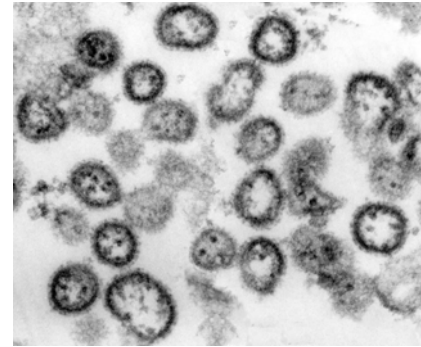




# Lassa Fever

## Pathogen: *Lassa virus*

The Lassa virus was first described in 1950 and isolated in 1969 from blood samples belonging to two fatally ill nurses in Lassa (Nigeria). The zoonotic (animal-to-person transmission) Lassa virus is part of the Arenaviridae family and is polymorphic in shape, measuring between 80 and 300 nm in diameter. The lipid membrane of the virus particle contains two ring-shaped nucleocapsids (protein membranes), which contain the negative-sense RNA strands: L (long; approx. 7,400 bases) and S (short; approx. 3,400 bases). Like most RNA viruses, Lassa viral bacteria remain infectious for several hours at an ambient temperature. However, when heated to 60 °C for one hour, they become deactivated.



Picture: F. A. Murphy, School of Veterinary Medicine, University of California, Davis.

## Occurrence

Lassa fever is first and foremost endemic in West Africa. According to recent serological studies, it probably exists in other parts of the continent too. So far, natural outbreaks of the disease have been described in the following countries: Sierra Leone, Côte d'Ivoire, Liberia, Guinea, Central African Republic and Nigeria. It is estimated that there are a total of 300,000 cases of Lassa fever per year, around 5,000 of which prove fatal. The last recorded large-scale outbreak of Lassa fever occurred between January 1996 and April 1997 in Sierra Leone. At that time, 823 people were infected, with 153 subsequently dying (19%). Then, in Summer 2000 a Dutch doctor became infected in Sierra Leone and died shortly after his return. To date, Switzerland has had no reported cases of Lassa fever. However, since 1974, Germany has had eight imported cases of Lassa fever: two cases in 1974 and 1985 (doctors), two fatal cases in 2000 (a student who had been living in Africa, as well as a Nigerian man who had been flown to Germany for diagnosis and treatment) and four cases in 2004.

## Transmission

The reservoir of the virus is wild rodents, particularly the African rat *Mastomys natalensis* (multimammate rat) and related species. Throughout their life infected rodents excrete the pathogen in very high concentrations and contaminate food and water. Smear infections may occur through broken skin and intact mucous membranes (airways) coming into direct contact with the bacterium. In some regions, the human population is known even to eat these infected rodents. Most cases of Lassa fever are reported during the dry season (January to March). Person-to-person transmission is possible in the first days after the infection through bleeding. Only a week after infection a high viremia (concentration of viruses in the blood) level is reached, through which other bodily fluids such as saliva and urine can also become infectious. Although the illness lasts between 1 and 4 weeks, viruses can be secreted in the urine 3 to 9 weeks after infection and up to 3 months in semen. Laboratory infections may occur due to the careless handling of the virus.

## Incubation period

Incubation period (time between infection and appearance of first symptoms) is between 6 and 21 days.

### Symptoms (pathology)

40%-80% of cases of Lassa fever progress subclinically (unnoticed) or with mild symptoms. Following the incubation period, the onset of the illness is slow, and is characterised by fever and non-specific symptoms (generally feeling unwell, headache, sore throat and aching limbs). The haemorrhagic fever begins on around the 7<sup>th</sup> day of the illness, characterised for example by swelling of the eyelids and face, conjunctivitis, hypotension, and pronounced myalgia (muscle pain). This is followed by painful coughing, hypotension, nausea, vomiting, a high SGOT (serum-glutamate-oxalacetate-transaminase) value and a high viremia level. At this point, the prognosis is poor. Body temperature can rise to 39 - 41 °C. Haemorrhaging can lead to multiorgan failure. Among hospitalised patients, the mortality rate is 20%; if left untreated, it can rise to 60%. In endemic regions, if people present with the following clinical symptoms, there is an 80% likelihood that they have Lassa fever: fever accompanied pharyngitis (inflammation of the pharynx), proteinuria (passing of low-molecular proteins in urine) and retrosternal (behind the breast bone) pain. Many patients who recover from the infection are left with residual deafness.

### Diagnosis (identification)

It is difficult to diagnose Lassa fever exactly, as its symptoms are very similar to those of severe malaria, Ebola or even Yellow Fever. Where there are sufficient grounds to suspect infection, the first physician to treat the patient takes a blood sample, which is then analysed by special biosafety laboratories. In Switzerland, only the Institute for Clinical Microbiology (IKMI) in St. Gallen performs Lassa virus diagnostic procedures. Infection is diagnosed by immunological tests, such as ELISA (enzyme-linked immunosorbent assay) and molecular tests, such as reverse transcription polymerase chain reaction (RT-PCR).

### Therapy

There is currently no vaccine against the Lassa viruses. However, research has been stepped up worldwide due to the bioterrorist threat. The aim is to develop a vaccine with attenuated (diluted) viruses, which could be combined with a Yellow Fever vaccine, since both illnesses are endemic in the same West African regions. The most recent vaccine trials with genetically modified VSV (vesicular stomatitis viruses) have produced encouraging results in non-human primates.

To date, the mortality rate falls when the antiviral drug and nucleoside analogue, Ribavirin, is administered 6 days from the appearance of the subjective symptoms. Therapy also generally involves intensive medical care. During this time, the patient is routinely monitored for the sudden onset of hypotension (drop in blood pressure).



Picture: World Health Organization (WHO)  
Uige province, Angola 2005

### Lassa viruses as biological weapons

As a haemorrhagic fever, the Lassa viruses meet main bioweapon criteria. They are highly contagious (person-to-person transmission) and have a high mortality rate. There is currently no prophylaxis or therapy, and the diagnosis of Lassa viruses must be carried out under special conditions, such as level 4 biosafety laboratories. However, Lassa viruses have a limited ability to survive in the environment and the effectiveness of aerosol infection is unclear. Genetic engineering may make it possible to manufacture aerosolised arenaviruses, thus underlining their bioweapon potential.

### Literature

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