26 | LASSA VIRUS

26.1 | Disease agent

- Lassa virus (LASV)

26.2 | Disease agent characteristics

- Family: *Arenaviridae*; Genus: *Mammarenavirus*.
- Virion morphology and size: Enveloped, spherical or pleomorphic virions with a ribonucleoprotein complex or nucleocapsid structure, diameter of 50 nm to more than 200 nm (mean: 110–130 nm). Virion surface is covered with club-shaped projections.
- Nucleic acid: Ambisense genomic organization (two viral genes separated by an intergenic region), bisegmented, negative-sense, single-stranded RNA genome, S (small, ∼3.5 kb) and L (large, ∼7.2 kb) segments.
- Physicochemical properties: Inactivated by low-level disinfectants, such as quaternary ammonium-based products, phenolics, chlorine-based products, and iodophor formulations; estimated time required to inactivate 5 logs PFU/mL of LASV is 37 min at 60°C; loss of infectivity occurs in serum after 15 min in 3% acetic acid; over 5 logs of LASV is inactivated/rad of Co60 radiation; successful inactivation after 20 min of UV exposure (1200–2000 W/cm^2).

26.3 | Disease name

- Lassa fever
- Lassa hemorrhagic fever

26.4 | Priority level

- Scientific/Epidemiologic evidence regarding blood safety: Theoretical; viremia is a feature of symptomatic infection and transmission with this agent. Asymptomatic viremia has been neither well studied nor sought aggressively, so there are few or no data to make a critical assessment of risk.
- Public perception and/or regulatory concern regarding blood safety: Absent
- Public concern regarding disease agent: Very low

26.5 | Background

- Disease first recognized in 1969 in a nurse in a rural clinic near Lassa, Nigeria, and is endemic in West Africa. Crude estimates suggest that 100,000– 300,000 infections and 5000 deaths occur each year in West Africa.
  - At the time of this revision (March 2023), an epidemic with 636 confirmed cases and 104 deaths is in progress in Nigeria.
- Epidemics are recognized and have commonly included secondary spread to health care providers.
- Focality is common (uneven distribution of virus). Cases are seasonal and tend to occur in the first quarter of the year.
- Classified among the highest priority for bioterrorism agents by the CDC (Category A)

26.6 | Common human exposure routes

- This zoonotic virus is shed in urine and droppings of the chronically infected animal host, the multimammate rat (*Mastomys natalensis*).
- Contamination can occur through contact with infected urine and excreta, ingestion of contaminated food such as rice, by inhalation of aerosols, during capture and preparation of infected rodents as a food source, and more generally as a consequence of proximity to rodent infestations.
- The common occurrence of person-to-person transmission after exposure to blood, body fluid, or tissue of Lassa fever patients distinguishes this *Mammarenavirus* from others.

26.7 | Likelihood of secondary transmission

Occurs following direct contact with infected blood, tissues, secretions, or excretions. Nosocomial transmission, particularly parenteral, is common in healthcare settings where proper personal protective equipment is not used. LASV has been isolated from semen for up to 3 months.

26.8 | At-risk populations

- Nonimmune individuals within the geographic range of the virus
- A threat as a bioterrorist weapon for populations not previously considered being at risk

26.9 | Vector and reservoir involved

- Chronic viremic infection in neonatal *Mastomys* rodents following congenital or vertical transmission

26.10 | Blood phase

- There are no published data documenting transmission by transfusion.
- In one study, virus was recovered from the blood of patients from 3 to 22 days after the onset of the illness.
- Whether viremia occurs in asymptomatic individuals, during the incubation period, or after resolution of signs and symptoms, requires further study.

26.11 | Survival/persistence in blood products

- Unknown

26.12 | Transmission by blood transfusion

- Never reported

26.13 | Cases/frequency in population

- Lassa fever is endemic and sometimes epidemic in West Africa, but incidence has not been reported elsewhere.
- Incidence rates in some rural villages in Sierra Leone have reached 10%–20% per year.

26.14 | Incubation period

- Typically, 10 days (range, 2–21 days) when infection is transmitted person-to-person, and it is assumed that transmission from infected rodents is similar

26.15 | Likelihood of clinical disease

- While Lassa fever is mild or has no observable symptoms in about 80% of people infected with the virus, the remaining 20% have a more severe multisystem disease.

26.16 | Primary disease symptoms

- Varied and nonspecific, including fever, weakness, malaise, exudative pharyngitis, retrosternal and abdominal back pain, cough, vomiting, conjunctivitis, diarrhea, proteinuria
- Mucosal bleeding and neurological complications also can occur.
- Severe hemorrhagic fever involving multiple organs occurs in 5-10% of cases and it manifests primarily as a diffuse capillary leak syndrome with facial edema, hypotension, pleural effusions, oliguria, and peripheral vasoconstriction.

26.17 | Severity of clinical disease

- Most symptomatic patients recover.
- Lassa hemorrhagic fever can be lethal.
- Unilateral or bilateral hearing loss is a frequent sequela.
- Can also cause spontaneous abortion, pericarditis, orchitis, and uveitis

26.18 | Mortality

- The overall case-fatality rate is approximately 1%, but it is 15%–20% among hospitalized cases and can be as high as 50% in epidemic settings.
- High-titer viremia at presentation is a useful prognostic index. At 10^3 tissue culture infectious doses and higher, the mortality is around 80%, whereas, at lower levels, it is less than 20%.

26.19 | Chronic carriage

- No published data in humans
- The reservoir, rodents, can be chronically infected when initially infected as neonates or *in utero*.

26.20 | Treatment available/efficacious

- Ribavirin has been used with success in patients with Lassa fever. It has been shown to be most effective when given early in the course of the illness. A recent systematic review and meta-analysis questions its risk-benefit in mild infections.
- 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 complicating infections.

26.21 | Agent-specific screening question(s)

- No specific question is in use; however, current geographic deferrals for malaria will exclude at-risk

populations from endemic sub-Saharan Africa if an asymptomatic viremic interval exists.
- Not indicated because transfusion transmission has not been demonstrated
- No sensitive or specific question is feasible.
- Under circumstances of a bioterrorism threat, the need for, and potential effectiveness of, specific donor screening questions would need to be addressed.

26.22 | Laboratory test(s) available

- No FDA-approved diagnostic tests or FDA-licensed blood donor screening test exist.
- Diagnosis is most often made by serology (EIA) for antibody or antigen. Viral cultures can also be carried out but require BSL-4 containment.
- RT-PCR can be used in the early stage of disease. Because of the substantial genetic variability of the Lassa genome, a multiplex PCR assay is preferred by CDC.

26.23 | Currently recommended donor deferral period

- No FDA Guidance or AABB Standard exists.
- Routine screening practices would defer donors with fever and symptoms. Prudent practice should defer infected individuals until signs and symptoms are fully resolved and any course of treatment is complete.
- The deferral interval due to geographic risk for malaria (a minimum of 3 months) is likely adequate for donors from Lassa endemic areas who have clinically recovered from their disease.

26.24 | Impact on blood availability

- Agent-specific screening question(s): Not applicable; in response to a bioterrorism threat, impact of a local deferral would be significant.
- Laboratory test(s) available: Not applicable

26.25 | Impact on blood safety

- Agent-specific screening question(s): Not applicable; unknown impact in response to a bioterrorism attack
- Laboratory test(s) available: Not applicable

26.26 | Leukoreduction efficacy

- Unknown but unlikely (no known tropism for WBCs)

26.27 | Pathogen reduction efficacy for plasma derivatives

- No specific data available, but presumed to be robust, as the agent is an enveloped virus that should be sensitive to many measures used in the fractionation process

26.28 | Other prevention measures

- Vaccines are under development.
- Avoidance of contact with infected material in endemic areas and use of PPE during care of affected patients

SUGGESTED READING

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