Factsheet for health professionals

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AGENTS

Ebola and Marburg viruses are members of the Filoviridae family. The *Ebolavirus* genus includes five distinct species: *Zaire ebolavirus, Sudan ebolavirus, Bundibugyoebola virus, Tai Forest ebolavirus* and *Reston* ebolavirus. *Zaire, Sudan , Bundibugyo* and *Tai Forest* ebolaviruses occur in Africa and cause serious illness in humans. *Reston* ebolavirus present in the Philippines only causes asymptomatic illness in human. The *Marburgvirus* genus contains only one species, *Marburg virus* (MARV) which is responsible of several outbreaks of haemorrhagic fever in Africa.

Ebola viruses and Marburg virus are classified as biosafety level 4 (BSL-4) pathogens and require special containment and barrier protection measures, in particular for people taking care of infected patients or bodies.

RESERVOIRS OF EBOLAVIRUS AND MARBURGVIRUS

Ebola viruses have been isolated from several fruit bats of the Pteropodidae family in central and western Africa, particularly of the species hammer-headed bat (*Hypsignathus monstrosus*), Franquet's epauletted fruit bat (*Epomops franqueti*) and little collared fruit bat (*Myonycteris torquata*), which are considered natural reservoirs. On the African continent, human Ebolavirus infections have been linked to direct contact with gorillas, chimpanzees, monkeys, forest antelope and porcupines found dead in the rainforest. Ebola viruses (*Zaire* and *Tai Forest* ebolaviruses) have been detected in the wild in carcasses of chimpanzees (in Cote d'Ivoire and Congo), gorillas (Gabon and Congo) and forest antilopes (Congo). *Reston* ebolavirus caused severe outbreaks in macaque monkeys in the Philippines and asymptomatic infections have been reported in pigs. Scientific studies implicate African fruit bats, particularly the Egyptian fruit bat or Egyptian rousette (*Rousettus aegypticus*) as the reservoir of the Marburg virus. Several outbreaks were linked to visits to caves colonized by bats.

TRANSMISSION MODES

Ebola and Marburg viruses are highly transmissible by direct contact with organs, blood or other bodily fluids (e.g. saliva, urine, vomit) of living or dead infected persons or any soiled material.

Transmission by sexual contact can occur up to six weeks after clinical recovery. Viral genome was recovered in semen up to 3 months after onset of illness.
Transmission can also occur by contact with dead or living infected animals including bushmeat (e.g. monkeys, chimpanzees, forest antelopes and bats) or visiting caves colonized by bats.

Nosocomial transmission can occur. Healthcare workers can be infected through close contact with infected patients. The risk for infection can be significantly reduced through the appropriate use of infection control precautions and adequate barrier procedures. This is especially important when performing invasive procedures.
Filoviruses can survive in liquid or dried material for many days.They are inactivated by gamma irradiation, heating for 60 minutes at 60°C or boiling for five minutes, and are sensitive to sodium hypochlorite and other disinfectants. Freezing or refrigeration will not inactivate Filoviruses.

EPIDEMIOLOGY

In 1967, isolated cases of haemorrhagic fever occurred among laboratory workers handling tissues from monkeys (*Chlorocebus aethiops*) from Uganda and in medical personnel who attended the laboratory workers. This was a new virus named Marburg virus after the city in Germany where it was first characterised. In 1976, epidemics of severe haemorrhagic fever occurred simultaneously in Sudan and Democratic Republic of Congo (former Zaire); a new virus was identified and named after a small river in Democratic Republic of Congo. Later studies showed some differences between the virus isolated in Democratic of Congo and the virus isolated from Sudan. These viruses were also serologically distinct from the Marburg virus.

Multiple outbreaks of infection with both Ebola virus and Marburg virus have been identified since their initial discovery. From 1976 to 2012, 2387 cases of ebolavirus infections and 1590 deaths have been reported (Case Fatalty Rate [CFR] 66.6%) and from 1967 to 2012, 571 cases of Marburg virus infections including 470 deaths (CFR 82.3%). Oubreaks of Ebolavirus have been reported in mainly Democratic Republic of Congo , Congo, Gabon, and Sudan and outbreaks of Marburg virus in Kenya, Uganda and Angola. In 2008, two tourists (one from the USA and one from the Netherlands) became infected after visiting, several months apart, a cave in Maramagambo forest in Uganda; one of the cases died.

In March 2014, an outbreak of *Zaire ebolavirus* was reported in Eastern Guinea. The disease spread rapidely in neighboring countries, Sierra Leone and Liberia. The disease further spread to Nigeria and Senegal. This is the first outbreak of ebolavirus in West Africa and the worst ever reported. Another unrelated outbreak also due to *Zaire ebolavirus* was reported in August 2014 in Democratic Republic of Congo.

CLINICAL PRESENTATION

The typical incubation period for these viruses ranges from 2 to 21 days. Short incubation periods are likely in case of exposure to high contaminated materials (e.g. needle mishap). In most cases, an infected patient experiences sudden onset of flu-like illness, with fever, malaise (weakness), muscle and joint pains and headache, followed by progressive weakness, anorexia (lack of appetite), diarrhoea (watery stools sometimes containing blood and mucus), nausea and vomiting. This first set of symptoms corresponds to the prodromal phase (duration up to 10 days).

The next stage of the disease is characterised by symptoms and clinical manifestations from several organ systems. Symptoms can be gastrointestinal (vomiting, diarrhoea, anorexia and abdominal pain), neurological (headaches, confusion), vascular (conjunctival/pharyngeal injections), cutaneous (maculopapular rash), and respiratory (cough, chest pain, shortness of breath), and can include complete exhaustion (prostration).

After one week of evolution, haemorrhagic manifestations can appear in more than half of the patients (bloody diarrhoea, nosebleeds, hematemesis, petechiae, ecchymosis and prolonged bleeding from needle puncture sites). Some patients develop profuse internal and external haemorrhages and disseminated intravascular coagulation. Patients in the final stage of disease die in the clinical picture of tachypnea, anuria, hypovolemic shock and multi-organ failure. Depending on the viral species, 25% to 90% of cases may die.

DIAGNOSIS

Laboratory tests on blood specimens detect viral material (viral genome or antigen) or specific antibodies. Only a few tests are commercially available. Samples from infected patients should be handled under strict biological containment conditions in biosafety level 3 or 4 laboratories. Any attempt for viral replication should be handled in biosafety level 4 laboratories.

THERAPY

- No curative treatment is presently available and validated for filovirus infections. Treatment is supportive (oral rehydration with solutions containing electrolytes or intravenous fluids) and severe cases require intensive care.
- Research on vaccine and drug therapy is ongoing.

INFECTION CONTROL AND PREVENTION

The goal of outbreak control is to interrupt direct human-to-human transmission through the early identification and systematic isolation of cases, timely contact-tracing, proper personal protection, safely conducted burials, and improved community awareness about risk factors of viral infection and individual protective measures. Quarantine of infected

patients has been shown to effectively stop the spread of the disease in previous outbreaks.

Healthcare workers have frequently been infected while treating patients with suspected or confirmed Ebola or Marburg infection. This occurred through close contact with patients when infection control precautions were not strictly practiced or haemorrhagic viral etiology not recognized. The risk for infection can be significantly reduced through the appropriate use of infection control precautions and adequate and strict barrier nursing procedures.

It is advised to avoid, in areas/countries where Ebola and Marburg disease were reported, habitats which might be populated by bats such as caves, and any form of close contact with wild animals (including monkeys, forest antelopes, rodents and bats), both alive and dead, and consumption of type of 'bush meat'.

Implementation of appropriate infection control measures in healthcare settings, including use of personal protective equipment, is effective in minimising the risk for transmission of filoviruses.

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