

Eastern equine encephalitis

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Background

Eastern equine encephalitis (EEE) is a viral condition caused by the Eastern equine encephalitis virus (EEEV). This virus, which is from the same genus as the [Chikungunya virus](#), was first isolated in the United States in 1933. The first human case of EEE was identified in Massachusetts in 1938.

It normally circulates between mosquitoes and wild birds. Occasionally, the mosquitoes can pass the virus on to people or horses. EEE does not spread from person to person or from horses to people. Transmission through organ transplantation has been documented as well.

EEE occurs mainly in the eastern and Gulf Coast states of the US and around the Great Lakes, as well as part of eastern Canada and the Caribbean. Around 11 cases in the US are reported each year. Most infections happen between late spring and early autumn, when mosquitoes are most active. In Gulf Coast states, however, transmission can occur year-round.

What are the symptoms of EEE?

Symptoms usually appear 4 to 10 days after being bitten by an infected mosquito and initially include:

- Fever
- Headache
- Nausea
- Vomiting
- Fatigue
- Muscle and joint pain

Neurological symptoms usually appear a few days later and include:

- Altered mental state
- Photophobia (increased intolerance to light)
- Seizures
- Paralysis
- Loss of consciousness
- Coma

How is it diagnosed?

It is usually diagnosed by a combination of the person's symptoms, a history of possible mosquito exposure, and laboratory tests. The tests may include:

- Blood and cerebrospinal fluid (CSF) tests. CSF is the fluid surrounding the brain and spinal cord and is collected via a lumbar puncture (LP). The main test looks for IgM antibodies against EEEV. A positive result is usually confirmed with a more specific test called a plaque reduction neutralisation test (PRNT).
- Molecular testing (PCR). This detects the genetic material of the virus in the CSF, blood or tissue samples (a tissue sample is a group of similar cells that work together to perform a specific job in your body). Because the virus is only present for a short time, a negative result does not necessarily rule out EEE.
- Brain imaging (MRI). An MRI scan may show changes in areas of the brain such as the basal ganglia, thalamus, and brainstem, which are commonly affected by EEE. Early thalamic and basal ganglia involvement on MRI can help distinguish EEE from [herpes simplex encephalitis](#).
- Electroencephalogram (EEG). This records the brain's electrical activity and can help detect seizure activity or brain dysfunction.

How is it treated?

There is currently no specific antiviral treatment for EEE. Treatment therefore focuses on supportive care which aims to manage symptoms while the body fights the infection. People with severe illness such as encephalitis are usually treated in hospital, often in an intensive care unit.

Supportive care may include:

- Medication to reduce fever and relieve pain.
- Intravenous fluids to prevent dehydration.
- Anti-seizure medications.
- Treatments to reduce swelling and pressure in the brain.
- Breathing support, such as a ventilator, if the person cannot breathe adequately on their own.

Some doctors consider [intravenous immunoglobulin \(IVIG\)](#) but there is no good evidence that it improves outcomes.

If the person becomes stable, rehabilitation can begin, and can involve physiotherapy, occupational therapy, speech and language therapy, and neuropsychological support to help with recovery.

What are the outcomes?

Most people infected with EEEV do not develop symptoms, and some experience only a mild, flu-like illness. However, when the virus causes encephalitis, it is one of the most severe mosquito-borne conditions.

While dependent on age, mortality (death) rate of EEE is around 30%, with the most severity associated with young children and the elderly. Death often occurs within 2 to 10 days of neurological symptoms appearing.

Around half of survivors experience long-term neurological complications that can range from minor to severe. These may include:

- Problems with memory, concentration, and thinking.
- Changes in personality and behaviour.
- Ongoing seizures (epilepsy).
- Paralysis or weakness.
- Problems with speech or swallowing.

Some survivors need long-term care, and those with severe brain damage may have a reduced life expectancy. Recovery can take months or years.

Ongoing rehabilitation and support can make a significant difference to the quality of life.

Can it be prevented?

There is no vaccine for humans. EEE is preventable only by avoiding mosquito bites.

Preventing mosquito bites:

- Use N,N-Diethyl-m-toluamide (DEET) mosquito repellent, especially from dusk to dawn. It is recommended to use concentrations up to 50% (the higher the concentration, the longer the length of protection). It is safe to use in pregnancy and breastfeeding and in children older than two months.
- Wear long-sleeved clothing which may be treated with mosquito-repellent (permethrin).
- Sleep in rooms with air-conditioning and houses with mosquito screens on the windows and doors.
- Take extra care during the mosquito season. Consider limiting outdoor activities at peak mosquito times, particularly between late spring and early autumn in areas where EEE occurs.

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