

Notes from the Field

Lymphocytic Choriomeningitis Virus Meningoencephalitis from a Household Rodent Infestation — Minnesota, 2015

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On April 20, 2015, a female aged 15 years sought care at her pediatrician's office after 5 days of fever, myalgia, left parietal headache, and photophobia. A rapid influenza assay was negative, and erythrocyte sedimentation rate and total white blood cell count were normal. She improved with symptomatic care at home, but returned to her pediatrician's office on April 28, reporting recurrence of her headache and photophobia and new onset of a stiff neck. She was admitted to the hospital, where she was febrile to 102.9°F (39.4°C) and had meningismus. Computed tomography scan of her head was normal, and a cerebrospinal fluid (CSF) analysis showed a markedly elevated white blood cell count with 68% lymphocytes, low glucose, and a negative Gram stain. She was treated empirically for both bacterial and herpes simplex virus meningitis. The patient's hospital course was notable for hypotension (blood pressure 81/50), irritability, and pancreatitis with a peak lipase of 8,627 U/L. CSF cultures yielded no growth, and CSF polymerase chain reaction (PCR) testing for herpes simplex virus was negative. Nucleic acid amplification testing, acid-fast bacilli stain, and acid-fast bacilli cultures of CSF were negative for *Mycobacterium tuberculosis*. Results of investigations for human immunodeficiency virus, syphilis, Lyme disease, human herpesvirus 6 and 7, and species of *Babesia*, *Toxoplasma*, *Histoplasma*, *Cryptococcus*, *Blastomyces*, and *Brucella* were negative. She recovered and was discharged on hospital day 11 with no apparent sequelae.

The case was reported to the Minnesota Department of Health's Unexplained Critical Illnesses and Deaths Project,* which provides testing for cases that appear likely to have infectious etiologies although usual laboratory assays do not identify an etiologic agent; specimens collected during the hospitalization were submitted. Serum collected on hospital day 4 was reported to be positive for lymphocytic choriomeningitis virus (LCMV) antibody by immunofluorescence assay at a commercial reference laboratory (Table). CDC's Viral Special Pathogens Branch was consulted because of the uncommon diagnosis and to determine whether this illness represented acute infection. Serologic testing by enzyme-linked immunosorbent assay at CDC showed an immunoglobulin M titer of >1/6,400, consistent with recent infection (Table).

* <http://www.health.state.mn.us/divs/idepc/dtopics/unexplained/index.html>.

The Minnesota Department of Health initiated an investigation to identify the source of infection, determine whether additional persons were at risk, and develop recommendations to prevent additional cases. A recently ill family member tested negative for LCMV antibody. No pregnant women resided in the duplex apartment. The family had reported a rat infestation to the treating medical team during hospitalization; subsequent home inspection by a Minnesota Department of Health investigator revealed mouse droppings in the kitchen pantry. The fecal pellets tested positive for LCMV (1) by PCR, implicating the mouse infestation as the likely source of the patient's infection. A 2006 case report from Michigan identified household rodents as the source of a human LCMV infection, which was confirmed through necropsy, serology, and tissue testing of trapped mice; fecal pellet testing in that case was negative for LCMV (2). This is the first report to identify LCMV-infected mice through fecal pellet testing.

The family was referred for integrated pest management services through the U.S. Department of Housing and Urban Development Healthy Homes program. The city housing inspector performed an urban rodent survey, and the property owner complied with orders to have professional exterminators treat the apartment within 30 days. Both households in the duplex were provided with educational materials concerning prevention of rodent reinfestation.

In the United States, an etiologic agent is identified in <50% of meningoencephalitis cases (3); some undiagnosed cases might be caused by LCMV. LCMV is a virus of the *Arenaviridae* family; its primary host is the house mouse, *Mus musculus*. The disease burden in humans is unknown; an estimated 5% of U.S. house mice carry LCMV (4). Human infection occurs by inhalation of aerosolized urine and droppings of infected rodents (5). The virus is a fetal teratogen, and transplacental vertical transmission with severe effects on infants has been described (6); infection after solid organ transplant (7–9) also have been reported.

This investigation suggests fecal pellet testing as a possible first step in an environmental LCMV investigation when rodent trapping and conducting necropsy for diagnostics are difficult or impractical. Public health action around home rodent infestation might be warranted when LCMV infections in households are detected. Collaboration among clinicians, public health investigators, and local housing authorities can facilitate integrated pest management to decrease the risk for LCMV infection.

TABLE. Laboratory findings associated with lymphocytic choriomeningitis virus (LCMV) infection in a patient with meningoencephalitis, by specimen collection date — Minnesota, April–August 2015

| Clinical specimen/Laboratory test | Reference range | Collection date | | | | |
|---|-----------------|-----------------|----------------|-------|----------------|----------------|
| | | April 28 | May 2 | May 4 | May 21 | August 6 |
| Cerebrospinal fluid | | | | | | |
| White blood cells/ μ L | 0–10 | 1,287 | — | 688 | — | — |
| Red blood cells/ μ L | 0–10 | 108 | — | 1,186 | — | — |
| Lymphocytes (%) | <70 | 68 | — | 89 | — | — |
| Glucose (mg/dL) | 45–80 | 36 | — | 26 | — | — |
| Protein (mg/dL) | 15–40 | 94 | — | 150 | — | — |
| Serum | | | | | | |
| LCMV IgM antibodies (IFA)* | <1:10 | — | 1:40 | — | 1:20 | — |
| LCMV IgG antibodies (IFA)* | <1:10 | — | 1:1,280 | — | 1:2,560 | — |
| LCMV IgM antibodies (ELISA [†]) | <1/100 | — | \geq 1/6,400 | — | \geq 1/6,400 | \geq 1/6,400 |
| LCMV IgG antibodies (ELISA [†]) | <1/100 | — | <1/100 | — | <1/100 | \geq 1/400 |

Abbreviations: ELISA = enzyme-linked immunosorbent assay; IFA = immunofluorescence assay; IgG = immunoglobulin G; IgM = immunoglobulin M.

* Commercial reference laboratory.

[†] CDC Viral Special Pathogens Branch laboratory.

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