

Lassa Virus

Disease Agent:

- Lassa virus (LASV)

Disease Agent Characteristics:

- Family: *Arenaviridae*; Genus: *Arenavirus*
- Virion morphology and size: Enveloped, pleomorphic virions with filamentous helical nucleocapsids, diameter of 50-300 nm (mean: 110-130 nm)
- Nucleic acid: Ambisense genomic organization (two viral genes separated by an intergenic region), bisegmented, negative-sense, single-stranded RNA genome, S (small, ~3.4 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 minutes at 60°C; loss of infectivity occurs in serum after 15 minutes in 3% acetic acid; over 5 logs of LASV is inactivated/rad of Co₆₀ radiation; successful inactivation after 20 minutes of UV exposure (1200-2000 W/cm²).

Disease Name:

- Lassa fever
- Lassa hemorrhagic fever

Priority Level

- Scientific/Epidemiologic evidence regarding blood safety: Theoretical; viremia is a feature of symptomatic infection 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

Background:

- Disease first discovered in 1969 in West Africa where it is endemic. Crude estimates suggest that up to 300,000 infections and 5000 deaths occur each year in West Africa.
- Epidemics are recognized and have commonly included secondary spread to health care providers.
- Focality is common (uneven distribution of virus).
- Classified among the highest priority for bioterrorism agents by the CDC (Category A)

Common Human Exposure Routes:

- Virus is shed in urine and droppings of the chronically infected animal host, the multimammate rat (*Mastomys* rodent species).
- Contamination can occur through contact with infected excreta, ingestion of contaminated food, by inhalation of aerosols, or during capture and preparation of infected rodents as a food source.
- The occurrence of person-to-person transmission via close contact with infected blood, body fluid, or tissue of Lassa fever patients distinguishes this arenavirus from others.

Likelihood of Secondary Transmission:

- Occurs following direct contact with infected bodily fluids, secretions or excretions. LASV isolated from semen 6 weeks after acute disease.

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

Vector and Reservoir Involved:

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

Blood Phase:

- There are no published data documenting transmission by transfusion, but a viremic phase is well documented. In one study, virus was recoverable from the blood of patients from 3 to 22 days after the onset of illness.
- Information is scarce on the occurrence of viremia during the incubation period or after resolution of symptoms.

Survival/Persistence in Blood Products:

- Unknown

Transmission by Blood Transfusion:

- Never reported

Cases/Frequency in Population:

- Lassa fever is endemic and sometimes epidemic in Western Africa, but incidence is nil elsewhere.
- Infection rates in some rural villages in Sierra Leone have reached 10-20% per year.

Incubation Period:

- Typically 10 days (range, 5-21 days) when infection is transmitted person-to-person, and it is assumed that transmission from infected rodents is similar

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.

Primary Disease Symptoms

- Varied and nonspecific, including fever, exudative pharyngitis, retrosternal and abdominal back pain, cough, vomiting, conjunctivitis, diarrhea, proteinuria
- Mucosal bleeding and neurological complications also can occur.
- Severe infection is manifest primarily as a diffuse capillary leak syndrome with facial edema, hypotension, pleural effusions, oliguria, and peripheral vasoconstriction.

Severity of Clinical Disease:

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

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 infective doses and higher, the mortality is around 80%, whereas, at lower levels, it is less than 20%.

Chronic Carriage:

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

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.
- 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.

Agent-Specific Screening Question(s):

- No specific question is in use; however, current geographic deferrals for malaria and group O HIV would 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.

Laboratory Test(s) Available:

- No FDA-licensed blood donor screening test exists.
- Diagnosis is most often made by serology (EIA) for antibody or antigen. Viral cultures can also be carried out. NAT is also used in research settings.

Currently Recommended Donor Deferral Period:

- No FDA Guidance or AABB Standard exists.
- Prudent practice would be to defer donor until signs and symptoms are gone and any course of treatment is complete.
- The deferral interval due to geographic risk for malaria and group O HIV is expected to be longer than what might be recommended for donors from Lassa endemic areas who have clinically recovered from their disease.

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

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

Leukoreduction Efficacy:

- Unknown but unlikely (no known tropism for WBCs)

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

Other Prevention Measures:

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

Suggested Reading

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