Virginia Department of Health
Viral Hemorrhagic Fever (VHF): Overview for Healthcare Providers*

Organism*	*Arenaviridae:* Lassa virus, Lujo virus, New World arenaviruses (Guanarito, Junin, Machupo and Sabia)	*Bunyaviridae:* Crimean-Congo hemorrhagic fever (CCHF) virus, Rift Valley fever (RVF) virus, hantavirus	*Filoviridae:* Ebola virus, Marburg virus	*Flaviviridae*: Yellow fever (YF) virus, dengue virus, Alkhurma hemorrhagic fever (AHF) virus, Kyasanur Forest disease (KFD) virus, Omsk hemorrhagic fever (OHF) virus
Reporting to Public Health	In general, suspected or confirmed cases of VHF require immediate notification to the local health department (LHD). Suspected or confirmed cases of dengue and hantavirus pulmonary syndrome require reporting to the LHD within 3 days.			
Occurrence	Lassa: West Africa; Lujo: Zambia and South Africa; New World arenaviruses: Americas	CCHF: Africa, Eurasia; RVF: Africa, Saudi Arabia, Yemen	Africa	YF: Africa, tropical Americas; dengue: Asia, the Pacific, the Americas, Africa, and Caribbean; AHF: Saudi Arabia, Egypt; KFD: India; OHF: Siberia
Natural Reservoir or Vector	Rodents	CCHF: tick; RVF: mosquito	Ebola: potentially fruit bats; Marburg: fruit bats	YF, dengue: mosquito; AHF, KFD OHF: ticks
Route of Infection	All: Primarily inhalation of aerosols of rodent excreta; ingestion of contaminated food; Lassa: also percutaneous, person-to-person transmission, sexual transmission; Lujo: also person-to-person transmission	All: Vector-borne, contact with infected animals; RVF: also possible consumption of contaminated raw milk, reported airborne transmission in labs; CCHF: also person-to-person transmission	Contact with infected persons, body fluids or animals; percutaneous, person-to person, sexual transmission	All: Bite from infected insect; YF: also parenteral or unexplained (possibly aerosol) transmission in labs; vertical transmission from mother to infant; KFD: also, aerosol transmission in lab; OHF: also contact with infected animal; waterborne and airborne transmission might occur
Risk Factors (in addition to living in/traveling to endemic areas)	Rodent exposure (inhalation of aerosols, direct contact), close contact with infected patients; manipulating specimens in labs	Close contact with infected patients or animals; manipulating specimens in labs	All: Close contact with infected patients or animals; manipulating specimens in labs; Marburg: also visiting bat caves	All: Insect exposure; AHF: also contact with livestock; KFD: also exposure to rural, outdoor settings, handling of cattle; OHF: also contact with infected animals (e.g., muskrats),manipulating specimens in labs
Case-fatality Rate	Lassa: 1% overall, 15%–20% among hospitalized cases; Lujo: 80% in 1 outbreak	CCHF: 9%–50% among hospitalized cases, 10%–40% in outbreaks; RVF: <1% overall, ~50% among hemorrhagic cases	Ebola: ~50% overall, 25%–90% in outbreaks; Marburg: 23%–90%	YF: 30%–60% for severe cases; AHF: 1%–20% among hospitalized cases; KFD: 3%–5%; OHF: <1%–3%
Incubation Period	Lassa: 6–21 days; New World arenaviruses: 5–21 days	CCHF, RVF: 2–10 days	Ebola, Marburg: 2–21 days	YF: 3–6 days; dengue: 4–7 days; AHF: 2–4 days; KFD and OHF: 3–8 days

Clinical Description	In general, initial signs and symptoms include fever, headache, muscle pain, erythematous maculopaular rash on the trunk, vomiting, diarrhea, abdominal pain, or bleeding			
Differential Diagnosis	Malaria, influenza, viral hepatitis, bacterial sepsis, toxic shock syndrome, meningococcemia, salmonellosis, shigellosis, rickettsial disease, leptospirosis, borreliosis, psittacosis, dengue, trypanosomiasis, septicemic plague, rubella, measles and hemorrhagic smallpox			
Radiography	Pulmonary edema or hemorrhage, acute respiratory distress, dilated bowels with signs of ileus or dynamic intestinal obstruction			
Specimen Collection and Laboratory Testing	Tests include serology, immunohistochemistry, PCR and virus isolation. Testing requires high containment (Biosafety Level 3 or 4). Testing is performed at CDC, with the exception of preliminary testing for Ebola virus by PCR that can be performed at DCLS (preliminary positive results require confirmatory testing at CDC). If VHF is suspected, notify LHD immediately to discuss the case and laboratory testing. Specimens may be sent to the Division of Consolidated Laboratory Services (DCLS) after VDH has approved testing. For questions about specimen collection, the DCLS Emergency Officer can be reached 24/7 at 804-335-4617.			
Treatment	Ribavirin, supportive care	Ribavirin, supportive care	Supportive care. Ebola: multiple investigational therapies	Supportive care
Postexposure Prophylaxis†	Lassa: oral ribavirin may be used for high-risk exposures	CCHF: ribavirin has shown some benefit	Not available	Not available
Vaccine	Argentine hemorrhagic fever (Junin virus): investigational vaccine available	RVF: investigational vaccine available	Ebola: investigational vaccines are available	YF: FDA-approved vaccine available; KFD: vaccine used in India
Infection Control§	In general, immediately isolate the patient and implement Standard, Contact and Droplet Precautions for the duration of illness. Hemorrhagic fever specific barrier precautions (Standard, Contract, and Airborne Precautions) are recommended if bioterrorism is suspected or if the epidemiology of virus transmission is unpredictable or unknown. For Ebola, refer to CDC's Ebola guidance for clinicians.			

*Other hemorrhagic fever viruses exist within these categories. However, the viruses that pose the most serious risk as biological weapons are the following: arenaviruses (Lassa virus, New World arenaviruses), bunyaviruses (Rift Valley fever virus), filoviruses (Ebola virus, Marburg virus), and flaviviruses (yellow fever virus, Omsk hemorrhagic fever virus, Kyasanur Forest disease virus); dengue virus, Crimean-Congo hemorrhagic fever viruses and hantaviruses are considered less likely to be used as biological weapons (Borio, et al 2002). The role of other hemorrhagic fever viruses as potential weapons is not known.

†In 2002, the Working Group on Civilian Biodefense does not recommend prophylactic antiviral therapy for persons exposed to any hemorrhagic fever viruses (including Lassa virus) in the absence of clinical illness (Borio, et al 2002); instead, the group recommended monitoring the exposed person for 21 days and, if symptoms suggestive of VHF develop or fever (≥101°F) is documented, ribavirin therapy should be initiated unless another diagnosis is confirmed (or the etiologic agent is known to be a filorvirus or flavivirus).

§Source: Siegel JD, et al 2007 for VHFs caused by Lassa, Ebola, Marburg, or Crimean-Congo fever viruses. Note that Borio, et al (2002) recommends additional airborne precautions because airborne transmission of VHFs cannot be conclusively excluded. For Ebola, CDC has developed extensive infection control guidance (https://www.cdc.gov/vhf/ebola/clinicians/index.html). Clinicians should consult with their local health department for additional guidance.