



Lymphocytic Choriomeningitis

Fact Sheet

What is lymphocytic choriomeningitis?

Lymphocytic choriomeningitis, or LCM, is a rodent-borne viral infectious disease that presents as aseptic meningitis (inflammation of the membrane, or meninges, that surrounds the brain and spinal cord), encephalitis (inflammation of the brain), or meningoencephalitis (inflammation of both the brain and meninges). Its causative agent is the lymphocytic choriomeningitis virus (LCMV), a member of the family Arenaviridae, that was initially isolated in 1933. Although LCMV is most commonly recognized as causing neurological disease, as its name implies, asymptomatic infection or mild febrile illnesses are common clinical manifestations. Additionally, pregnancy-related infection has been associated with abortion, congenital hydrocephalus and chorioretinitis, and mental retardation.

Where is the disease found?

LCM and milder LCMV infections have been reported in Europe, the Americas, Australia, and Japan, and may occur wherever infected rodent hosts of the virus are found. However, the disease has historically been underreported, often making it difficult to determine incidence rates or estimates of prevalence by geographic region. Several serologic studies conducted in urban areas have shown that the prevalence of LCMV infection among humans ranges from 2% to 10%.

How is LCMV spread, and how do humans become infected?

LCMV is naturally spread by the common house mouse, *Mus musculus*. Once infected, these mice can become chronically infected by maintaining virus in their blood and/or persistently shedding virus in their urine, a common characteristic of other arenavirus infections in rodents. Chronically infected female mice usually transmit infection to their offspring, which in turn become chronically infected.

Humans become infected by inhaling infectious aerosolized particles of rodent urine, feces, or saliva, by ingesting food contaminated with virus, by contamination of mucous membranes with infected body fluids, or by directly exposing cuts or other open wounds to virus-infected blood. LCMV infection has also been documented among staff handling infected hamsters. Person-to-person transmission has not been reported, with the exception of vertical transmission from an infected mother to fetus.

What are the symptoms of LCM?

The incubation period of LCMV infection is usually between 8 and 13 days. A characteristic biphasic febrile illness then follows. The initial phase, which may last as long as a week, typically begins with any or all of the following symptoms: fever, malaise, anorexia, muscle aches, headache, nausea, and vomiting. Other symptoms that appear less frequently include sore throat, cough, joint pain, chest pain, testicular pain, and parotid (salivary gland) pain. Following a few days of remission, the second phase of the disease occurs, consisting of symptoms of meningitis (for example, fever, headache, and a stiff neck) or characteristics of encephalitis (for example, drowsiness, confusion, sensory disturbances, and/or motor abnormalities, such as paralysis). LCMV has also been known to cause acute hydrocephalus, which often requires surgical shunting to relieve increased intracranial pressure. In rare instances, infection results in myelitis (inflammation of the spinal cord) and presents with symptoms such as muscle weakness, paralysis, or changes in body sensation. An association between LCMV infection and myocarditis (inflammation of the heart muscles) has been suggested.

During the first phase of the disease, the most common laboratory abnormalities are a low white blood cell count (leukopenia) and a low platelet count (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 (CSF) is usually found.

Are there any complications after recovery?

Previous observations have shown that most patients who develop aseptic meningitis or encephalitis due to LCMV recover completely. No chronic infection has been described in humans, and after the acute phase the virus is cleared. However, as in all infections of the central nervous system, particularly encephalitis, temporary or permanent neurological damage is possible. Nerve deafness and arthritis have been reported. Infection of the human fetus during the early states of pregnancy may lead to developmental deficits that are permanent.

Is the disease ever fatal?

LCMV is usually not fatal. In general, mortality is less than 1%.

How is LCMV treated?

Aseptic meningitis, encephalitis, or meningoencephalitis requires hospitalization and supportive treatment based on severity. There is no specific drug therapy for LCMV. Anti-inflammatory drugs, such as corticosteroids, may be considered under specific circumstances. Although studies have shown that ribavirin, a drug used to treat several other viral diseases, is effective against LCMV *in vitro*, there is no established evidence to support its use for treatment of LCMV in humans.

Who is at risk for LCMV infection?

Individuals of all ages who come into contact with urine, feces, saliva, or blood of the house mouse are potentially at risk for infection. Laboratory workers who themselves handle infected animals are also at risk. However, this risk can be minimized by utilizing animals from sources that regularly test for the virus, wearing proper protective laboratory gear, and following appropriate safety precautions. Owners of pet mice or hamsters may be at risk for infection if these animals originate from colonies with circulating LCMV, or if the animals become infected from other wild mice. Human fetuses are at risk of acquiring infection vertically from infected maternal blood.

How can LCMV infections be prevented?

Like many other rodent-borne infectious diseases, LCMV infection can be prevented by avoiding or minimizing direct physical contact with rodents or exposure to their excreta. Adequate ventilation should be provided to any heavily infested, previously unventilated enclosed room or dwelling prior to cleanup. A liquid disinfectant, such as a diluted household bleach solution, should be applied to visible rodent droppings and their immediate surroundings. Gloves should be worn when disinfecting and cleaning up rodent excreta. Rodent spring traps may be set up in households or dwellings where rodent infestations are a concern.

What needs to be done to address the threat of LCMV?

The geographic distributions of the rodent hosts are widespread both domestically and abroad. However, infrequent recognition and diagnosis, and therefore underreporting, of LCMV, have limited scientists' ability to estimate incidence rates and prevalence of disease among humans. Understanding the epidemiology of LCMV and LCMV infections will help to further delineate risk factors for infection and develop effective preventive strategies. Increasing physician awareness will improve disease recognition and reporting, which may lead to better characterization of the natural history and the underlying immunopathological mechanisms of disease, and stimulate future therapeutic research and development.

Suggested Reading:

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