

Lassa Fever

Lassa fever is an acute viral illness that occurs in west Africa. The illness was discovered in 1969 when two missionary nurses died in Nigeria. The virus is named after the town in Nigeria where the first cases occurred. The virus, a member of the virus family *Arenaviridae*, is a single-stranded RNA virus and is zoonotic, or animal-borne.

Lassa fever is endemic in parts of west Africa including Sierra Leone, Liberia, Guinea and Nigeria; however, other neighboring countries are also at risk, as the animal vector for Lassa virus, the "multimammate rat" (*Mastomys natalensis*) is distributed throughout the region. In 2009, the first case from Mali was reported in a traveler living in southern Mali; Ghana reported its first cases in late 2011. Isolated cases have also been reported in Côte d'Ivoire and Burkina Faso and there is serologic evidence of Lassa virus infection in Togo and Benin.

The number of Lassa virus infections per year in west Africa is estimated at 100,000 to 300,000, with approximately 5,000 deaths. Unfortunately, such estimates are crude, because surveillance for cases of the disease is not uniformly performed. In some areas of Sierra Leone and Liberia, it is known that 10%-16% of people admitted to hospitals every year have Lassa fever, which indicates the serious impact of the disease on the population of this region.

Transmission

The reservoir, or host, of Lassa virus is a rodent known as the "multimammate rat" (*Mastomys natalensis*). Once infected, this rodent is able to excrete virus in urine for an extended time period, maybe for the rest of its life. *Mastomys* rodents breed frequently, produce large numbers of offspring, and are numerous in the savannas and forests of west, central, and east Africa. In addition, *Mastomys* readily colonize human homes and areas where food is stored. All of these factors contribute to the relatively efficient spread of Lassa virus from infected rodents to humans.

Transmission of Lassa virus to humans occurs most commonly through ingestion or inhalation. *Mastomys* rodents shed the virus in urine and droppings and direct contact with these materials, through touching soiled objects, eating contaminated food, or exposure to open cuts or sores, can lead to infection.

Because *Mastomys* rodents often live in and around homes and scavenge on leftover human food items or poorly stored food, direct contact transmission is common. *Mastomys* rodents are sometimes consumed as a food source and infection may occur when rodents are caught and prepared. Contact with the virus may also occur when a person inhales tiny particles in the air contaminated with infected rodent excretions. This aerosol or airborne transmission may occur during cleaning activities, such as sweeping.

Direct contact with infected rodents is not the only way in which people are infected; person-to-person transmission may occur after exposure to virus in the blood, tissue, secretions, or excretions of a Lassa virus-infected individual. Casual contact (including skin-to-skin contact without exchange of body fluids) does not spread Lassa virus. Person-to-person transmission is common in health care settings (called nosocomial transmission) where proper personal protective equipment (PPE) is not available or not used. Lassa virus may be spread in contaminated medical equipment, such as reused needles.

Signs and Symptoms

Signs and symptoms of Lassa fever typically occur 1-3 weeks after the patient comes into contact with the virus. For the majority of Lassa fever virus infections (approximately 80%), symptoms are mild and are undiagnosed. Mild symptoms include slight fever, general malaise and weakness, and headache. In 20% of infected individuals, however, disease may progress to more serious symptoms including hemorrhaging (in gums, eyes, or nose, as examples), respiratory distress, repeated vomiting, facial swelling, pain in the chest, back, and abdomen, and shock. Neurological problems have also been described, including hearing loss, tremors, and encephalitis. Death may occur within two weeks after symptom onset due to multi-organ failure.

The most common complication of Lassa fever is deafness. Various degrees of deafness occur in approximately one-third of infections, and in many cases hearing loss is permanent. As far as is known, severity of the disease does not affect this complication: deafness may develop in mild as well as in severe cases.

Approximately 15%-20% of patients hospitalized for Lassa fever die from the illness. However, only 1% of all Lassa virus infections result in death. The death rates for women in the third trimester of pregnancy are particularly high. Spontaneous abortion is a serious complication of infection with an estimated 95% mortality in fetuses of infected pregnant mothers.

Because the symptoms of Lassa fever are so varied and nonspecific, clinical diagnosis is often difficult. Lassa fever is also associated with occasional epidemics, during which the case-fatality rate can reach 50% in hospitalized patients.

Risk of Exposure

Individuals at greatest risk of Lassa virus infection are those who live in or visit endemic regions, including Sierra Leone, Liberia, Guinea, and Nigeria and have exposure to the multimammate rat. Risk of exposure may also exist in other west African countries where *Mastomys* rodents exist. Hospital staff are not at great risk for infection as long as protective measures and proper sterilization methods are used.

Diagnosis

Lassa fever is most often diagnosed by using enzyme-linked immunosorbent serologic assays (ELISA), which detect IgM and IgG antibodies as well as Lassa antigen. Reverse transcription-polymerase chain reaction (RT-PCR) can be used in the early stage of disease. The virus itself may be cultured in 7 to 10 days, but this procedure should only be done in a high containment laboratory with good laboratory practices. Immunohistochemistry, performed on formalin-fixed tissue specimens, can be used to make a post-mortem diagnosis.

Treatment

Ribavirin, an antiviral drug, has been used with success in Lassa fever patients. It has been shown to be most effective when given early in the course of the illness. Patients should also receive supportive care consisting of maintenance of appropriate fluid and electrolyte balance, oxygenation and blood pressure, as well as treatment of any other complicating infections.

Prevention

Primary transmission of the Lassa virus from its host to humans can be prevented by avoiding contact with *Mastomys* rodents, especially in the geographic regions where outbreaks occur. Putting food away in rodent-proof containers and keeping the home clean help to discourage rodents from entering homes. Using these rodents as a food source is not recommended. Trapping in and around homes can help reduce rodent populations; however, the wide distribution of *Mastomys* in Africa makes complete control of this rodent reservoir impractical.

When caring for patients with Lassa fever, further transmission of the disease through person-to-person contact or nosocomial routes can be avoided by taking preventive precautions against contact with patient secretions (called VHF isolation precautions or barrier nursing methods). Such precautions include wearing protective clothing, such as masks, gloves, gowns, and goggles; using infection control measures, such as complete equipment sterilization; and isolating infected patients from contact with unprotected persons until the disease has run its course.

Further, educating people in high-risk areas about ways to decrease rodent populations in their homes will aid in the control and prevention of Lassa fever. Other challenges include developing more rapid diagnostic tests and increasing the availability of the only known drug treatment, ribavirin. Research is presently under way to develop a vaccine for Lassa fever.

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