Kaplan USMLE Step 1: What has infected this pet shop owner?

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If you're preparing for the United States Medical Licensing Examination® (USMLE®) Step 1 exam, you might want to know which questions are most often missed by test-prep takers. Check out this example from Kaplan Medical, and read an expert explanation of the answer. Also check out all posts in this series.

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This month's stumper

A 45-year-old man comes to the emergency department because of a headache, nausea and a stiff neck. The patient reports having had flu-like symptoms, nausea, and weakness with a fever, which lasted for two weeks prior to his present condition. He has no past medical history.

The patient is a pet shop owner that specializes in breeding and selling hamsters and mice. His temperature is 38.3 °C (101 °F), pulse is 110 beats per minute, blood pressure is 108/65 mmHg, respirations are 20 breaths per minute, and O2 saturation is 93% on room air. Physical examination shows the patient appears drowsy, has positive Kernig and Brudzinski signs, intact deep tendon reflexes, and generalized muscle weakness.

Laboratory studies show:

- Alanine aminotransferase (ALT, SGPT): 52 U/L.
- Aspartate aminotransferase (AST, SCOT): 68 U/L.
- Platelet count, blood: 98,000/mm^3.
- Leukocyte count: 3,800/mm^3.

Analysis of cerebrospinal fluid shows:

- Cell count: 18/mm^3.
- Glucose: 38 mg/dL.
- Pressure: 190 mm H_2O.
- Protein: 58 mg/dL.

This patient’s clinical presentation is best explained by infection with which of the following agents?

A. Cytomegalovirus.

B. Hantavirus.

C. Lymphocytic choriomeningitis virus.

D. Powassan virus.

E. Rabies virus.

F. Western equine encephalitis virus.

The correct answer is C.

Kaplan Medical explains why

The patient is presenting with signs and symptoms of lymphocytic choriomeningitis (LCM). LCM is a rodent-borne viral infectious disease caused by lymphocytic choriomeningitis virus (LCMV), a member of the family *Arenaviridae.* The primary host of LCMV is the common house mouse. Other types of rodents such as hamsters (not natural reservoirs) can become infected with LCMV from wild mice at the breeder, pet store, or home environment.

The onset of symptoms usually occurs eight to 13 days after exposure to the virus as part of a biphasic febrile illness. The initial phase, which may last as long as a week, typically begins with any or all of the following symptoms: fever, malaise, lack of appetite, muscle aches, headache, nausea, and vomiting. Following a few days of recovery, a second phase of illness may occur.

Symptoms may consist of meningitis (for example, fever, headache, stiff neck), encephalitis (drowsiness, confusion, sensory disturbances or motor abnormalities such as paralysis), or meningoencephalitis. It has also been known to cause acute hydrocephalus.

During the first phase of the disease, the most common laboratory abnormalities are leukopenia and thrombocytopenia. Liver enzymes in the serum may also be mildly elevated. After the onset of neurological disease during the second phase, an increase in protein levels, an increase in the number of white blood cells, or a decrease in the glucose levels in the cerebrospinal fluid is usually found.

Aseptic meningitis, encephalitis, or meningoencephalitis requires hospitalization and supportive treatment based on severity. Although studies have shown that ribavirin is effective against LCMV in vitro, there is no established evidence to support its routine use for the treatment of LCM in humans.

Why the other answers are wrong

Choice A: Cytomegalovirus (CMV) is not transmitted by rodents; it has a human reservoir and is transmitted via saliva, sexual contact, parenteral, or in utero. It will cause mononucleosis (negative Monospot) in immunocompetent patients, infection in immunocompromised (especially pneumonia in transplant patients), esophagitis, AIDS retinitis (“sightomegalovirus”) and congenital CMV.

Choice B: Hantavirus is transmitted via rodent feces, but it will not cause meningitis. Patients with hantavirus present with pulmonary syndrome (cough, myalgia, dyspnea, tachycardia, pulmonary

edema and effusion), and hypotension.

Choice D: Powassan virus is spread to people by the bite of an infected groundhog, squirrel or deer tick, not by exposure to rodents. Many people infected with the Powassan virus are asymptomatic. For those who develop symptoms, the time from tick bite to feeling sick ranges from one week to one month. Initial symptoms can include fever, headache, vomiting, and weakness. Powassan virus can cause severe disease, including encephalitis or meningitis. Symptoms of severe disease include confusion, loss of coordination, difficulty speaking, and seizures.

Choice E: Rabies virus infection is more commonly from bat, raccoon, and skunk bites than from dog bites in the United States; aerosol transmission (for example, bat caves) is also possible. Rodents are very rarely infected with rabies and have not been known to transmit rabies to humans.

Choice F: Western equine encephalitis virus is an arbovirus of the genus *Alphavirus*, family *Togaviridae*, which circulates in North America between birds and mosquitoes, occasionally causing disease in humans and horses.

Symptoms develop between five and 15 days after being bitten by infected mosquitoes. Most people are asymptomatic or develop mild symptoms, characterized by fever and headache. The symptoms of severe disease can include headache, high fever, neck stiffness, confusion, coma, shaking, seizures and paralysis. The risk of severe disease increases in older people.

Tips to remember

- The patient is presenting with signs of lymphocytic choriomeningitis; a rodent-borne viral infectious disease caused by lymphocytic choriomeningitis virus, a member of the Arenaviridae family.
- LCMV causes a biphasic febrile illness. The first phase begins eight to 13 days after exposure to the virus.
- Following a few days of recovery, a second phase of illness may occur. Symptoms may consist of meningitis, encephalitis and hydrocephalus.

For more prep questions on USMLE Steps 1, 2 and 3, view other posts in this series.