Ervebo® is the first FDA- approved vaccine for Ebola. It is safe and protective against Zaire ebolavirus. Ervebo is recommended for the prevention of disease caused by Zaire ebolavirus in individuals 12 months of age and older. It is not currently commercially marketed but is in the Strategic National Stockpile. It is available through CDC for preexposure vaccination for certain individuals. CDC also offers an expanded access Investigational New Drug (IND) program to allow booster dose administration in adults who were previously vaccinated and have potential risk for occupational exposure to Zaire ebolavirus.

A human vaccine for Kyasanur Forest Disease and an animal vaccine for Rift Valley Fever are used in endemic areas; in addition, there are investigational vaccines for Argentine hemorrhagic fever, Ebola virus disease, and Rift Valley fever.

7. Infection Control

The following infection control recommendations should be followed when caring for persons with suspected VHF:

- For **Ebola virus disease**, refer to CDC's infection control and prevention guidance. Note that, as of this writing, CDC has separate personal protective equipment (PPE) guidance depending on the status of the person suspected of having Ebola virus disease and their clinical presentation.
  - Infection Prevention and Control Recommendations for Hospitalized Patients with Known or Suspected Ebola Virus Disease in U.S. Hospitals
  - Donning and Doffing Personal Protective Equipment (PPE) for Evaluating Persons Under Investigation (PUIs) for Ebola Who Are Clinically Stable and Do Not Have Bleeding, Vomiting, or Diarrhea
  - Guidance on Personal Protective Equipment (PPE) To Be Used by Healthcare Workers during Management of Patients with Confirmed Ebola or Persons under Investigation (PUIs) for Ebola who are Clinically Unstable or Have Bleeding, Vomiting, or Diarrhea in U.S. Hospitals, Including Procedures for Donning and Doffing PPE
  - Interim Guidance for Environmental Infection Control in Hospitals for Ebola Virus
  - In the case of a child with suspected or confirmed Ebola virus disease, resources for discussing parental presence can be found here:
    - Parental Presence During Treatment of Ebola or Other Highly Consequential Infection (American Academy of Pediatrics)
    - Parental Presence at the Bedside of a Child with Suspected Ebola: An Expert Discussion

- For **VHF caused by other viruses**, including Lassa, Marburg, and Crimean-Congo hemorrhagic fever viruses, patients should be isolated in a private room and on Standard, Contact, and Droplet precautions for the duration of illness (see 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings and the corresponding Appendix A updates).
  - Although transmission by the airborne route has not been established, Airborne Precautions may be initiated for patients if bioterrorism is suspected or for patients undergoing airborne-generating procedures (e.g., aerosolized or nebulized medication administration, diagnostic sputum induction, bronchoscopy, airway suctioning, endotracheal intubation, positive pressure ventilation via face mask and high frequency

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Appendix: Epidemiology and clinical manifestations of specific viruses causing viral hemorrhagic fever by virus family

Please see the appendix table below.

Note: Other hemorrhagic fever viruses exist in 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/Ravn 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.

Appendix. Epidemiology and clinical manifestations of specific viruses causing viral hemorrhagic fever by virus family

VHF (Family/Order)	Organism	Natural Reservoir	Person-to-person Transmission	Occurrence	Incubation Period	Signs and Symptoms	Case-fatality Rate
Lassa Fever (Arenaviruses)	Lassa virus	Multimammate rat (Mastomys rodent)	Yes	Endemic in Benin, Ghana, Guinea, Liberia, Mali, Nigeria, and Sierra Leone and probably in other West African countries. An estimated 100,000–300,000 infections, including approximately 5,000 deaths, occur annually. In some areas of Sierra Leone and Liberia, it is known that 10%–16% of people admitted to hospitals every year have Lassa fever.	6–21 days	Asymptomatic/mild (80%): slight fever, general malaise, weakness, and headache Severe (20%): multisystem involvement and hemorrhaging (e.g., in gums, eyes, or nose), respiratory distress, vomiting, facial swelling, pain in the chest, back, and abdomen, and shock. Neurological symptoms (e.g., hearing loss, tremors, and encephalitis) can be present. Pregnant women are more likely to develop severe disease and fetal loss occurs in >80% of cases. Deafness occurs in ~25% of patients who survive; half of these patients regain partial hearing after 1–3 months.	~1% overall ~15–20% among hospitalized patients
New World Arenaviruses (Arenaviruses)	Multiple viruses Machupo - Bolivian hemorrhagic fever (HF) Junin - Argentine HF Guanarito - Venezuelan HF Sabia – Brazilian HF Chapare - Chapare HF in Bolivia	Rats and mice Sabia and Chapare: unknown, presumed to be rodent host	Yes	Virus and host dependent Primarily limited to certain areas in Argentina, Bolivia, Brazil, and Venezuela	Virus dependent Typically, 6–14 days Range: 5–21 days	Asymptomatic infections occur Signs and symptoms include: fever, headache, anorexia, malaise, muscle pain, with pain especially in the lower back; other symptoms might include nausea, dizziness, abdominal pain, vomiting, diarrhea, sore throat, flushing of the head and torso, or generalized lymphadenopathy Most patients improve after 1–2 weeks; ~1/3 of untreated cases become severe and life-threatening. Petechiae and ecchymosis on the skin or gums, bleeding from the vagina or gastrointestinal tract, and neurologic symptoms might be present.	15–30% in untreated patients

VHF (Family/Order)	Organism	Natural Reservoir	Person-to-person Transmission	Occurrence	Incubation Period	Signs and Symptoms	Case-fatality Rate
Rift Valley Fever (Bunyavirales)	Rift Valley fever virus	Ruminants (e.g., cattle, sheep, and possibly wild ruminants), rats in some areas	No	First reported in livestock in Kenya's Rift Valley in the early 1910s Generally found in eastern and southern Africa, but exists in most of sub-Saharan Africa, including West Africa and Madagascar In September 2000, an outbreak was reported in Saudi Arabia and subsequently, Yemen. This outbreak represented the first identified cases outside Africa.	2–6 days	Most common: asymptomatic or mild flu-like illness with fever, pain in the muscle and joints, and headache. Most patients recover within one week. Severe illness (8–10%) may include the following: Ocular form - blurred and decreased vision that occurs 1–3 weeks after illness onset and might resolve within 10–12 weeks Meningoencephalitis form - headaches, memory loss, hallucinations, confusion, disorientation, vertigo, convulsions, lethargy, and coma. This form occurs in less than 1% of patients and presents 1–4 weeks after initial symptoms appear. Although death is rare, neurological deficits often persist. Hemorrhagic fever form - occurs in <1% of patients, may begin with jaundice and other signs of liver impairment, followed by vomiting blood, bloody stool, or bleeding from gums, skin, nose, and injection sites. These symptoms appear 2–4 days after initial onset and death usually occurs 3–6 days later.	<1% overall ~50% among those with hemorrhagic fever form
Ebola Virus Disease (Filoviruses)	Ebola virus (Includes species: Sudan, Zaire, Reston, Tai Forest, and Bundibugyo)	Unknown, presumed to be fruit bats	Yes	First identified in 1976, sporadic outbreaks in Africa, primarily sub-Saharan countries. Largest outbreak in 2014–2016 in West Africa. Most recent outbreak in Uganda in September 2022, caused by Sudan ebolavirus; ended January 11, 2023.	8–10 days Range: 2–21 days	Fever, fatigue, headache, joint and muscle aches, and sore throat. These are followed by diarrhea, vomiting, and symptoms of impaired kidney and liver function, and in some cases bleeding inside and outside the body.	~50% overall 25–90% in outbreaks

VHF (Family/Order)	Organism	Natural Reservoir	Person-to-person Transmission	Occurrence	Incubation Period	Signs and Symptoms	Case-fatality Rate
Marburg Hemorrhagic Fever (Filoviruses)	Marburg virus, Ravn virus	Fruit bat (Rousettus aegypticus)	Yes	First identified in 1967 when outbreaks occurred simultaneously in laboratories in Germany and Yugoslavia. Has been identified in: Uganda, Zimbabwe, the Democratic Republic of the Congo, Kenya, and Angola A few cases outside of Africa have been identified and were related to laboratory exposure or importation after travel to Africa Most recent outbreaks: early 2023 in Tanzania and Equatorial Guinea; declared over in June 2023	5–10 days Range: 2–21 days	Sudden symptom onset marked by high fever, severe headache, and severe malaise. Muscle aches and pains are common. On the third day, severe diarrhea, abdominal pain, nausea, and vomiting can begin. A maculopapular rash, most prominent on the trunk (chest, back, stomach), might occur 2–7 days after initial symptom onset. Symptoms become increasingly severe and can include jaundice, inflammation of the pancreas, severe weight loss, delirium, shock, liver failure, severe hemorrhaging (which occurs 5–7 days after onset), and multi-organ dysfunction. Central nervous system involvement manifests as confusion, irritability, and aggression. Orchitis, which can occur during the late stages of infection, has occasionally been reported.	23–90%
Yellow Fever (Flaviviruses)	Yellow fever virus	Nonhuman and human primates	Yes (Also, vectorborne transmission via infected mosquitoes, primarily Aedes or Haemagogus spp.)	Endemic in parts of Africa (particularly sub-Saharan West Africa); Central/South America. Sylvatic (jungle) transmission cycle – via nonhuman primates and mosquitoes in the forest canopy in tropical regions of Africa and Latin America Intermediate (savannah) transmission cycle - via various Aedes spp., humans, and nonhuman primates in humid and semi humid areas of Africa Urban transmission cycle – via humans and mosquitoes (Aedes aegypti) in parts of Africa, particularly West Africa	3–6 days	Most infections are asymptomatic Symptoms include fever, chills, headache, backache, general muscle pain, prostration, nausea, and vomiting. Some patients may experience mild, febrile illness. In approximately 15% of cases, there is a brief remission of symptoms lasting hours to a day followed by the recurrence of initial symptoms and progression to jaundice and hemorrhagic symptoms. Leukopenia (most pronounced around Day 5 of infection), leukocytosis (usually in second week of infection), elevated liver enzymes, abnormal clotting factors, albuminuria and anuria may be seen as a result of liver and renal failure.	30–60% for severe disease

VHF (Family/Order)	Organism	Natural Reservoir	Person-to-person Transmission	Occurrence	Incubation Period	Signs and Symptoms	Case-fatality Rate
Kyasanur Forest Disease (Flaviviruses)	Kyasanur Forest disease virus	Rodents, bats, and other small mammals Monkeys appear to be amplifying hosts Arthropod vector: ticks (Haemaphysalis spinigera)	No	Identified in 1957 from a sick monkey from the Kyasanur Forest in India Since then, approximately 400–500 human cases per year have been reported	3–8 days	Sudden onset symptoms with fever, chills, and headache, followed in 3–4 days by severe muscle pain, vomiting, gastrointestinal symptoms, and bleeding. Abnormally low blood pressure and low platelet, red blood cell, and white blood cell counts might occur. Some patients recover without complication after 1–2 weeks. However, some patients (10–20%) experience a second wave of symptoms at the start of the third week that include fever and neurological manifestations, such as severe headache, mental disturbances, tremors, and vision deficits.	3–5%
Omsk hemorrhagic fever (Flaviviruses)	Omsk hemorrhagic fever virus	Rodents (including muskrats and voles) Arthropod vector: ticks (Dermacentor reticulatus, Dermacentor marginatus, Ixodes persulcatus)	No	First described between 1945 and 1947 in Omsk, Russia from patients with hemorrhagic fever, and is endemic in the western Siberia region	3–8 days	Sudden onset symptoms with fever, chills, and headache, followed in 3–4 days with severe muscle pain, vomiting, gastrointestinal symptoms, and bleeding. Some patients might experience abnormally low blood pressure and low platelet, red blood cell, and white blood cell counts. After 1–2 weeks of symptoms, some patients recover without complication. Other patients might experience a second wave of symptoms at the beginning of the third week that include fever and encephalitis.	<1–3%