LYMPHOCYTIC CHORIOMENINGITIS THREAT IN OHIO PET RODENTS
DIRECTOR'S JOURNAL ENTRY REPORT
January 12, 2006

Background

In May, 2005 the Centers for Disease Control and Prevention (CDC) received reports of severe illness in four organ recipients who received either lungs, kidneys or a liver from a common donor (Appendix 1). Three of the recipients died and one recovered. The transplant recipients were later found to be infected with lymphocytic choriomeningitis virus (LCMV). Two other patients received corneas from the donor, but were asymptomatic. The organ donor was a Rhode Island woman who died of a stroke. She owned a hamster which tested positive for LCMV, the same strain as that found in the organ recipients. A person in the donor's home who cared for the hamster was also positive for LCMV, although he did not become ill. Organs for donation are not routinely screened for LCMV.

The organ donor's hamster was purchased at a local PetSmart in Rhode Island. Fifty-six hamsters and eight guinea pigs were collected from the store. Because testing on live animals is not reliable, the animals were humanely euthanized and tested by CDC for LCMV. Three of the 56 hamsters were LCMV positive. One of these was the donor's black-bear hamster. Of the eight guinea pigs, one was LCMV positive.

LCMV is naturally occurring and has been found in wild mouse populations. Prevalence in wild mice in the U.S. is approximately 5% (Appendix 2). Pet rodents can become infected when they have contact with infected wild rodents. People who are exposed to infected pets or wild rodents, their waste or their bedding can become infected. LCMV does not usually affect healthy individuals. However, pregnant women and immunocompromised individuals may be at risk. Pregnant women may also transfer the virus to their fetuses, resulting in miscarriage or birth defects (Appendix 3). Signs and symptoms of LCMV infection may include: mild febrile illness, headache, chills, muscle aches, aseptic meningitis, and encephalitis. Asymptomatic infections are common in healthy individuals. There is no specific treatment.

The Ohio Department of Health (ODH) became involved in this investigation June 1, 2005 when it was determined that all the rodents at the Rhode Island PetSmart were supplied by one distributor, Mid-South Distributors. Their facility is located at 7524 East Pike near Zanesville in Muskingum County, Ohio. Mid-South operates not only the distribution facility in Ohio but also a large breeding facility in Arkansas. Rodents from the Arkansas facility, along with rodents from other small breeding facilities, converge at Mid-South Ohio for distribution to pet shops in several northeastern and midwestern states. CDC wanted to identify the source of the LCMV by testing animals from both Mid-South facilities.

Because the ability to investigate Mid-South in Arkansas was limited, CDC requested permission to begin the investigation in Ohio. Pursuant to Ohio Revised Code 3701.14,

on June 16, 2005, the Director of Health determined an investigation was needed and filed a Director's Journal Entry. This entry declared LCMV a risk to public health and authorized an investigation to evaluate the presence of LCMV in the Mid-South Ohio facility and to take prompt action to control and suppress it (Appendix 4). ODH requested the assistance of the Ohio Department of Agriculture (ODA) because ODA enforces rules regarding the health of animals coming into Ohio. ODA declared LCM a dangerously contagious and infectious disease (Appendix 5) which gave them authority to test animals and to quarantine facilities.

In addition to ODH, ODA, CDC, and the United States Department of Agriculture, Animal Plant Health and Inspection Service, Animal Care (USDA) was involved in an ongoing investigation of animal care violations. Also, OSHA had recently completed an investigation as a result of worker complaints.

Findings

An unannounced inspection was made very at the Mid-South Ohio facility on July 18, 2005 (Appendix 6). Ten staff representing ODH, ODA, CDC, USDA, and the Muskingum County Health Department and Sheriff's office were present. The premises were immediately placed under quarantine and no animals were permitted to enter or leave the facility.

Based on CDC recommendations for a statistically significant sample, 100 rodents from the general population were collected and euthanized for LCMV testing. Of these, 30 were black bear hamsters and 70 were short-haired hamsters. An additional 28 animals that were considered sick, were dead, or had escaped from their cages were also collected for testing. These animals included hamsters, mice and a guinea pig.

The night before the inspection, several vans brought shipments of young rodents from the Mid-South Arkansas breeding facility. These animals were placed in containers in the Mid-South Ohio general population room, separate from the existing population. Twenty-four animals were sampled from this room. At the time of the inspection, these vans had already left Mid-South Ohio loaded with pet rodents bound for pet shops in six states: Connecticut, New York, New Jersey, Pennsylvania, Massachusetts, and Vermont. Because these vans were affected by the quarantine, ODH and ODA contacted their counterparts in those states to inform them that animals from a facility under quarantine were about to enter their state. Each state had to determine which agency, agriculture or health, had primary authority and had to decide how to handle the animals once they arrived. Some states quarantined or euthanized the entire shipment. Others chose to allow the pet shops to keep the animals alive but off the sales floor until CDC completed testing of the 100 Mid-South rodents. If all the tested animals at CDC were negative, this would indicate that the animals at the pet shop were probably not infected.

Because human health was the primary focus of ODH's investigation, ODH, with assistance from CDC, developed an extensive questionnaire for workers in the event that there was a need to pursue this further (Appendix 7). Mid-South workers were asked if

they felt ill or had been sick since working there. All who were asked claimed they had no health problems and had not been sick since working at Mid-South.

ODH was later contacted by two former Mid-South workers regarding their belief that their current illnesses might be the result of LCMV. Both were directed to their private physicians for evaluation and blood testing. One of the workers, who had not worked for Mid-South in over a year, reported back to ODH. This worker's serology was compatible with a past exposure but not current infection with LCMV. This does not necessarily mean that the person was exposed at Mid-South, because other environmental exposures to LCMV during a lifetime are possible.

CDC confirmed that about 3% of the Ohio Mid-South hamsters were positive for LCMV. Some of these animals had arrived directly from the Arkansas breeding facility just hours before they were collected for testing in Ohio. The fact that these animals tested positive indicates that they were infected at the breeding facility.

Conclusions

- Mid-South Ohio was the distributor of the hamster purchased in Rhode Island that was linked to the infection and death of several organ transplant recipients.
- Mid-South Ohio harbored animals that carried LCMV.
- At least some of the infected animals at Mid-South Ohio were infected at the breeding facility at Mid-South Arkansas.
- Because LCMV easily spreads among rodents, infected animals were probably transmitting the infection amongst themselves at Mid-South Ohio.
- Pet rodents potentially infected with LCMV should not be sold to the public.
- Pet rodents that are already in homes are of minimal risk to owners and should not be tested for LCMV, but precautions should be taken to minimize risk to humans (Appendix 8).
- There were no verifiable reports of any people in Ohio with active LCM infections linked to this facility.

Recommendations

To stop the spread of LCMV infection in rodents:

- All animals at Mid-South Ohio should be humanely euthanized immediately and the facility cleaned and sanitized before allowing any more animals back into the building.
- Mid-South should abide by importation rules and get appropriate permits and veterinary certificates in the future before shipping any animals out of state.
- Mid-South should develop and implement animal biosecurity measures to prevent infection of animals with LCMV. Paramount is keeping wild rodents from mixing with domestic pet stock.

- To get the quarantine removed from the facility, Mid-South Ohio must prove that they are keeping good records and they are testing a certain percentage of their animals for disease.

To prevent LCMV infection in humans:

CDC issued interim guidelines to prevent the spread of LCMV to humans (Appendix 9).

- Stop rodent infestations in or around your home by sealing entry holes, trapping and killing wild rodents, and removing rodent food sources and nesting areas. (Appendix 10).
- Purchase only healthy rodents as pets.
- Do not kiss pet rodents or put them against your face.
- Always wash your hands after handling a pet rodent, cleaning its cage.
- If you are pregnant or immunocompromised, you should not own or care for pet rodents.
- Pet stores should provide educational materials to new pet rodent owners on preventing LCMV and other zoonotic diseases from rodents.

If people feel they may have been exposed to LCMV, or feel they show symptoms of LCM, they should consult with their doctor. Only a blood test can show if someone is infected with LCMV.

Industry Control Measures

As a result of these events, the nation's two largest pet retailers, PetSmart and PetCo, voluntarily stopped the sale of all pet rodents received from Mid-South over the six months preceding the positive test results. Four states - Vermont, Massachusetts, New Jersey and Michigan - issued stop-sale or quarantine orders for pet rodents supplied by Mid-South. Both PetSmart and PetCo ceased doing business with Mid-South. The Pet Industry Joint Advisory Council (PIJAC) issued a warning to all pet stores about the potential for LCMV infection in rodents (Appendix 11).

The CDC issued recommendations related to pets supplied by Mid-South (Appendix 12). Three options were provided: 1) stop sale or distribution of all rodents originating from Mid-South; 2) stop sale or distribution of hamsters and guinea pigs from Mid-South; or 3) Allow sale or adoption of rodents provided appropriate educational material is given to the purchaser.

All animals at the Mid-South Ohio facility were humanely euthanized. In accordance with the ODA Proclamation (Appendix 13), the facility was cleaned and sanitized and the quarantine was lifted on November 29, 2005 (Appendix 14). The facility has not reopened.

The Mid-South breeding facility in Arkansas was quarantined by Arkansas state authorities in August. The owner voluntarily euthanized all hamsters and guinea pigs. Approximately 450 animals from Arkansas were sent to CDC for LCMV testing. Results may be available by late January 2006. USDA also suspended the breeder's license.

CDC is working with the medical community to disseminate information on LCMV, especially to those who serve pregnant and immunocompromised patients. CDC is also finalizing MOU's with PETCO, one of the largest pet distributors in the U.S., and the Pet Industry Joint Advisory Council (PIJAC) to create educational material on zoonotic diseases related to the pet industry. This partnership will allow CDC and PIJAC to combine efforts in educating a large audience of pet industry stakeholders including, but not limited to: breeders, distributors, retail establishments and owners.

Appendices

1) MMWR LCMV Infection in Organ Transplant Recipients, May 2005
2) CDC LCMV Fact Sheet
3) CDC LCMV, Pregnancy and Birth Defects: October, 2005
4) ODH Director's Journal Entry: June 16, 2005
5) ODA Executive Order 2005-158: June 13, 2005
6) Mid-South Distribution Facility Inspection Report: July 18, 2005
7) LCMV worker survey: July 2005
8) CDC Information for Pet Owners
9) MMWR Interim Guidance for Minimizing Risk for Human LCMV Infection Associated with Rodents July, 2005
10) CDC Prevent LCM from Wild Rodents
11) PIJAC warning
12) MMWR Update Interim Guidance for Minimizing Risk for Human LCMV Infection Associated with Pet Rodents August, 2005
13) ODA Proclamation: August 12, 2005
14) ODA Quarantine removed Nov 29, 2005

Lymphocytic Choriomeningitis Virus Infection in Organ Transplant Recipients --- Massachusetts, Rhode Island, 2005

On May 3, 2005, CDC received a report of severe illness in four patients who had received solid organ transplants from a common donor. All four organ recipients subsequently were found to have evidence of infection with lymphocytic choriomeningitis virus (LCMV), a rodent-borne Old World arenavirus. Preliminary findings from the ensuing investigation indicate the source of infection likely was an infected hamster in the donor's home. This report summarizes the ongoing investigation and provides information on exposure risks and possible prevention measures.

In early April, in Rhode Island, a woman with a medical history remarkable only for hypertension and 1 week of headache had sudden onset of hemiplegia caused by a stroke, followed by brainstem herniation and brain death within 3 days. A thorough evaluation was not suggestive of infection.

Family members of the woman consented to donation; organs and tissues were recovered, including the liver, the lungs, both kidneys, both corneas, and skin. Within 3 weeks after transplantation, the four persons who received the liver, lungs, and two kidneys had abnormalities of liver function and blood coagulation, and dysfunction of the transplanted organ. Signs, symptoms, and clinical laboratory test results varied in these patients and included fever, localized rash, diarrhea, hyponatremia, thrombocytopenia, hypoxia, and kidney failure. Three of the four organ recipients died, 23--27 days after transplantation. The fourth patient, a kidney recipient, survived. Histopathologic findings varied in the four cases, but hepatocellular necrosis was common to all three decedents on autopsy. The two cornea recipients were asymptomatic. Skin was not transplanted.

When the cause of illness among the recipients was not identified through extensive diagnostic testing and suspicion of transplant-transmitted infection arose, tissue and blood samples from the donor and recipients were sent from the Rhode Island Department of Health and the Massachusetts Department of Public Health to CDC. LCMV was identified as the cause of illness in all four organ recipients; diagnosis was made in tissues from multiple organs through immunohistochemical staining, reverse transcriptase-polymerase chain reaction (RT-PCR), enzyme-linked immunosorbent assays (i.e., IgM capture and indirect

IgG), and viral culture on Vero E6 cells. Sequencing of the virus genome confirmed its identity as LCMV. Based on the diagnosis of LCMV infection, the surviving kidney transplant recipient was treated with intravenous ribavirin and reduction in his immunosuppressive drug regimen; the patient improved clinically.

Epidemiologic Investigation

To determine the source of LCMV infection, investigations were conducted at the hospitals involved in organ recovery and transplantation and at the coordinating organ procurement organization. Interviews also were conducted at locations where the donor had spent substantial time in the month preceding her death.

Interviews with hospital and organ bank staff members revealed no likely sources of LCMV infection in the hospital or organ-recovery settings. Environmental assessment at locations the donor frequented (e.g., home and work) revealed limited opportunities for exposure to wild rodents; the sole location noted with rodent infestation was a garden shed at her home. Interviews with family members of the donor determined that a pet hamster had been acquired recently. The hamster was cared for primarily by another family member. No illnesses compatible with LCMV had been reported in the donor or family members during the month preceding the donor's death. Further investigation of the source of infection, including rodent traceback, is ongoing.

Laboratory Investigation

Family members of the donor were tested for LCMV antibodies. The family member who cared for the hamster had specific IgM and IgG antibodies to LCMV. No other family member had detectable IgG or IgM antibodies to LCMV. All available donor tissues were tested, and no evidence of LCMV was determined by serology, immunohistochemistry, RT-PCR, or viral culture. However, the pet hamster was determined positive for LCMV by virus isolation, RT-PCR, and immunohistochemistry. Genetic sequencing to enable comparison of patient and rodent virus isolates is planned.

Reported by: *Rhode Island Hospital, Providence; Rhode Island Dept of Health. New England Organ Bank, Newton; Massachusetts General Hospital, Brigham and Women's Hospital, Boston; Massachusetts Dept of Public Health. Infectious Disease Pathology Activity, Special Pathogens Br, Div of Viral and Rickettsial Diseases, Div of Healthcare Quality Promotion, National Center for Infectious Diseases; EIS officers, CDC.*

Editorial Note:

LCMV infection usually is either asymptomatic or causes mild self-limited illness in otherwise healthy persons. LCMV can cause aseptic meningitis, but the

infection is rarely fatal (*1*). Infection during pregnancy can result in vertical transmission of the virus from mother to fetus; LCMV infection during the first or second trimesters can lead to severe illness in the fetus (*2*). Serologic studies conducted in urban areas of the United States have indicated that prevalence of LCMV infection among humans is approximately 5% (*3,4*). The house mouse (*Mus musculus*) is the primary reservoir for LCMV, with a prevalence of infection of 3%--40%; a high degree of focality often is noted (*3,5,6*). However, other types of rodents (e.g., hamsters or guinea pigs) can be infected after contact with infected house mice (*7*); these rodents also have been implicated in human infection. Animals can become ill or can be asymptomatic. Infection in humans occurs primarily through exposure to secretions or excretions of infected animals (*8*).

Human-to-human transmission of LCMV has not been reported, with the exception of vertical transmission from an infected mother to fetus (*2*). A large outbreak associated with pet hamsters sold by a single distributor was reported in 1975, when 181 symptomatic cases among persons with hamster contact were identified in 12 states; no deaths occurred (*9*). In 2003, a cluster of solid organ transplant-associated meningoencephalitis deaths in Wisconsin was investigated and determined to be associated with LCMV infection. In that investigation, testing of donor tissues did not reveal any evidence of infection (*10*), and no exposures to rodents were found. Acute LCMV infection in an organ donor is thought to be a rare event.

In the case described in this report, neither the donor nor the infected family member had illness characteristic of LCMV infection. In the organ recipients, transplantation of LCMV-infected organs in the setting of immunosuppression likely increased disease severity. Although most persons infected with LCMV do not exhibit symptoms and the risk for LCMV infection from pet rodents is considered low, persons (especially pregnant women) should be aware of the possible risks associated with LCMV infection. Persons can minimize risk of LCMV infection from pet rodents by being attentive to proper hand hygiene and environmental cleaning. Additional information on handling pet rodents is available at http://www.cdc.gov/healthypets/animals/pocket_pets.htm. Additional information on LCMV is available at http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/lcmv.htm.

Health-care providers should be aware that LCMV can be transmitted through organ transplantation. Any unexpected infectious syndromes in recipients after solid organ or tissue transplantation should trigger concern about the possibility of transplant-associated transmission of an infectious agent. Although such instances are rare, providers should alert the associated organ procurement organization, tissue bank, and public health authorities when such events are suspected. The lifesaving benefits from transplanted organs outweigh the potential risk for unidentified infectious diseases; opportunities to increase

donation should be encouraged.

References

1. Rousseau MC, Saron MF, Brouqui P, Bourgeade A. Lymphocytic choriomeningitis virus in southern France: four case reports and a review of the literature. Eur J Epidemiol 1997;13:817--23.
2. Barton LL, Mets MB, Beauchamp CL. Lymphocytic choriomeningitis virus: emerging fetal teratogen. Am J Obstet Gynecol 2002;187:1715--6.
3. Childs JE, Glass GE, Ksiazek TG, Rossi CA, Oro JG, Leduc JW. Human-rodent contact and infection with lymphocytic choriomeningitis and Seoul viruses in an inner-city population. Am J Trop Med Hyg 1991;44:117--21.
4. Park JY, Peters CJ, Rollin PE, et al. Age distribution of lymphocytic choriomeningitis virus serum antibody in Birmingham, Alabama: evidence of a decreased risk of infection. Am J Trop Med Hyg 1997;57:37--41.
5. Childs JE, Glass GE, Korch GW, Ksiazek TG, LeDuc JW. Lymphocytic choriomeningitis virus infection and house mouse (*Mus musculus*) distribution in urban Baltimore. Am J Trop Med Hyg 1992;47:27--34.
6. Morita C, Matsuura Y, Fujii H, et al. Isolation of lymphocytic choriomeningitis virus from wild house mice (*Mus musculus*) in Osaka Port, Japan. J Vet Med Sci 1991;53:889--92.
7. Bowen GS, Calisher CH, Winkler WG, et al. Laboratory studies of a lymphocytic choriomeningitis virus outbreak in man and laboratory animals. Am J Epidemiol 1975;102:233--40.
8. US Department of Health and Human Services, CDC, National Institutes of Health. Biosafety in microbiological and biomedical laboratories. 4th ed. Washington, DC: US Government Printing Office; 1999.
9. Gregg MB. Recent outbreaks of lymphocytic choriomeningitis in the United States of America. Bull World Health Organ 1975;52:549--53.
10. Paddock C, Ksiazek T, Comer JA, et al. Pathology of fatal lymphocytic choriomeningitis virus infection in multiple organ transplant recipients from a common donor. Mod Pathol 2005;18(Suppl):263A--4A.

Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

References to non-CDC sites on the Internet are provided as a service to *MMWR* readers and do not constitute or imply endorsement of these organizations or their programs by CDC or the U.S. Department of Health and Human Services. CDC is not responsible for the content of pages found at these sites. URL addresses listed in *MMWR* were current as of the date of publication.

Disclaimer All *MMWR* HTML versions of articles are electronic conversions from ASCII text into HTML. This conversion may have resulted in character translation or format errors in the HTML version. Users should not rely on this HTML document, but are referred to the electronic PDF version and/or the original *MMWR* paper copy for the official text, figures, and tables. An

original paper copy of this issue can be obtained from the Superintendent of Documents, U.S. Government Printing Office (GPO), Washington, DC 20402-9371; telephone: (202) 512-1800. Contact GPO for current prices.

**Questions or messages regarding errors in formatting should be addressed to mmwrq@cdc.gov.

Date last reviewed: 5/26/2005

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, infection without symptoms or mild febrile illnesses are common clinical manifestations. Additionally, pregnancy-related infection has been associated with congenital hydrocephalus, chorioretinitis, and mental retardation.

Where does the virus come from?
The primary host is the common house mouse, *Mus musculus*. Infection in house mouse populations may vary by geographic location but, about 5% of mice throughout the United States carry LCMV. The virus is found in the saliva, urine, and feces of infected mice. Infected mice carry LCMV and shed it for the duration of their lives without showing any sign of illness. Other types of rodents, such as hamsters, are not the natural reservoirs but can become infected with LCMV from wild mice at the breeder, in the pet store or home environment. Humans are more likely to contract LCMV from house mice, but infections from pet rodents have also been reported.

How do humans become infected?
Individuals become infected with LCMV after exposure to fresh urine, droppings, saliva, or nesting materials. Transmission can also occur when these materials are directly introduced into broken skin, the nose, the eyes, or the mouth, or presumably, via the bite of an infected rodent. Person-to-person transmission has not been reported, with the exception of vertical transmission from infected mother to fetus. Recent investigations indicate that organ transplantation may also be a means of transmission.

Where does the disease occur?
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 5%.

What are the symptoms of LCM?
Some people infected with LCMV do not become ill. For infected persons who do become ill, onset of symptoms usually occurs 8-13 days after being exposed to the virus. 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, lack of appetite, 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 recovery, 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 (increased fluid on the brain), 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 of illness, 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?
LCM is usually not fatal. In general, mortality is less than 1%.

How is LCM treated?
Aseptic meningitis, encephalitis, or meningoencephalitis requires hospitalization and supportive treatment based on severity. 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 routine use for treatment of LCM 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 work with the virus or 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 that have become contaminated with LCMV, or if the animals become infected from other wild mice. Human fetuses are at risk of acquiring infection vertically from an infected mother.

What can I do to prevent getting LCMV?
LCMV infection can be prevented by avoiding contact with house mice and taking precautions when handling pet rodents (i.e. mice, hamsters, or guinea pigs).

Although rare, pet rodents may become infected with LCMV from wild rodents. Breeders, pet stores, and pet owners should take measures to prevent infestations of wild rodents. Pet rodents should not come into contact with wild rodents.

If you have a rodent infestation in and around your home, take the following precautions to reduce the risk of LCMV infection:

- Seal up rodent entry holes or gaps with steel wool, lath metal, or caulk.
- Trap rats and mice by using an appropriate snap trap.
- Clean up rodent food sources and nesting sites and take precautions when cleaning rodent-infected areas. See recommendations for cleaning rodent-infested areas.

If you have a pet rodent, wash your hands with soap and water (or waterless alcohol-based hand rubs when soap is not available and hands are not visibly soiled) after handling rodents or their cages and bedding.

What are the recommendations for cleaning a rodent-infested area?

- Use cross-ventilation when entering a previously unventilated enclosed room or dwelling prior to cleanup.
- Put on rubber, latex, vinyl or nitrile gloves.
- Do not stir up dust by vacuuming, sweeping, or any other means.

- Thoroughly wet contaminated areas with a bleach solution or household disinfectant.
  Hypochlorite (bleach) solution: Mix 1 and ½ cups of household bleach in 1 gallon of water.
- Once everything is wet, take up contaminated materials with damp towel and then mop or sponge the area with bleach solution or household disinfectant.
- Spray dead rodents with disinfectant and then double-bag along with all cleaning materials and throw bag out in an appropriate waste disposal system.
- Remove the gloves and thoroughly wash your hands with soap and water (or waterless alcohol-based hand rubs when soap is not available and hands are not visibly soiled).

What needs to be done to address the issue of LCMV?
The geographic distributions of the rodent hosts are widespread both domestically and abroad. However, infrequent recognition and diagnosis, and therefore underreporting, of LCM, have limited scientists' ability to estimate incidence rates and prevalence of disease among humans. Understanding the epidemiology of LCM 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:

- Jahrling PB, Peters CJ. Lymphocytic choriomeningitis virus: a neglected pathogen of man. Arch Pathol Lab Med 1992;116:486-8
- Peters CJ, Buchmeier M, Rollin PE, Ksiazek TG. Arenaviruses. In: Belshe RB, ed. Textbook of Human Virology. 2nd ed. St. Louis: Mosby-Year Book, Inc. 1991:541-70.
- Peters CJ, et al. Arenaviridae: Biology of viruses. In: Fields BN, Knipe DM, Howley PM, et al, eds. Fields Virology. 3rd ed. Philadelphia: Lippincott-Raven Publishers. 1996:1527-51.
- Peters CJ. Arenaviruses. In: Richman DD, Whitley RJ, Hayden FG, eds. Clinical Virology.
- New York: Churchill Livingstone, Inc. 1997: 973-96.

Lymphocytic Choriomeningitis Virus (LCMV) and Pregnancy: Facts and Prevention

Photo produced for CDC by Orkin Pest Control, Inc.

What is LCMV and how is it spread?

Lymphocytic choriomeningitis virus (LCMV) is carried by wild mice. Laboratory rodents and pet rodents, such as hamsters and guinea pigs, can become infected with LCMV from contact with wild mice. This can happen in a breeding facility, in a laboratory facility, in a pet store, or in the home (e.g., if wild mice are present).

Humans can become infected with LCMV through contact with urine, blood, saliva, droppings, or nesting materials of infected rodents. This could occur, for example, through a break in the skin or a bite from an infected rodent. Infection can also be spread by inhaling dust or droplets containing LCMV, such as while sweeping infected rodent droppings. A pregnant woman who becomes infected with LCMV can pass the infection to her unborn baby. LCMV infection can also be spread to patients who receive an organ transplant from an infected donor. However, spread of LCMV infection from one person to another is not known to occur outside these situations (1).

About 5% of adults have a positive blood test that shows they were infected with LCMV at some time in their lives (2, 3). Some people with normal immune systems have no symptoms during LCMV infection. Others have a mild illness with symptoms such as headache, fever, chills, and muscle aches. Sometimes, meningitis (inflammation around the brain and spinal cord) will occur.

[Return to Top]

What are the risks of LCMV infection during pregnancy?

If you have an LCMV infection during your pregnancy, your unborn baby can also become infected. LCMV infection during pregnancy can result in loss of the pregnancy. Infants who are infected with LCMV before they are born can have severe birth defects. It is not known how often this happens because pregnant women with LCMV infection might have only mild symptoms or no symptoms at all, and babies often are not tested for the infection (4, 5). Since LCMV infection was first identified, more than 50 babies have been reported with LCMV infection worldwide (6, 7).

How can I prevent becoming infected with LCMV?
In general, the risk of LCMV infection is low. If you are pregnant or planning to become pregnant, you should avoid contact with rodents, including pets such as hamsters and guinea pigs, and rodent droppings whenever possible. Following these instructions can reduce the risk of LCMV infection:

- If you suspect there are mice in your home, call a professional pest control company to control them or have another member of the household remove them. Avoid vacuuming or sweeping rodent urine, droppings, or nesting materials.
- Ask a friend or family member who does not live with you to care for pet rodents in his or her home while you are pregnant. If this is not possible, keep the pet rodent in a separate part of the home and have another family member or friend care for the pet and clean its cage. Avoid being in the same room where the rodent is kept.
- If you have contact with a wild rodent or its urine, droppings, or nesting materials, thoroughly wash your hands afterward.
- Further guidance on preventing LCMV infection, including management and prevention of rodents in the home, is available at: http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/lcmv.htm and http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/lcmv/prevent.pdf

[Return to Top]

Is there treatment for LCMV infection during pregnancy?
Currently, there is no specific treatment available for LCMV infection. Pregnant women who have LCMV infection should talk with their doctors about how to manage their symptoms and how the infection might affect the outcome of their pregnancy.

If you are pregnant and have come in contact with a rodent, or have fever or other symptoms during your pregnancy, contact your doctor. A blood test is available to detect current or previous LCMV infection. Having had LCMV infection in the past is not a risk for current or future pregnancies.

[Return to Top]

For more information:
Organization of Teratology Information Services (OTIS) visit http://www.otispregnancy.org/ or call (866) 626-6847

Special Pathogens Branch of Centers for Disease Control
http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/lcmv.htm

[Return to Top]

Date: October 5, 2005
Content source: National Center on Birth Defects and Developmental Disabilities

OHIO DEPARTMENT OF HEALTH

246 North High Street
Post Office Box 118
Columbus, Ohio 43216-0118

Telephone (614) 466-3543
www.odh.state.oh.us

BOB TAFT
Governor

J. NICK BAIRD, M.D.
Director of Health

JOURNAL ENTRY

The Ohio Department of Health and the Director have received notice that Lymphocytic Choriomeningitis Virus, or LCMV, has recently been identified in four organ transplant recipients, three of whom died. LCMV is highly contagious rodent-borne virus and may be transmitted to humans through contact with an infected animal's feces, urine or saliva. LCMV is capable of causing mild flu-like symptoms, serious illness, or death.

According to the New England Organ Bank, the organ donor, who died at Rhode Island Hospital, gave both kidneys, a set of lungs, the liver and corneas. Six people received the organs. One of the kidney recipients survived and the two cornea recipients were asymptomatic.

Rhode Island health officials believe the donor became infected by a pet hamster that was purchased from a pet store in Rhode Island about three weeks before the donor died of an unrelated cause and has since tested positive for LCMV. The hamster was bred in Arkansas and distributed to the retail location through the MidSouth Distributors facility located at 7524 East Pike Road, Norwich, Muskingum County, Ohio.

The Chief, Bureau of Infectious Disease Control, recommends the Director authorize an investigation, pursuant to section 3701.14 of the Revised Code, to evaluate the presence of LCMV in animals at the Muskingum County facility and take prompt action to control and suppress it. Muskingum County is the primary site of the investigation. The investigation effective date was June 10, 2005. Further, on June 13, 2005, the Ohio Department of Agriculture issued an Executive Order (No. 2005-158) designating LCMV as a dangerously contagious and infectious disease. Since LCMV is a threat to public health, an investigation is necessary and will be conducted jointly with the Ohio Department of Agriculture.

APPROVED

J Nick Baird MD/gg

J. Nick Baird, M.D.
Director of Health

6-16-2005

Date

An Equal Opportun y Employer/Provider

State of Ohio
Department of Agriculture

EXECUTIVE ORDER

ORDER NO. 2005-158

WHEREAS, the Ohio Department of Agriculture has determined that three persons have died from Lymphocytic Choriomeningitis Virus (LCMV) in Rhode Island after receiving organ transplants from a donor infected with LCMV and several others in Rhode Island have tested positive for LCMV; and,

WHEREAS, Lymphocytic Choriomeningitis Virus (LCMV) is a highly contagious disease passed fro m rodents, such as hamsters and guinea pigs, to humans capable of causing illness or death; and,

WHEREAS, under authority of paragraph (D) of rule 901:1-21-02 of the Administrative Code the Director of Agriculture may designate a disease not otherwise specified as such, a dangerously contagious and infectious disease by executive order;

NOW THEREFORE, it is hereby **ORDERED** that Lymphocytic Choriomeningitis Virus (LCMV) be and it hereby is designated as a dangerously contagious and infectious disease. It is further **ORDERED** that a certified copy of this Executive Order be filed with the Secretary of State and that this Executive Order be published in a newspaper of general circulation within this State in accordance with paragraph (D) of rule 901:1-21-02 of the Administrative Code. This **ORDER** shall expire ninety days from its effective date.

Effective date of this Order: Upon journalization:

Fred L. Dailey, Director
Ohio Department of Agriculture

6-13-05
Date

Entered, Ohio Department of Agriculture Journal this 13th day of June 2005, by Connie Ellis.

CERTIFICATION

STATE OF OHIO :
COUNTY OF LICKING, SS :

I, Fred L. Dailey, Director, Ohio Department of Agriculture, do hereby certify that the annexed instrument is a true and correct copy of ORDER NO. 2005-158, which was entered upon the order journal of the Ohio Department of Agriculture on the 13th day of June, 2005.

In testimony whereof, I have hereunto set my hand and affixed the seal of the Ohio Department of Agriculture at Reynoldsburg, Ohio, this 13th day of June, 2005.

Fred L. Dailey, Director
Ohio Department of Agriculture

Mid-South Distribution Facility Inspection
July 18, 2005

Participants

CDC: Brain Amman (mammalogist)
USDA: Zona Gabbard (tech), Carl LaLonde, Rick Kirsten (vet), Randy Coleman (animal care inspector)
ODA: Dave Frew (vet), Gary Hill (enforcement), Bill Folwarczny
ODH: Kim Winpisinger (epidemiologist)
Muskingum County Health Dept.: Mike Kirsch (Deputy Health Commissioner)

Also present: Sheriff's Department: Deputies J. Yerian and K-9, Dave Neal

Time Line
6:15am: convene at meeting location and go over introductions of the various agency members and discuss today's plans

7:00am: arrive at Mid-South Distribution facility. One sheriff is stationed at each of the two driveway entrances to the facility to prevent anyone from entering or exiting. The facility is immediately placed under quarantine. Gary Hill and Dave Frew explain the ramifications of this to the Mid-South staff.

8:15am: after waiting over one hour for the supervisor, Robin Cromwell, to arrive we are finally allowed to commence the inspection.

11:15am: inspection ends. We all leave and sheriff's department opens the entrances to the facility. Dave and Gary reiterate to Robin that no animals can enter or leave the facility until the LCM testing results are in. Brian says that he should have results by July 27, 2005, a week from this Wednesday.

Facility information

- The current population is:
    - Black bear hamsters – 219 males, 99 females (less 1 female that was found dead this morning)
    - Short-haired hamsters – 546 males, 555 females
- A shipment came in from Little Rock, Arkansas this weekend (7/17/05) which included:
    - 2,387 hamsters
    - 458 rats
    - 156 guinea pigs
    - 117 mice
    - 450 gerbils

    - 2 ferrets (these are already enroute to a selling facility)

- Shipment schedule:
    - Arkansas comes in on Sundays
    - Pennsylvania guinea pigs come in on Saturdays
    - CDC (breeder) they don't buy from them anymore because they are too far away and shipping is costly
    - Sand Valley, PA every other week sends hamsters
    - Marty Holmes, in PA, ships mice every other week

- Mid-South Ohio distributes rats, mice, hamsters, gerbils, guinea pigs, chinchillas, and occasionally ferrets and bunnies (seasonal at Easter). Mice are the most common animal in this facility.
- Shipments from Mid-South Arkansas arrive in air conditioned vans, according to Robin.
- "The (horse) trailer" is operational and the AC works.
- The OH/AR driver lives in OH and makes a run to AR once a week round trip. His job is pretty much just driving the route, not working in the facility.
- Animals go from opaque shipping tubs into black tubs and are watered and fed as soon as they arrive. Black bins are placed on racks in the facility. Usually 12 hamsters per tub maximum, unless animals are ready to ship to pet stores, then there may be up to 20 per tub.
- ALL short hair and long hair hamsters in the facility come from Arkansas
- Black bear hamsters only come from Arkansas or Sand Valley, PA
- PA and AR animals are segregated and kept in separate bins based on where they came from.
- There is a sick area near the front of the hamster/mouse/rat/chinchilla room. Animals here all have yellow water, indicating it has tetracycline in it. This treats upper respiratory symptoms and wet tail.
- Sick animals are euthanized every morning using CO2 gas.
- Robin Cromwell has been the manager of the day shift since March 2005.
- Tabby Hamilton has been an employee since October 2004.

<u>Notes</u>

- Several mice "escapees" were seen running around on the floor between cages. Some were captured and euthanized for testing
- Two mice were found alive in the dumpster where used bedding was being dumped. These were captured and euthanized for testing.
- We sampled (live, healthy) 30 black bear hamster and 70 short-haired hamsters and 1 guinea pig. All others were sick, dead, or escapees.
- Manager of sick bay room and hamster area is Tabby Hamilton. She claims no relation to David Hamilton, though she says many employees accuse her of being related. She gave us the tour and accompanied, Dave Frew, Brian Amman and Kim Winpisinger during the sample collection process.

- Julie manages the chinchillas and another woman manages the guinea pig room. The upstairs rat/mouse breeding facility is managed by another woman.
- I saw fewer than 8 employees present in the facility.
- I only spoke directly with 4 workers. Other workers made themselves scare when inspectors were around. Of the workers I spoke to about health issues, both denied any problems and claimed they new of nobody having any health problems.
- The manager, Robin, has severe asthma and claims she recently received a brown recluse spider bite. I asked if she sent it in for ID and testing and she said no, but her doctor told her that was the problem with her leg.
- I felt the facility was fairly clean and the smell was not as strong as some poorly run pet shops I have been in. Noticeable but not overwhelming. It should be noted, however, that they kept us out of the facility for over 1 hour after we arrived.

Submitted by,

Kim Winpisinger
Zoonotic Disease Program
Ohio Department of Health

Lymphocytic Choriomeningitis Virus
Exposure Questionnaire

Case Identification Number _____
Date of Interview ___/___ /___ (mm/dd /yy)

I. Interviewer
Last Name _____ First Name _____ MI ____
Title _____
Organization _____

<All instructions to the interviewer are in italics and surrounded by <> brackets. All temporal questions use the 2 weeks prior to symptoms. Use a calendar to jog the interviewee's memory regarding temporal events.>

II. Name of Person Interviewed
Last Name _____ First Name _____ MI ____

Residence
Street Address _____ Apt. # _____
City _____ State_____ Zip Code _____
County _____
Home Number (_____) _____- _____

Place of Employment
Name of Company _____
Street Address _____
City _____ State_____ Zip Code _____
County _____
Work Number (_____) _____- _____

III. Demographic Information
We would like to ask you some questions so we can learn more about the lymphocytic choriomengitis virus that causes people to become ill. I'll begin by asking you some questions about yourself.

Q1. What is your date of birth? ____/____ /____ (mm/dd/yy) Age _____

Q2. Sex *<INTERVIEWER COMPLETE>*:
□ Male □ Female

Q3. Do you consider yourself Hispanic?

□ Yes □ No □ Unsure/Don't Know

Q4. What category best describes the racial group to which you belong?

□ White □ Black □ Asian/Pacific Islander □ American Indian

□ Other, specify _____

Q5. What day did you first feel like you were getting sick? ___/___/___ (mm/dd/yy)

□ Unsure/Don't Remember

Q6. What was your main occupational activity between *<2 weeks before illness>* ___/___/___ and < *(onset of illness)* > ___/___/___?

□ Unemployed *<IF UNEMPLOYED SKIP TO Q9>*

□ Housewife/Homemaker

□ Animal care worker

□ Animal packer/unpacker

□ Other, specify job title(s) _____

Q7. What was the name and address of your employer between *<2 weeks before illness>* ___/___/___ and < *(onset of illness)* > ___/___/___?

<If same as employer address listed in Part II. Write "same">

_____

_____

Q8. What were your three most common occupational duties *<2 weeks before illness>* ___/___/___ and < *(onset of illness)* > ___/___/___?

a. _____

b. _____

c. _____

Q9. What is the highest year of formal education you have finished?

□ None
□ Grade school K-8
□ Some high school
□ Completed high school/GED
□ Some college
□ Completed college
□ Some graduate school
□ Completed graduate school
□ Trade school
□ Unsure/Don't Know

IV. Exposure Information

A. Rodent Exposure

The following sequence of questions asks about your exposure to rodents in the two weeks prior to the onset of your illness. Animals such as mice, rats, hamsters, guinea pigs, chipmunks, and squirrels are all rodents. For each question, try to recall exposures to rodents which might have occurred at work, at home, or during recreational activities. Work related activities may be full-time work or temporary work, and includes work you may not have been paid for. Homesite refers to exposures which may have occurred in or around your home. Recreational activities refer to things you do in your spare time, but away from your home.

<Interviewer: prompt case regarding work-related, homesite, or recreational related exposures. In other words, you don't have to ask each question three times. Ask each question once, but follow it up to determine if a potential exposure occurred at work, home, or during recreational activities. For example, Q10. Did you see any live or dead rodents at work? ...at home? ...during recreational activities? Use DK response category to signify "unsure/don't know". Include any comments or supplemental information provided by case in space provided on page 5.>

Between <___/___/___> and <___/___/___>

	a. Work-Related	b. Homesite	c. Recreational
Q10. Did you **see** any live or dead rodents? IF YES...	□ Yes □ No □ DK	□ Yes □ No □ DK	□ Yes □ No □ DK
Q11. What type of rodent(s) did you handle? (check all that apply)	□ Mouse □ Rat □ Guinea pig □ Hamster □ Squirrel □ Chipmunk □ Other _____	□ Mouse □ Rat □ Guinea pig □ Hamster □ Squirrel □ Chipmunk □ Other _____	□ Mouse □ Rat □ Guinea pig □ Hamster □ Squirrel □ Chipmunk □ Other _____
Q12. Did you see any rodent drop pings?	□ Yes □ No □ DK	□ Yes □ No □ DK	□ Yes □ No □ DK
Q13. Did you see any rodent nests?	□ Yes □ No □ DK	□ Yes □ No □ DK	□ Yes □ No □ DK
Q14. Did you **hear** any rodents? **If NO/DK to Q10-Q14, skip to Q35**	□ Yes □ No □ DK	□ Yes □ No □ DK	□ Yes □ No □ DK

	a. Work-Related	b. Homesite	c. Recreational
Q15. Did you place any poison for rodents?	□ Yes □ No □ DK	□ Yes □ No □ DK	□ Yes □ No □ DK
Q16. Did you set any rodent traps? IF NO/DK, GO TO Q 18. IF Y ES...	□ Yes □ No □ DK	□ Yes □ No □ DK	□ Yes □ No □ DK
Q17. Type of rodent(s) caught (check all that apply).	□ Mouse □ Rat □ Guinea pig □ Hamster □ Squirrel □ Chipmunk □ Other _____	□ Mouse □ Rat □ Guinea pig □ Hamster □ Squirrel □ Chipmunk □ Other _____	□ Mouse □ Rat □ Guinea pig □ Hamster □ Squirrel □ Chipmunk □ Other _____
Q18. Did you **handle** any **live** rodents? IF NO/DK, GO TO Q 21. IF Y ES...	□ Yes □ No □ DK □ Yes □ No □ DK	□ Yes □ No □ DK □ Yes □ No □ DK	□ Yes □ No □ DK □ Yes □ No □ DK
Q19. Type of rodent(s) handled (check all that apply).	□ Mouse □ Rat □ Guinea pig □ Hamster □ Squirrel □ Chipmunk □ Other _____	□ Mouse □ Rat □ Guinea pig □ Hamster □ Squirrel □ Chipmunk □ Other _____	□ Mouse □ Rat □ Guinea pig □ Hamster □ Squirrel □ Chipmunk □ Other _____
Q20. Did you wear gloves?	□ Yes □ No □ DK	□ Yes □ No □ DK	□ Yes □ No □ DK
Q21. Did you **handle** any **dead** rodents? IF NO/DK, GO TO Q 25. IF Y ES...	□ Yes □ No □ DK	□ Yes □ No □ DK	□ Yes □ No □ DK
Q22. Type of rodent(s) handled (check all that apply).	□ Mouse □ Rat □ Guinea pig □ Hamster □ Squirrel □ Chipmunk □ Other _____	□ Mouse □ Rat □ Guinea pig □ Hamster □ Squirrel □ Chipmunk □ Other _____	□ Mouse □ Rat □ Guinea pig □ Hamster □ Squirrel □ Chipmunk □ Other _____
Q23. Did you wear gloves?	□ Yes □ No □ DK	□ Yes □ No □ DK	□ Yes □ No □ DK
Q24. Did you use a disinfectant before handling?	□ Yes □ No □ DK	□ Yes □ No □ DK	□ Yes □ No □ DK
Q25.Did you **handle** any rodent **droppings**? IF NO, GOTO Q28. IF YES	□ Yes □ No □ DK	□ Yes □ No □ DK	□ Yes □ No □ DK
Q26. Did you wear gloves?	□ Yes □ No □ DK	□ Yes □ No □ DK	□ Yes □ No □ DK
Q27. Did you use a disinfectant before handling?	□ Yes □ No □ DK	□ Yes □ No □ DK	□ Yes □ No □ DK

	a. Work-Related	b. Homesite	c. Recreational
Q28. Did you **handle** any rodent **nests or bedding**? IF NO/DK, GO TO Q 31. IF Y ES...	□ Yes □ No □ DK	□ Yes □ No □ DK	□ Yes □ No □ DK
Q29. Did you wear gloves?	□ Yes □ No □ DK	□ Yes □ No □ DK	□ Yes □ No □ DK
Q30. Did you use a disinfectant before handling?	□ Yes □ No □ DK	□ Yes □ No □ DK	□ Yes □ No □ DK
Q31. D id you get **bitten** by a rodent? IF NO/DK, GO TO Q 33, IF Y ES...	□ Yes □ No □ DK	□ Yes □ No □ DK	□ Yes □ No □ DK
Q32. Type of rodent?	□ Yes □ No □ DK	□ Yes □ No □ DK	□ Yes □ No □ DK
Q33. D id you get **scratched** by a rodent? IF NO/DK, GO TO Q 35, IF Y ES...	□ Yes □ No □ DK	□ Yes □ No □ DK	□ Yes □ No □ DK
Q34. Type of rodent?	□ Mouse □ Rat □ Guinea pig □ Hamster □ Squirrel □ Chipmunk □ Other _____	□ Mouse □ Rat □ Guinea pig □ Hamster □ Squirrel □ Chipmunk □ Other _____	□ Mouse □ Rat □ Guinea pig □ Hamster □ Squirrel □ Chipmunk □ Other _____

Comments

Q10-Q14.

_____
_____
_____

Q15-Q17.

_____
_____
_____

Q18-Q20.

_____
_____
_____

Q21-Q24.

_____
_____
_____

Q25-Q27.

_____
_____
_____

Q28-Q30.

_____
_____
_____

Q31-Q34.

_____
_____
_____

B. Animal Exposure

Q35. Were any of the following animals kept it or around your home **between <___/___/___> and <___/___/___>**? *<For each animal checked "yes" indicate if allowed in home>*

	YES	NO	UNSURE	If YES, how many?	Allowed in home? YES	NO
Mice						
Rats						
Hamsters						
Guinea pigs						
Gerbils						
Prairie dogs						
Ferrets						
Chinchillas						
Rabbits						
Other rodent (list)						

V. Medical Information

A. Medical History

Q36. Do you have any of the following medical problems for which you see a doctor regularly?

	YES	NO	UNSURE
Asthma			
Eczema			
Lupus			
Allergies			
Diabetes			
Cancer			
AIDS			
Thyroid problem			
Any other immune deficiency (list)			
Other (list)			

B. Current Symptoms

Q37. Do you currently have any of the following medical symptoms?

	YES	NO	UNSURE
Fever			
Headache			
Malaise			
Lack of appetite			
Muscle aches			
Nausea			
Vomiting			
Sore throat			
Cough			
Joint pain			
Chest pain			
Testicular pain			
Salivary gland pain			
Stiff neck			
Drowsiness			
Confusion			
Sensory disturbances			
Motor abnormalities (like paralysis)			
Muscle weakness			

Q38. In the past month, have you had any of the following medical symptoms?

	YES	NO	UNSURE
Fever			
Headache			
Malaise			
Lack of appetite			
Muscle aches			
Nausea			
Vomiting			
Sore throat			
Cough			
Joint pain			
Chest pain			
Testicular pain			
Salivary gland pain			
Stiff neck			
Drowsiness			
Confusion			
Sensory disturbances			
Motor abnormalities (like paralysis)			

Q39. In the past month, have you been diagnosed with any of the following?

	YES	NO	UNSURE
Meningitis			
Encephalitis			
Meningoencephalitis			
Myocarditis (heart inflammation)			
Paralysis			

*<If YES, to any in Q39. continue, else skip to Q**X**.>*

Q40. Where were you diagnosed?

Doctor's Last Name _____ Doctor's First Name _____
Clinic Name _____
Street Address _____ Apt. # _____
City _____ State_____ Zip Code _____
County _____
Phone Number (_____) _____- _____

Q41. Were you hospitalized? □ Yes □ No □ Unsure/Don't Know

Q42. If yes, where and when?

From ____/____/____ to ____/____/____ ER only? □ Yes □ No □ DK

Hospital Name _____
Street Address _____ Apt. # _____
City _____ State_____ Zip Code _____
County _____
Phone Number (_____) _____- _____

Thank you very much for your assistance.

Information for Pet Owners:

Reducing the Risk of Becoming Infected with LCMV from Pet Rodents

What happened recently to bring attention to LCMV?

In May 2005, CDC received reports of four solid organ-transplant recipients with unknown illness. All were infected with lymphocytic choriomeningitis virus (LCMV) from a common organ donor. Three of the four organ recipients died from LCMV infection.

Epidemiologic investigation traced the source of the virus to a pet hamster recently purchased by the donor from a pet store in Rhode Island. LCMV testing of other rodents at the pet store identified three other LCMV-infected rodents (two hamsters and a guinea pig). All four pet rodents had been supplied by a single distributor, MidSouth Distributors in Ohio. During this investigation, it was determined that LCMV-infected pet rodents might have been transported from the Ohio facility to pet stores in the northeastern and midwestern United States as early as February 2005.

Where does the virus come from?

The primary host of LCMV is the common house mouse (*Mus musculus*). LCMV is not normally found in pet rodents, such as hamsters, gerbils, and guinea pigs. However, pet rodents can become infected after being in contact with wild house mice in breeding facilities, pet stores, or homes. People have become infected from contact with LCMV-infected hamsters.

Humans can develop LCMV infection from exposure to urine, droppings, saliva, or nesting material of infected rodents. LCMV infection can also occur when these materials are inhaled or directly introduced into broken skin or into the nose, eyes, or mouth, and possibly by a bite from an infected animal.

What are the symptoms of LCMV in people?

Adults with normal immune systems can be infected with LCMV without symptoms, or they may develop a mild illness with symptoms that may include the following: fever, lack of appetite, muscle aches, headache, chills, nausea, and vomiting. Some people may have meningitis (inflammation of the brain covering) approximately 7-15 days after the start of fever. People with weakened immune systems may have more severe or fatal illness when infected with LCMV.

Women who become infected with LCMV during pregnancy may have spontaneous abortion, or their baby may have severe birth defects, including congenital hydrocephalus (fluid on the brain), chorioretinitis (inflammation of the eye), blindness, or mental retardation. It is unknown what proportion of infants whose mothers have LCMV during pregnancy will have developmental defects.

Can LCMV spread from one person to another?

A pregnant woman who becomes infected can pass the LCMV infection to her unborn baby; in addition, LCMV can be spread through organs transplanted from an infected donor. With the exception of these situations, there is no documented evidence of person-to-person transmission.

Which pet stores have LCMV-infected rodents?

Rodents and other pets from *any* pet store pose some risk of transmitting certain infectious diseases and should be handled appropriately. For more information on how to reduce the risk of infectious diseases from your pet, please see the CDC *Healthy Pets* Web site: www.cdc.gov/healthypets.

Should I get rid of my pet hamster or other rodent?

Persons who are not pregnant and who have healthy immune systems are at very low risk for any serious illness associated with LCMV. The probability of any one rodent being infected is low. The greatest risk of infection for a pet owner is likely to occur soon after purchase of a pet rodent. Thus, most exposures have likely already occurred for existing owners, and continued ownership of the rodent will not likely result in substantial added risk. Persons with further concerns about their pets should seek guidance from a veterinarian. Women who are pregnant or planning to become pregnant, or persons who have impaired immune systems should not obtain rodents for pets.

What should I do if I no longer want my pet rodent?

People who have already purchased hamsters or other rodents from pet stores should not return their animals to the stores, regardless of where the animal was purchased. People who no longer wish to keep their pet rodent should consult a veterinarian.

Can I release my pet rodent into the wild?

No. Pet rodents must not be released into the wild for humane reasons and because it is illegal in many states. Pet rodents are not adapted to surviving in the wild environment and may starve or be killed by predators. Many pet rodents are not native species to North America. Releasing them into the wild could introduce a non-native species that could become a pest, endanger native species, or otherwise damage the normal ecosystem.

Can I have my pet rodent tested for LCMV?

CDC does not recommend testing individual pet rodents. Testing on live rodents can be inaccurate and misleading. Always assume that pet animals are capable of transmitting certain infectious diseases. Follow appropriate precautions as described on CDC's *Healthy Pets* Web site (www.cdc.gov/healthypets) when handling any pets.

How can I purchase a safe and healthy pet?

There is no way to be absolutely sure that any pet animals are free of all infectious diseases. Information on purchasing a healthy pet and general steps to prevent pet rodents from bringing diseases into the home is available at http://www.cdc.gov/healthypets/lcmv_rodents.htm.

How can pregnant women reduce the risk of LCMV?

LCMV infection during pregnancy can cause severe illness or developmental defects in the fetus. Women who are pregnant or who are planning to become pregnant should avoid contact with all rodents. Some of the following precautions can be taken to reduce the risk of acquiring LCMV infection during pregnancy:

- To avoid contact with wild rodents, pregnant women who reside in a household with a wild rodent infestation should have the infestation controlled promptly by a professional pest control company or another member of the household.

- To avoid contact with pet rodents, remove the pet rodents from the house or keep pet rodents in a separate part of the home. Pregnant women should ask another family member or friend to clean the cage and care for the pet or arrange for temporary adoption of the pet by a responsible person. Pregnant women should avoid any room where a rodent resides.

How can people with weakened immune systems reduce the risk of LCMV?

People with an impaired immune system may be at risk for more severe disease from LCMV and other diseases carried by pet rodents. Persons with an impaired immune system should avoid contact with all rodents.

Can I get tested for LCMV?

Testing for LCMV infection in persons who have no symptoms is not necessary. Individuals who are experiencing symptoms as described above should seek medical care and let the physician know about any exposures to wild or pet rodents. Only your physician can decide whether testing for LCMV is necessary.

What is being done to prevent LCMV infection in pet rodents?

CDC and other partners are working with breeders and retailers in the pet industry to minimize the risk of LCMV infection in rodents that are sold to the public and to educate owners of pet rodents about LCMV infection. For more information on what your state is doing regarding LCMV, please contact your state health department or visit their Web site (http://www.cdc.gov/doc.do/id/0900f3ec80226c7a).

Interim Guidance for Minimizing Risk for Human Lymphocytic Choriomeningitis Virus Infection Associated with Rodents

In May 2005, CDC received reports of four organ-transplant recipients with unknown illness. All were discovered to have been infected with lymphocytic choriomeningitis virus (LCMV) via a common organ donor (*1*). Epidemiologic investigation traced the source of the virus to a pet hamster purchased by the donor from a local pet store. LCMV testing of other rodents at the pet store revealed three other LCMV-infected rodents (two hamsters and a guinea pig), supplied by a single distributor (distributor A). Preliminary laboratory testing of hamsters from distributor A has identified an infection rate of approximately 3% among the animals sampled. The facility of distributor A is under quarantine until it can be documented as free of LCMV infection. This report provides background information on LCMV and interim guidance* for the public on reducing risk for LCMV infection from pet rodents.

Background Information

LCMV is a rodent-borne arenavirus endemic in house mouse (*Mus musculus*) populations worldwide (*3*--*5*). Pet rodents (e.g., hamsters and guinea pigs) can become infected with LCMV after contact with wild rodents at a breeding facility, pet store, or home. The prevalence of LCMV in pet rodents is not known. Although other animals could possibly become infected with the virus, documented infections in humans have occurred only after exposure to infected mice, guinea pigs, and hamsters (*6,7*).

LCMV infection in humans with normal immune systems usually causes either asymptomatic or mild, self-limited illness, characterized by any or all of the following symptoms: fever, malaise, lack of appetite, muscle aches, headache, nausea, and vomiting. Aseptic meningitis also can occur in some patients, but the infection is rarely fatal (*6*). LCMV infection during the first or second trimester of pregnancy can cause severe illness or developmental defects in the fetus, including hydrocephalus, psychomotor retardation, and blindness (*8*); the proportion of developmental defects caused by LCMV is not known. Serologic studies of previous infection in humans in urban areas of the United States have demonstrated a prevalence of previous LCMV in those populations of approximately 5% (*3*).

Person-to-person transmission has not been associated with LCMV, except for transmission from mother to fetus or through organ transplantation (*1*). Human

infection occurs most commonly through exposure (by direct contact or aerosol) to secretions or excretions of infected animals (*9*). LCMV infection is a well-known occupational risk for laboratory workers who work with LCMV-infected laboratory rodents (*9*).

An outbreak associated with pet hamsters sold by a single distributor was reported in 1974, when 181 symptomatic cases in persons with hamster contact were identified in 12 states; no deaths occurred (*10*). The outbreak was brought under control by voluntary cessation of sale and destruction of the infected breeding stock.

Control of Wild Rodents

Environmental modifications and hygiene practices that deter rodents from colonizing the home and work environment are the best means of reducing risk for exposure to infectious rodents. In addition, if rodents are found in work or living areas, safe practices for cleaning rodent waste and nesting materials are recommended. Preventing wild rodent entry also reduces opportunity for infection of pet rodents.

Detailed instructions on rodent-proofing, safe cleaning practices, and trapping wild rodents are available at http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/lcmv.htm.

General Recommendations for Preventing LCMV Infection from Pet Rodents

Hamsters and other rodents are common pets, and the number of documented human LCMV infections from pet hamsters and other rodents is low. Basic precautions can reduce the risk for acquiring LCMV and other infections from pet rodents. Because rodents might not always exhibit signs of ill health resulting from LCMV infection, CDC recommends taking appropriate precautions with any rodent:

- The public should be apprised of the risk for LCMV infection from rodents purchased from *any* pet store.
- Destruction or return of recently purchased pet rodents is not recommended. The probability of any one animal harboring LCMV infection is low. All pets are potential carriers of infectious diseases and should always be handled by using appropriate precautions.
- Pet rodents must not be released into the wild to prevent introduction of nonnative species to North America.
- Persons with specific concerns regarding the health of their pets should seek guidance from a veterinarian.

Purchasing a Healthy Pet

Information on purchasing a healthy pet and general steps to prevent pet rodents from bringing diseases into the home is available at

http://www.cdc.gov/healthypets/lcmv_rodents.htm.

Care of Pet Rodents

Anyone handling or keeping pet rodents should take the following precautions to reduce the risk for LCMV infection:

- Wash hands with soap and water (or alcohol-based hand sanitizers when soap is unavailable and hands are not visibly soiled) after handling pet rodents or cleaning up pet droppings, cages, or areas where pets have been.
- Keep rodent cages clean and free of soiled bedding.
- Clean cages outdoors or in a well-ventilated area.
- Closely supervise young children when cleaning cages or handling rodents and supervise or assist children in washing their hands immediately after handling rodents and rodent cages or bedding.
- Never kiss or hold pet rodents close to the face.
- Never allow pet rodents to come into contact with wild rodents or their droppings or nests. Cover pet rodent cages and food supplies and always supervise pet rodents when they are not in their cages.

Precautions for Pregnant Women

Although the risk for LCMV infection from pet rodents is low, pregnant women or women who think they might become pregnant should be aware of the risks associated with LCMV infection during pregnancy. The following precautions can be taken to reduce the risk for acquiring LCMV infection during pregnancy:

- Avoid contact with wild rodents. Pregnant women who reside in a household with a wild rodent infestation should have the infestation addressed promptly by a professional pest control company or another member of the household.
- Keep pet rodents in a separate part of the home. Pregnant women should ask another family member or friend to clean the cage and care for the pet or arrange for temporary adoption of the pet by a responsible person. Pregnant women should avoid prolonged stays in any room where a rodent resides.

Precautions for Persons with Weakened Immune Systems

For the organ recipients described in this report, transplantation of LCMV-infected organs into persons with medically induced immunosuppression likely increased disease severity. Persons with impaired immune-system function should avoid contact with all rodents.

Testing for LCMV in Pet Rodents

CDC does not recommend testing pet rodents. Serologic testing on rodents can be inaccurate and misleading. All pet animals should be assumed capable of transmitting

certain infectious diseases.

Testing for LCMV in Humans

Testing for LCMV infection in asymptomatic persons is not necessary. Similarly, testing persons with previous history of LCMV-compatible illness generally is not useful. Persons with active disease suggestive of LCMV should seek medical care and report any exposures to wild or pet rodents. A physician should determine whether testing for LCMV is indicated. Physicians should work closely with their respective state health departments to discuss forwarding of samples to state laboratories or CDC for testing.

Reported by: *Div of Viral and Rickettsial Diseases, National Center for Infectious Diseases; EIS officer, CDC.*

References

1. CDC. Lymphocytic choriomeningitis virus infection in organ transplant recipients---Massachusetts, Rhode Island, 2005. MMWR 2005: 54;537--9.
2. Institute of Laboratory Animal Resources Commission on Life Sciences, National Research Council. Guide for the care and use of laboratory animals. Washington, DC: National Academy Press; 1996.
3. Childs JE, Glass GE, Ksiazek TG, Rossi CA, Oro JG, Leduc JW. Human-rodent contact and infection with lymphocytic choriomeningitis and Seoul viruses in an inner-city population. Am J Trop Med Hyg 1991;44:117--21.
4. Childs JE, Glass GE, Korch GW, Ksiazek TG, LeDuc JW. Lymphocytic choriomeningitis virus infection and house mouse (*Mus musculus*) distribution in urban Baltimore. Am J Trop Med Hyg 1992;47: 27--34.
5. Morita C, Matsuura Y, Fujii H, et al. Isolation of lymphocytic choriomeningitis virus from wild house mice (*Mus musculus*) in Osaka Port, Japan. J Vet Med Sci 1991;53:889--92.
6. Rousseau MC, Saron MF, Brouqui P, Bourgeade A. Lymphocytic choriomeningitis virus in southern France: four case reports and a review of the literature. Eur J Epidemiol 1997;13:817--23.
7. Traub E. The epidemiology of lymphocytic choriomeningitis in white mice. J Exp Med 1936;64:183--200.
8. Barton LL, Mets MB, Beauchamp CL. Lymphocytic choriomeningitis virus: emerging fetal teratogen. Am J Obstet Gynecol 2002;187: 1715--6.
9. US Department of Health and Human Services. Biosafety in microbiological and biomedical laboratories. 4th ed. Washington, DC: US Department of Health and Human Services, CDC, National Institutes of Health; 1999. Available at http://www.cdc.gov/od/ohs/biosfty/bmbl4/bmbl4toc.htm.
10. Gregg MB. Recent outbreaks of lymphocytic choriomeningitis in the United States of America. Bull World Health Organ 1975;52:549--53.

* These recommendations were assembled by a CDC working group to provide interim guidelines for

protection of public health. Guidelines for care of laboratory animals have been published previously (*2*). In addition, the National Association of State Public Health Veterinarians, in conjunction with partners, is developing a set of comprehensive veterinary infection-control guidelines.

Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

References to non-CDC sites on the Internet are provided as a service to *MMWR* readers and do not constitute or imply endorsement of these organizations or their programs by CDC or the U.S. Department of Health and Human Services. CDC is not responsible for the content of pages found at these sites. URL addresses listed in *MMWR* were current as of the date of publication.

Disclaimer All *MMWR* HTML versions of articles are electronic conversions from ASCII text into HTML. This conversion may have resulted in character translation or format errors in the HTML version. Users should not rely on this HTML document, but are referred to the electronic PDF version and/or the original *MMWR* paper copy for the official text, figures, and tables. An original paper copy of this issue can be obtained from the Superintendent of Documents, U.S. Government Printing Office (GPO), Washington, DC 20402-9371; telephone: (202) 512-1800. Contact GPO for current prices.

**Questions or messages regarding errors in formatting should be addressed to mmwrq@cdc.gov.

Date last reviewed: 7/29/2005

Lymphocytic Choriomeningitis Virus (LCMV)

Prevention Checklist

SEAL UP!

HOW TO KEEP RODENTS OUT OF YOUR HOME

- ☐ Seal up gaps around roofing, attic spaces, windows and doors.
- ☐ Examine the outside of your house for gaps between the foundation and the ground.
- ☐ Inspect for gaps under the sink and locations where water pipes come into your home.
- ☐ Check around vents and air conditioners for holes.
- ☐ Seal any gaps or holes with steel wool, lath metal or caulk.

TRAP UP!

HOW TO USE SNAP TRAPS

- ☐ Fix gaps in trailer skirting.
- ☐ Select an appropriate trap - some are for mice and some are for rats.
- ☐ Read the instructions on the box before setting the snap trap. Set away from children and pets.
- ☐ Place chunky peanut butter the size of a pea on the bait pan on the snap trap.
- ☐ Position the bait end of the trap next to the wall so it forms a “T” with the wall.
- ☐ Place snap traps in areas where you have seen rodents, nesting materials, urine or droppings.

CLEAN UP!

HOW TO KEEP A CLEAN AND HEALTHY HOME

How to clean up rodents and rodent droppings:

- ☐ Wear rubber or plastic gloves when handling dead rodents or rodent droppings.
- ☐ Spray dead rodent, urine or droppings with a disinfectant or a mixture of bleach and water.
- ☐ Soak rodent, nesting materials or droppings in solution for five minutes before wiping up with paper towel or rag as appropriate.
- ☐ Place the paper towel and rodent with trap or nesting material in a plastic bag and seal it.
- ☐ Place the full bag in a second plastic bag and seal it.
- ☐ Mop or sponge the area with a disinfectant or bleach solution.
- ☐ Wash hands with soap and water after taking off your gloves (or use a waterless alcohol-based hand rub when soap is not available and hands are not visibly soiled).

Clean up rodent food sources and nesting sites

- ☐ Place human and pet food in thick plastic or metal containers with tight lids.
- ☐ Wash dishes and cooking utensils soon after use.
- ☐ Put pet food away in rodent-proof containers after use. Do not leave pet-food or water bowls out overnight.
- ☐ Place garbage in thick plastic or metal can with a tight lid.
- ☐ Move woodpiles and composting bins more than 100 feet from the home.
- ☐ Trim grass and shrubbery within 100 feet of the home.

CDC
CENTERS FOR DISEASE Control, and Prevention

For more information on lymphocytic choriomeningitis (LCMV), please visit www.cdc.gov or phone (404) 639-1510

PetAlert

THE PET INDUSTRY'S UNIFIED VOICE

(LCM Gen)

POTENTIONALLY INFECTED RODENTS IN PET STORES

ISSUE.

The presence of Lymphocytic Choriomeningitis virus (LCVM) in organ transplant recipients has been traced to a pet hamster purchased by the organ donor from a Rhode Island pet store. Three of the four recipients died from the virus. Further testing of rodents in the pet store revealed that two hamsters and a guinea pig were also infected. All of the infected animals had been supplied by an animal distributor, MidSouth Distributors of Ohio.

The Centers for Disease Control (CDC) is working with industry to determine which stores and states have received potentially exposed animals from MidSouth. Every pet store that received any animals from MidSouth Distributors since February 2005 should contact their state public health department or agriculture department for additional guidance and information.

CDC, industry and state public health officials are designing educational materials with the aim of minimizing the risk of transmission of LCMV within stores as well as with the public at large. As these materials become available copies will be posted on PIJAC's website (www.pijac.org) as well as in a future PIJAC *PetAlert.*

RECOMMENDATIONS.

- **Review your source records** and if you received **any animals from MidSouth** since February 2005, **contact your state pubic health authority or state department of agriculture** for additional guidance and information
- **State contact information** (if your state is not on the list, contact PIJAC for information on your state):

Alabama	334-206-5969	New Jersey	609-588-3121
Arkansas	501-661-4172	New York	518-474-3186
Connecticut	860-509-7994	North Carolina	919-733-3410
Delaware	302-739-4811	Ohio	614-728-6220
Illinois	217-782-4944	Pennsylvania	717-772-2852
Indiana	317-233-7272	Rhode Island	401-222-2781
Iowa	515-281-4933	South Carolina	864-596-3333
Kentucky	502-564-3418	Tennessee	615-741-7247
Maryland	410-767-5649	Vermont	802-863-7240
Massachusetts	617-626-1790	Virginia	804-864-8141
Minnesota	612-676-5414	Washington DC	202-442-9138
Mississippi	601-576-7725	West Virginia	304-558-2214
Missouri	573-751-6141	Wisconsin	608-266-2154
New Hampshire	603-271-2404		

PET INDUSTRY JOINT ADVISORY COUNCIL (PIJAC)
1220 19th Street, NW, Suite 400, Washington, DC 20036
Phone 202-452-1525, 800-553-PETS, Fax 202-293-4377

- **Review your in-store procedures** for minimizing risk of cross-contamination of your animals as well as exposing your employees and customers to possible infection.
- **Educate all employees** on importance of always washing hands before and after handling animals, their habitats, the bedding and waste materials.
- **Ensure that pregnant or immune suppressed employees** do not handle the rodents without their physician's approval..
- **Clean and disinfect** (household disinfectant) reusable equipment (water bottles, dishes, toys) and cages as appropriate.
- **Advise customers** purchasing Hamsters, Guinea pigs, Gerbils, rats and mice of the importance of practicing safe handling procedures to protect both the animals and their handlers.
- **Inform customers of the importance of pregnant women or persons with weakened immune systems** seriously considering not owning a pet rodent. If they do have pet rodents, the pet rodents should be housed in a separate room and cared for by other people. And they should consult with their physician.
- **Provide your customers with a care sheet** on how to enjoy their pet and safe handling procedures they can use to minimize the chance of getting sick from enjoying their pets. A copy of an industry-sponsored care sheet is attached.

PET INDUSTRY JOINT ADVISORY COUNCIL (PIJAC)
1220 19th Street, NW, Suite 400, Washington, DC 20036
Phone 202-452-1525, 800-553-PETS, Fax 202-293-4377

Update: Interim Guidance for Minimizing Risk for Human Lymphocytic Choriomeningitis Virus Infection Associated with Pet Rodents

In May 2005, CDC received reports of illness in four solid-organ transplant recipients who were later determined to have been infected with lymphocytic choriomeningitis virus (LCMV) from a common organ donor (*1*). Three of the four organ recipients died, 23--27 days after transplantation. This report updates information about the ongoing investigation and provides interim measures for reducing the risk for LCMV infection from pet rodents associated with this outbreak.

Epidemiologic investigation traced the source of the virus to a pet hamster recently purchased by the organ donor from a pet store in Rhode Island. LCMV testing of other rodents at the pet store identified three other LCMV-infected rodents (two hamsters and a guinea pig). All four pet rodents had been supplied by a single distributor, MidSouth Distributors of Ohio. Preliminary test results determined that four (3.4%) of 115 hamsters sampled from the Ohio distributor had active LCMV infection. On the basis of sequence analysis, the LCMV from the transplant recipients, the donor's pet rodent, and from rodents obtained from the Rhode Island pet store and the Ohio distributor were determined to have the same lineage (i.e., likely to share a common source). Under the authority of the Ohio Department of Agriculture, the MidSouth facility was quarantined. The MidSouth owner voluntarily depopulated the facility; the premises also will be disinfected.

LCMV test results for the sampled rodents and records reviewed at the Rhode Island pet store and at MidSouth Distributors indicate that LCMV-infected pet rodents might have been transported from the Ohio facility to pet stores in the northeastern and midwestern United States as early as February 2005. Ohio authorities and CDC are working to determine which stores and states have received potentially affected shipments from the Ohio facility. CDC also is conducting an ongoing traceback investigation of the breeding facilities that supplied MidSouth Distributors.

Background Information

LCMV infection in humans with normal immune systems usually causes either asymptomatic or mild, self-limited illness. Aseptic meningitis also can occur in some patients, but the infection is rarely fatal (*2*). However, LCMV infection during the first or second trimester of pregnancy can cause severe illness or developmental defects in

the fetus, including hydrocephalus, psychomotor retardation, blindness, and fetal death (*3*). The frequency with which developmental defects occur after in utero LCMV infection is not known. In addition, LCMV can be a serious infection in persons with impaired immune systems.

Pet hamsters and guinea pigs are not known to be natural reservoirs for LCMV. However, pet rodents can become infected if they have contact with wild house mice (*Mus musculus*) (e.g, in a breeding facility, pet store, or home). Although infection of other animals with LCMV might be possible, documented infections in humans have occurred only after exposure to infected mice, guinea pigs, and hamsters (*2,4*). Most human cases are associated with wild house mice, which are considered the primary reservoir (*5*).

Serologic testing of pet rodent species for antibodies against LCMV has not been reliable; the tests have not detected antibodies in animals with active infections demonstrated by other tests (i.e., immunohistochemistry staining of tissues and virus isolation). The unreliability of serologic testing is of concern because certain species of pet rodents infected with LCMV can shed virus for up to 8 months without signs of illness and thus can be a source of infection for humans (*4,6*).

A large outbreak of LCMV infection associated with pet hamsters sold by a single distributor was reported in 1974, when 181 symptomatic human cases were identified in 12 states; no deaths occurred (*7*). The outbreak was controlled by voluntary cessation of the sale of pet hamsters and subsequent destruction of the infected breeding stock. Stores were advised that all caging material be decontaminated or destroyed before receiving new animals. In addition, the public was informed of the risk for infection from hamsters purchased during the outbreak at stores supplied by the affected distributor (*8*).

Pet Stores with Potentially Infected Rodents in Stock

Two national retail chains have temporarily stopped the sale of potentially affected rodents (e.g., hamsters, guinea pigs, gerbils, rats, chinchillas, and mice) originating from MidSouth Distributors since February 2005. Pet stores that have received rodents from MidSouth Distributors since February should contact the appropriate authority in their states (i.e., state health department or state department of agriculture) for additional information and guidance.

Although LCMV is known to infect hamsters and guinea pigs, data are insufficient to determine the potential for infection of other rodent species (e.g., chinchillas, dwarf hamsters, or gerbils). However, husbandry practices in breeding facilities, distribution centers, and pet stores make cross-contamination with LCMV of other species a possibility. CDC is working with retailers in the pet industry to consider appropriate testing of these other rodent species.

Practices that can lead to cross-contamination of rodents include 1) housing healthy

rodents in the same room or bin or in cages near potentially infected rodents (i.e., rodents from the MidSouth Distributors facility in Ohio); 2) handling or caring for rodents without washing hands or changing gloves after handling other rodents and between other animal-care activities, such as cleaning cages; 3) placing rodents in cages that previously housed other rodents without first decontaminating the cages with bleach or other appropriate disinfectants; and 4) reusing materials (e.g., water bottles, food dishes, bedding, or toys) that might be contaminated by potentially infected rodents.

Pet rodents that did not originate from MidSouth Distributors of Ohio and were not exposed to potential cross-contamination can be sold or distributed as normal. In addition, nonrodent species (e.g., ferrets and rabbits) can be sold or distributed as normal.

Pet stores are advised to work with state authorities to minimize the risk for transmission of LCMV from affected rodents to humans. Options considered by state authorities include 1) stopping sale or distribution of all rodents originating from MidSouth Distributors of Ohio since February, 2) stopping sale or distribution of hamsters and guinea pigs originating from MidSouth Distributors of Ohio since February, or 3) allowing distribution (i.e., sale or adoption), provided that appropriate educational material (e.g., state-approved informed consent or fact sheet) is provided to purchasers of pet rodents originating from MidSouth Distributors since February. Educational material should disclose the specific LCMV risk in this population of pet rodents and potential outcomes in humans, including birth defects and fetal deaths. If sale of rodents is allowed to continue, populations at high risk (i.e., pregnant women, women who think they might become pregnant, and persons with weakened immune systems) should be advised against purchasing a pet rodent (9).

Preventing LCMV Infection in New Supplies of Rodents

Efforts are under way to ensure that animal facilities and equipment in retail outlets are disinfected, that new supplies of rodents come from sources free from LCMV, and that cross-contamination between new supplies of rodents and potentially infected animals will not occur. Surfaces, cages, and any reusable equipment that has been in contact with affected animals, their waste, or bedding material should be cleaned and disinfected by using a household disinfectant according to the manufacturer's instructions. Persons who are pregnant or have compromised immune systems should not engage in cleaning and disinfection related to these affected animals or other rodents. CDC and other partners will work with breeders and retailers in the pet industry to implement quality-assurance programs to minimize the risk for LCMV infection in rodents that are sold to the public.

Previously Purchased Pet Rodents

Testing of individual pet rodents in households is not a recommended strategy to minimize risk for LCMV infection; the probability of any one rodent in the United

States being infected is low. The greatest infection risk for a pet owner is likely to occur soon after purchase of a pet rodent. Thus, most exposures likely already have occurred for existing owners and substantial added risk is unlikely to result from continued ownership of the rodent. However, women who are or who plan to become pregnant and persons who are immunocompromised should avoid contact with all rodents.

To prevent any possible infection of other rodents in stores, owners should not return pet rodents from MidSouth Distributors to pet stores. For legal, ethical, and wildlife conservation considerations, owners should not release pet rodents into the wild. Persons who no longer wish to keep their pet rodent should consult a veterinarian.

CDC continues to work with state public health officials and retailers in the pet industry to educate the public regarding safe handling of pet rodents and has prepared educational material for reducing the risk for LCMV infection from pet rodents. Rodents and other pets from any pet store pose some risk for transmitting certain infectious diseases and should be handled appropriately. Additional information about reducing the risk for infectious diseases from pets is available at http://www.cdc.gov/healthypets. More detailed information about LCMV is available at http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/lcmv.htm.

Reported by: *Div of Viral and Rickettsial Diseases, National Center for Infectious Diseases, CDC.*

References

1. CDC. Lymphocytic choriomeningitis virus infection in organ transplant recipients---Massachusetts, Rhode Island, 2005. MMWR 2005; 54;537--9.
2. Rousseau MC, Saron MF, Brouqui P, Bourgeade A. Lymphocytic choriomeningitis virus in southern France: four case reports and a review of the literature. Eur J Epidemiol 1997;13:817--23.
3. Barton LL, Mets MB, Beauchamp CL. Lymphocytic choriomeningitis virus: emerging fetal teratogen. Am J Obstet Gynecol 2002;187:1715--6.
4. Traub E. The epidemiology of lymphocytic choriomeningitis in white mice. J Exp Med 1936;64:183--200.
5. Childs JE, Peters CJ. Ecology and epidemiology of arenaviruses and their hosts. In: Salvato MS, ed. The Arenaviridae. New York, NY: Plenum Press;1993:331--84.
6. Skinner HH, Knight EH, Buckley LS. The hamster as a secondary reservoir host of lymphocytic choriomeningitis virus. J Hyg (Lond) 1976;76:299--306.
7. Gregg MB. Recent outbreaks of lymphocytic choriomeningitis in the United States of America. Bull World Health Organ 1975;52:549--53.
8. CDC. Lymphocytic choriomeningitis associated with pet hamsters---New York. MMWR 1974;23.
9. CDC. Interim guidance for minimizing risk for human lymphocytic choriomeningitis virus infection associated with rodents. MMWR

2005;54:747--9.

Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

References to non-CDC sites on the Internet are provided as a service to *MMWR* readers and do not constitute or imply endorsement of these organizations or their programs by CDC or the U.S. Department of Health and Human Services. CDC is not responsible for the content of pages found at these sites. URL addresses listed in *MMWR* were current as of the date of publication.

Disclaimer All *MMWR* HTML versions of articles are electronic conversions from ASCII text into HTML. This conversion may have resulted in character translation or format errors in the HTML version. Users should not rely on this HTML document, but are referred to the electronic PDF version and/or the original *MMWR* paper copy for the official text, figures, and tables. An original paper copy of this issue can be obtained from the Superintendent of Documents, U.S. Government Printing Office (GPO), Washington, DC 20402-9371; telephone: (202) 512-1800. Contact GPO for current prices.

**Questions or messages regarding errors in formatting should be addressed to mmwrq@cdc.gov.

Date last reviewed: 8/12/2005

STATE OF OHIO

Department of Agriculture

OFFICE OF THE DIRECTOR

Reynoldsburg

PROCLAMATION

WHEREAS, the Ohio Department of Agriculture has determined that lymphocytic choriomeningitis (LCMV), as identified in Ohio and other states, may significantly endanger the health of animals and the public in Ohio; and

WHEREAS, LCMV has been designated for purposes of Chapter 941 and for Section 941.01(A) of the Ohio Revised Code as a dangerously contagious or infectious disease; and

WHEREAS:

1) Rodents (order Rodentia) capable of transmitting lymphocytic choriomeningitis virus (LCMV) have been transported into the state of Ohio;

2) Beginning February 2005, certain Ohio pet stores have received shipments of these potentially infected rodents from MidSouth Distributors of Ohio, LLC or from MidSouth Distributors of Arkansas.

3) Pet rodents (e.g., hamsters, dwarf hamsters, guinea pigs, and mice) infected with LCMV are capable of transmitting LCMV to humans;

4) LCMV infection in humans with normal immune systems usually causes either asymptomatic or mild, self-limited illness, characterized by any or all of the following symptoms: fever, malaise, lack of appetite, muscle aches, headaches, nausea, and vomiting;

5) Aseptic meningitis also can occur in some individuals, but the infection is rarely fatal;

6) LCMV infection during the first or second trimester of pregnancy can cause severe illness or developmental defects in the fetus, including hydrocephalus, psychomotor retardation, and blindness;

7) LCMV infection is a well-known occupational risk for laboratory workers who work with LCMV-infected laboratory rodents;

8) An outbreak associated with pet hamsters sold by a single distributor was reported in 1974, when 181 symptomatic cases in persons with hamster contact were identified in 12 states; no deaths occurred. The outbreak was brought under control by voluntary cessation of sale and destruction of the infected breeding stock;

9) Residents of the state of Ohio are at risk of exposure to LCMV infection through exposure to animals that may be capable of transmitting the virus to humans;

10) This situation constitutes an imminent danger to the health or lives of both animals and residents of the state of Ohio; and

11) This determination is based on information provided by the U.S. Centers for Disease Control and Prevention, which investigated potential infection after receiving reports of illness in four solid organ-transplant recipients who were later diagnosed with LCMV infection from a common organ donor. Three of the four organ recipients died 23-27 days after transplantation. Epidemiological investigation traced the source of the virus to a pet hamster purchased by the donor from a pet store in Rhode Island that had been supplied by MidSouth Distributors of Ohio, LLC or from MidSouth Distributors of Arkansas, LLC. Testing of other rodents at this distributor revealed two additional hamsters and a guinea pig, infected with LCMV. It is likely that LCMV-infected pet rodents have been distributed by MidSouth Distributors of Ohio, LLC or from MidSouth Distributors of Arkansas, LLC to pet stores in Ohio.

Now, Therefore, I, Fred Dailey, Director of Agriculture for the State of Ohio, do hereby issue a Proclamation pursuant to 901:1-21-02 (B) of the Ohio Administrative Code Ordering that:

A) The Intra-state transportation, display, sale, any other distribution or release into the environment of animals belonging to the following species, shipped or received from MidSouth Distributors of Ohio, LLC or from MidSouth Distributors of Arkansas, LLC from February 2005 to present, IS PROHIBITED until further notice:

Members of the order Rodentia, including:

- hamsters (Mesocricetus sp.)
- dwarf hamsters (Phodopus sp.)
- guinea pigs (Cavia sp.)
- mice (Mus sp.)

B) The Intra-state transportation, display, sale, any other distribution, or release into the environment of animals caged with any hamsters, dwarf hamsters, guinea pigs, and/or mice shipped or received from MidSouth Distributors of Ohio, LLC or from MidSouth Distributors of Arkansas, LLC from February 2005 to present, IS PROHIBITED until further order, including:

- Any and all hamsters, dwarf hamsters, guinea pigs, and mice sharing the same cage or habitat or in cages adjacent to one another;
- Any and all hamsters, dwarf hamsters, guinea pigs, and mice cared for or handled such that there is a possibility of cross-contamination (e.g., inadequate hand washing, multiple cage cleanings without washing hands in between, etc.);
- Any and all hamsters, dwarf hamsters, guinea pigs, and mice that were placed in cages before the cages had been disinfected (i.e., with bleach or Lysol) after housing other rodents; or
- Any and all hamsters, dwarf hamsters, guinea pigs, and mice that had been exposed to potentially contaminated articles involved in rodent care (e.g., water bottles, food/food dishes, bedding, toys, shelter, etc.)

C) Before resuming the display, sale, or distribution of pet rodents, pet stores or other facilities covered by this order, must clean and disinfect all cages, containers, and equipment that hold or are used for rodents in their facilities, and take steps to ensure that cross contamination between new supplies of rodents and potentially infected animals will not occur. Employees who are pregnant or with compromised immune systems shall not be involved in these activities.

D) This order does not apply to the transportation of the listed species to veterinarians or animal control officials. Also, it does not apply to authorized employees and agents of the Ohio Departments of Agriculture, Health, and Natural Resources in the discharge of their official duties.

E) This Proclamation may be amended to include other species as additional information about LCMV infection and its transmission is acquired.

The Proclamation shall take effect at 6:00 p.m. on August 12, 2005, and shall be effective until rescinded.

Proclamations that are inconsistent with this proclamation are hereby revoked.

IN WITNESS WHEREOF, I have hereunto subscribed my name and caused the Seal of the Ohio Department of Agriculture to be affixed at Reynoldsburg, Ohio; this 12th day of August, in the year Two Thousand and Five.

Fred L. Dailey
Director of Ohio Department of Agriculture

ATTEST:

CERTIFICATION

STATE OF OHIO :
:
COUNTY OF LICKING :

I, Fred L. Dailey, Director, Ohio Department of Agriculture, do hereby certify that the annexed instrument is a true and correct copy of said proclamation which was entered upon the Order Journal of the Ohio Department of Agriculture on the 15th day of August, 2005.

In testimony whereof, I have hereunto set my hand and affixed the Seal of the Ohio Department of Agriculture at Reynoldsburg, Ohio, this 15th day of August, 2005.

Fred L. Dailey

Fred L. Dailey, Director
Ohio Department of Agriculture

Ohio Department of Agriculture

OHIO PROUD®

Governor Bob Taft
Lieutenant Governor Jennette Bradley
Director Fred L. Dailey

Administrative Offices
8995 East Main Street • Reynoldsburg, Ohio 43068-3399
Phone: (614) 466-2732 • Fax: (614) 466-6124
ODA home page: www.state.oh.us/agr/ • e-mail: agri@odant.agri.state.oh.us

November 30, 2005

Sent via facsimile and regular U.S. Mail

Scott Eickelberger, Esq.
Kincaid, Taylor & Geyer
50 North Fourth Street
Box 1030
Zanesville, Ohio 43702-1030

Re: Former Mid-South Building

Dear Mr. Eickelberger:

I apologize that I have been unable to reach you by telephone about this matter. The State Veterinarian, Dr. David Glauer, lifted the quarantine that had been on the former Mid-South building as of yesterday, November 29th. Enclosed is a copy of the quarantine order on the building with the release of the quarantine on the second page. According to our experts there is very little likelihood that the lymphocytic choriomeningitis virus (LCMV) has survived since the removal and destruction of the animals as the virus generally needs a host to survive. Also, the wide swings in temperature over the past month would make it very unlikely that the virus has survived. However, Dr. Glauer has a couple of precautions that your client should take with any remaining items within the building.

Dr. Glauer mentioned that there are still materials, primarily outside the building, although there may be some items still within the building. While it is highly unlikely that the virus is still active, some precautions should still be taken when handling these items. Any contact with any items, particularly items that were previously used as cages or bedding should only be done while wearing gloves, masks, and disposable coveralls. Again, while it is unlikely that the virus is still living in any of these materials these precautions should be taken given the potentially deadly effect the virus has upon humans. Please refer to the background paper enclosed for more information on this virus. Also, please note that any wild rodents that may be living in the building have approximately a 5 percent possibility of carrying this virus, thus, they too should be treated with caution.

Again, the quarantine has been lifted on this building and your client is free to enter the building. I apologize that I was not able to relay this information to you yesterday, November 29th. If you have any questions, please feel free to call me at (614) 728-6213. Please note, however, that I will be out of the office this Thursday and Friday, December

1-2 for Reserve duty. The office staff, however, will know how to reach me, therefore, if you need to speak to me prior to next Monday (12/5), please call (614) 728-6430 and ask to speak to the Chief Legal Counsel, William Hopper, and he can get you the phone number of where I can be reached.

Sincerely,

David D. Gorman
Staff Counsel

Enc.

cc: R. David Glauer, D.V.M.

ORDER OF QUARANTINE

OHIO DEPARTMENT OF AGRICULTURE
DIVISION OF ANIMAL INDUSTRY
Reynoldsburg, Ohio 43068

Owner/Bailee MIDSOUTH DISTRIBUTORS of Ohio LLC Date 08/01/2005
Street/Road 7529 EAST PIKE City NORWICH Zip 43767 County MUSKINGUM
Owner Phone(740) - 872-0300
In accordance with Ohio law you are hereby ordered to keep under quarantine upon the premises where designated, to wit: 7529 EAST PIKE NORWICH, OH 43767
Location

the following described animal(s):
PROPERTY
Number Species

Description or Identification: ALL BUILDINGS & SEMI-TRAILERS USED TO STORE ANIMAL FOOD AT ABOVE LISTED ADDRESS

Reason for quarantine: DC&I or FAD disease or investigation /residue /import violation /other (circle one/give details)
Statute and/or Administrative Code cited 941.07 (A) ORC
Terms for release of quarantine: NO ANIMALS ARE TO BE BROUGHT ONTO THE PROPERTY OR HOUSED AT ABOVE LISTED LOCATION WITHOUT PERMISSION BY THE DIRECTOR OF AGRICULTURE OR HIS DESIGNEE

NO ANIMAL SHALL BE BROUGHT TO OR REMOVED FROM A QUARANTINED PREMISES WITHOUT WRITTEN PERMISSION FROM THE OHIO DEPARTMENT OF AGRICULTURE.

Remarks:

Quarantined by: [illegible] Date 08/01/2005 Phone(614) 728-6240
ODA / VS Representative

If the owner disagrees with this quarantine the owner has the right to a hearing on the matter. A written request for such hearing should be sent to ODA Staff Attorney, 8995 E. Main St., Reynoldsburg, Ohio 43068. This request must be made within 30 days of the quarantine date.

Fred L Dailey
Director of Agriculture
AGR 0267 (Rev. 9/95)

Pink-For Owner or Person in Charge of Animals
White-Chief, Animal Industry
Canary-For Person Issuing the Quarantine

ODA is an equal opportunity agency. If you believe you have been discriminated against because of race, color, religion, sex, national origin, age, or disability in the provision of service, write immediately to the Director of the Ohio Department of Agriculture, 65 S. Front Street, Columbus, Ohio 43215.

WARNING

OHIO LAW AND REGULATIONS provide penalty in the form of fine and/or imprisonment for Violation of Quarantine.

FIRST INSPECTION BY

Name_____

Address_____

Date_____

SECOND INSPECTION BY

Name_____

Address_____

Date_____

THIRD INSPECTION BY

Name_____

Address_____

Date_____

FOURTH INSECTION BY

Name_____

Address_____

Date_____

FINAL INSPECTION BY

Name_____

Address_____

Date Quarantine Removed_____

BACKGROUNDER • Ohio Department of Agriculture

Governor Bob Taft
Lieutenant Governor Bruce Johnson
Director Fred L. Dailey

Communications Office
8995 East Main Street • Reynoldsburg, Ohio 43068
Phone: 614-752-9817 • Fax 614-466-7754
ODA home page: www.ohioagriculture.gov • e-mail: agri@mail.agri.state.oh.us

NEW Information in Bold
July 28, 2005

Backgrounder: Lymphocytic Choriomeningitis Virus Confirmed at Norwich Pet Distribution Facility

Current Situation

- **The lymphocytic choriomeningitis virus (LCMV) has been found in hamsters at Mid-South Distributors of Ohio, LLC, a pet distributor in Norwich.**

- **Four animals were found to be positive for LCMV. Two positives came from an Arkansas facility owned by Mid-South. Some test results are still pending, and we expect to have final results next week.**

- **The Ohio Department of Agriculture (ODA) is working with Mid-South to depopulate and dispose of animals at the facility.**

- **The facility is still under quarantine (no movement in or out of the facility with facility equipment or animals) and will have to go through an extensive sanitation process in order for the quarantine to be lifted. ODA will work with Mid-South to decontaminate before animals can re-enter the facility. ODA will monitor the facility to make sure it is in compliance with stipulations on the release of the quarantine.**

- **ODA will conduct continual inspections to help reduce free roaming animals in future populations.**

- **According to the Ohio Department of Health (ODH), there are no human health occurrences in Ohio.**

ODA Response

- ODA, the Centers for Disease Control and Prevention (CDC), USDA Animal Care, USDA APHIS Veterinary Services, USDA Animal Health, ODH, local health department, Enforcement Investigation Services, and the Muskingum County Sheriff's office are working together on this investigation.

- ODA contacted state veterinarians in six states that received shipments the day of the quarantine to inform them of the situation. Those states include New York, New Jersey, Connecticut, Vermont, Massachusetts, and Pennsylvania.

- Consumers who think they may have purchased an animal that came from this distributor or have questions, please consult with their veterinarian. For other questions, call ODA's Animal Industry Division at 614.728.6220.

- Consumers with questions regarding human health are urged to call ODH at 1.888.722.4371, report illness to your local health department, or consult with a doctor.

- CDC's department of public inquiries can be reached by calling 404.639.1510 or e-mailing dvd1spath@cdc.gov. Consumers may also visit the CDC's National Center for Infectious Diseases' website on LCMV at: http://www.cdc.gov/healthypets/lcmv_rodents.htm.

Overview of the Investigation

- ODA animal health inspectors begun an investigation of Mid-South Distributors of Ohio, LLC, a pet distributor in Norwich on Monday, July 18. Investigators collected samples on to check the premises for LCMV, which can unknowingly be transferred from pet rodents to humans. The disease can be dangerous to humans with suppressed immune systems and pregnant women.

- The location was quarantined to obtain results from samples being tested by CDC. Approximately 20 dead or sick animals, and approximately 100 general population animals were tested.

- The investigation was initiated after a CDC investigation into three organ recipient deaths. The organ donor was linked to LCMV through a black bear pet hamster. Humans typically show flu like symptoms, but organ recipients don't have the ability to fight the disease, due to suppressed immunity. The CDC traced the organ donor's pet to the Zanesville distribution facility.

- Ohio Revised Code 941.07 allows ODA to quarantine a facility if a dangerously contagious or infectious animal disease is suspected.

- Animals are required to have certificate of veterinary inspection issued by a veterinarian in the state of origin and a permit for each shipment of animals. The animals at this distribution facility, which are shipped from a number of states, had not been shipped with inspection papers since October 2004.

- The Zanesville distribution center is used to reorganize and transfer rodents into smaller shipments to the East Coast. The center carries an average inventory of 3,500 to 4,500 animals, which include rats, hamsters, mice, guinea pigs, and other pocket pets.

Overview of the Disease

- What is LCMV? According to the CDC, lymphocytic choriomeningitis, or LCMV, 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). Additionally, pregnancy-related infection has been associated with congenital hydrocephalus, chorioretinitis, and mental retardation.

- LCMV is one of 35 dangerously contagious or infectious diseases on the state's current list. LCMV was added in June.

- According to the CDC, LCMV is carried by rodents and can be passed to humans. Not all people who are exposed to the virus become ill. Signs and symptoms of LCMV infection are similar to those for influenza and include fever, stiff neck, malaise, anorexia (lack of appetite), muscle aches, headache, nausea, and vomiting. Symptoms occur 1–2 weeks after exposure.

- According to the CDC, some hamsters may not show signs of infection. Those that do show signs of infection have been infected and transmitting virus for several months. The early signs of LCMV infection in a hamster include loss of activity, loss of appetite, and rough coat. Later, the animal may show signs of weight loss, hunched posture, inflammation of the eye lids, and eventually death. This can take several weeks or months.

- LCMV is commonly spread from animal to animal, only rarely from animal to human.

Reporters: For More Information

- For more information about ODA's ongoing investigation, reporters should call 614.752.9817.

- For more information about human health or human transmission, reporters should call ODH at 614.644.8562.

- For more information on animal welfare, reporters should call USDA Animal Care at 301.734.7799.

- For more information about the disease, reporters should call the CDC at 404.639.1143 or visit the CDC's National Center for Infectious Diseases' website on LCMV at: http://www.cdc.gov/healthypets/lcmv_rodents.htm.