 days, the second phase (known as the neurologic phase) occurs in 20-30% of patients and involves the central nervous system. These symptoms are more severe, and are characterized by meningitis (inflammation of the membranes that surround the brain and spinal cord), resulting in high fever, severe headache, stiff neck, encephalitis (inflammation of the brain, resulting in drowsiness, confusion, sensory disturbances, and/or motor abnormalities such as paralysis), or meningoencephalitis (a combination of both conditions). The European form of TBE tends to be milder than the Far Eastern subtypes, with a mortality rate of less than 2%. Mortality rates as high as 20-40% have been reported during some outbreaks of the Far Eastern subtype. TBE symptoms are more severe in older populations of people.

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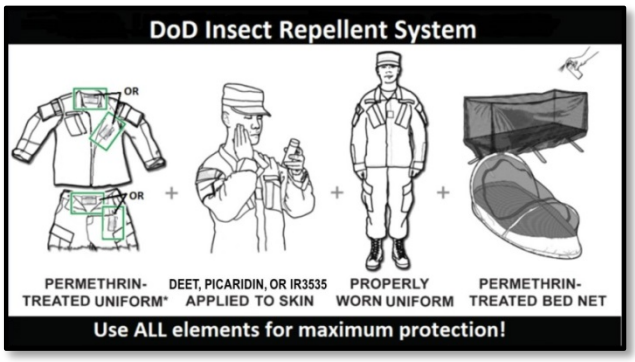
How is TBE treated?

There is no specific drug therapy for TBE. Meningitis, encephalitis, and meningoencephalitis require hospitalization and supportive care based on the severity of the symptoms.

How can TBE be prevented?



A vaccine is available in some disease-endemic countries, but not in the United States. Avoid tick habitat (tall grass and weeds, scrubby areas, woods and leaf litter). Using the DoD Insect Repellent System provides the best protection from ticks. It incorporates permethrin repellent on the uniform; DEET, picaridin or IR3535® repellent on exposed skin; a properly worn uniform; and sleeping inside a permethrin-treated bed net.

How do I know if my uniform is treated with permethrin repellent?

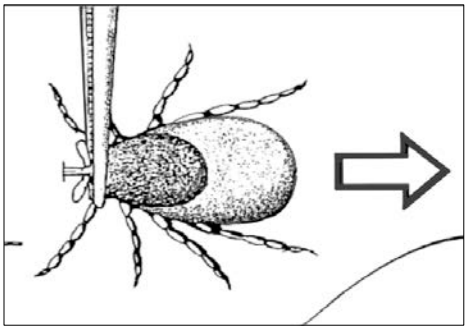
Factory-treated permethrin Army Combat Uniforms (ACUs) and Operational Camouflage Pattern (OPC) uniforms are now available to all Soldiers. The ACU/OCP trouser and coat will have a sewn-in label indicating the uniform is factory-treated with permethrin. If not factory-treated, Soldiers can permanently treat their uniforms with the IDA kit (NSN 6840-01-345-0237), which can last up to 50 washings, or temporarily treat using the 0.5% aerosol spray can (NSN 6840-01-278-1336), which can be reapplied after 6 weeks and the sixth washing. Never retreat uniforms that have been factory-treated, treated with an IDA kit, or treated using a 2-gallon sprayer. When applying permethrin, always read and follow the label directions. Permanently mark the uniform label with the permethrin treatment date. NEVER APPLY PERMETHRIN TO THE SKIN! Civilians can purchase commercially available 0.5% permethrin aerosol products and permethrin factory-treated clothing.

What standard military insect repellent products are available for exposed skin?

Approved military insect repellents for use on exposed skin come in a variety of formulations. Always refer to the label to determine frequency of repellent application based on activity. **Do not apply repellent to eyes, lips, or to sensitive or damaged skin.** Available military repellents are:

- Ultrathon™ (NSN 6840-01-284-3982) contains 34% controlled-release DEET lotion; one application protects for up to 12 hours.
- Ultra 30™ Insect Repellent Lotion (NSN 6840-01-584-8393) contains 30% Lipo DEET; one application protects for up to 12 hours.
- Cutter® pump spray (NSN 6840-01-584-8598) contains 25% DEET; one application protects for up to 10 hours.
- Natrapel® pump spray (NSN 6840-01-619-4795) contains 20% picaridin; protects for up to 8 hours.
- Bullseye™ Bug Repellant pump spray (NSN 6840-01-656-7707) contains 20% IR3535®; protects for up to 8 hours.

What is considered a "properly worn" combat uniform?



Military combat uniforms act as a physical barrier against insects, ticks and other disease transmitters and biting nuisance pests when worn properly. Wear uniforms with the sleeves rolled down; tuck pants into boots and undershirt into pants. A permethrin-treated uniform does not protect exposed skin. Protect exposed skin with an approved insect repellent.

What do I do if a tick is biting me?

Removing ticks promptly is the best way to reduce exposure to tick-borne diseases. Unattached ticks can be removed and do not present a threat by crawling on you. See the picture to the right about effectively removing an embedded tick from your skin. You can also visit PHC (How to Remove Attached Ticks https://www.youtube.com/watch?v=3b137ceSZ_s) and http://www.tickencounter.org/ for more information and to see a video about tick removal. Ticks removed from military personnel, their dependents, or DOD Civilians can be turned in for identification and disease testing through the Army Public Health Center's DoD Human Tick Test Kit Program: http://phc.amedd.army.mil/topics/envirohealth/epm/Pages/HumanTickTestKitProgram.aspx

References:

Centers for Disease Control and Prevention: https://www.cdc.gov/vhf/tbe/index.html
ECDC: https://ecdc.europa.eu/en/tick-borne-encephalitis