

12 | HANTAVIRUS—OLD WORLD

12.1 | Disease agent

- Old World Hantaviruses

12.2 | Disease agent characteristics

- Family: *Hantaviridae*; Subfamily: *Mammantavirinae*; Genus: *Orthohantavirus*.
- Virion morphology and size: Enveloped, helical nucleocapsid symmetry, spherical to pleomorphic particles, 80–120 nm in diameter.
- Nucleic acid: Circular, segmented, negative-sense, single-stranded RNA, 11.8–13.8 kb in length.
- Physicochemical properties: Inactivated by dry heat (56°C for 30 min) and solvent-detergent treatments.

12.3 | Disease name

- Hemorrhagic fever with renal syndrome (HFRS)

12.4 | Priority level

- Scientific/Epidemiologic evidence regarding blood safety: Theoretical
- Public perception and/or regulatory concern regarding blood safety: Very low to absent
- Public concern regarding disease agent: Low but moderate in endemic areas

12.5 | Background

- In 1913, HFRS was first described in Russia.
- In 1951, an HFRS outbreak occurred in US troops stationed in Korea.
- Four serotypes (*Hantaan*, *Seoul*, *Puumala*, and *Dobrava*) are the most common causes of HFRS.
- The genus is named after the Hantaan River in South Korea.
- HFRS is an acute febrile illness that progresses to renal failure, hemorrhage, and shock and is primarily found in Europe, Africa and Asia.
- *Orthohantaviruses* mainly infect endothelial cells in the microvasculature in multiple organs, but also macrophages, dendritic cells and renal tubular epithelium.

12.6 | Common human exposure routes

- Transmission is by inhalation of excreta from infected rodents.
- Other potential (but rare or suspected) routes of transmission are rodent bites, touching the nose or mouth after handling objects contaminated with rodent urine, droppings, or saliva, or eating food contaminated with rodent excreta.

12.7 | Likelihood of secondary transmission

- Old World hantaviruses are not known to be transmitted from person to person or through blood transfusion.

12.8 | At-risk populations

- The greatest risk is among people in rural and semi-rural areas who work, play, or live in any closed space where rodents are present. Primary exposure occurs during cleaning in and around houses that are infested with infected rodents and opening and cleaning of previously unused buildings.
- Other individuals who are at (nominal but low) risk include campers and hikers as well as farmers, construction, utility, and pest-control workers, and the military.

12.9 | Vector and reservoir involved

- Each virus has specific rodent hosts.
- Old World rats and mice (Asia and Europe): Examples include *Rattus norvegicus* and *Rattus rattus* which carry the *Seoul virus*, and the striped field mouse (*Apodemus agrarius*), which carries the *Hantaan virus*.

12.10 | Blood phase

- No data available for blood phase in asymptomatic persons.
- Virus isolated and/or RNA demonstrated in blood from symptomatic patients with several hantavirus virus infections and RNAemia may precede appearance of IgM antibody.
- Hantaviruses infect endothelial cells that line the inner lumen of the blood vessels of the lung, kidney, and other body parts.

12.11 | Survival/persistence in blood products

- Unknown

12.12 | Transmission by blood transfusion

- Hantaviruses have not been associated with transmission by blood transfusion.

12.13 | Cases/frequency in population

- Approximately 100,000 cases of HFRS are estimated annually in Asia and Europe.

12.14 | Incubation period

- Two to four weeks after exposure to infected material

12.15 | Likelihood of clinical disease

- Low to moderate

12.16 | Primary disease symptoms

- Severity of illness is quite variable and ranges from mild flu-like symptoms to shock.
- Fever and myalgia are followed by hemorrhage (gastrointestinal, subconjunctival), renal failure, and hemodynamic instability, which occasionally progresses to shock.
- Death is usually the result of shock or hemorrhage.

12.17 | Severity of clinical disease

- See mortality and primary disease symptoms

12.18 | Mortality

- Mortality rate for HFRS is 1%–15%, depending on the host and the specific species of hantavirus.

12.19 | Chronic carriage

- Not described for humans, but rodent vectors can be chronically infected.

12.20 | Treatment available/efficacious

- No known treatment; supportive care

12.21 | Agent-specific screening question(s)

- No specific question is in use.
- Not indicated because transfusion transmission has not been demonstrated.
- No sensitive or specific question is feasible. A question about rodent contact in endemic areas would likely have low positive predictive value.

12.22 | Laboratory(s) test available

- No FDA-licensed blood donor screening test exists.
- EIA detects hantavirus-specific IgM antibody or rising hantavirus-specific IgG antibody.
- RT-PCR detects RNA in blood or tissue.
- Hantavirus-specific antigen can be detected in tissue by immunohistochemistry.
- Immunoblot assay using recombinant antigens and class-specific conjugates for IgM-IgG differentiation is available.

12.23 | Currently recommended donor deferral

- No FDA Guidance or AABB Standard exists.

12.24 | Impact on blood availability

- Agent-specific screening question(s): Not applicable
- Laboratory test(s) available: Not applicable

12.25 | Impact on blood safety

- Agent-specific screening question(s): Not applicable
- Laboratory test(s) available: Not applicable

12.26 | Leukoreduction efficacy

- Unknown as some of these viruses have been isolated from peripheral blood mononuclear cells

12.27 | Pathogen reduction efficacy for plasma derivatives

- Multiple pathogen reduction steps used in the fractionation process have been shown to be robust in removal of enveloped viruses.

12.28 | Other preventive measures

- Unknown

SUGGESTED READING

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