Marburg Hemorrhagic Fever

Marburg hemorrhagic fever (Marburg HF) is a rare but severe hemorrhagic fever which affects both humans and non-human primates. Marburg HF is caused by Marburg virus, a genetically unique zoonotic (or, animal-borne) RNA virus of the filovirus family. The five species of Ebola virus are the only other known members of the filovirus family.

Marburg virus was first recognized in 1967, when outbreaks of hemorrhagic fever occurred simultaneously in laboratories in Marburg and Frankfurt, Germany and in Belgrade, Yugoslavia (now Serbia). Thirty-one people became ill, initially laboratory workers followed by several medical personnel and family members who had cared for them. Seven deaths were reported. The first people infected had been exposed to imported African green monkeys or their tissues while conducting research. One additional case was diagnosed retrospectively.

The reservoir host of Marburg virus is the African fruit bat, *Rousettus aegyptiacus*. Fruit bats infected with Marburg virus do not to show obvious signs of illness. Primates (including humans) can become infected with Marburg virus, and may develop serious disease with high mortality. Further study is needed to determine if other species may also host the virus.

This *Rousettus* bat is a sighted, cave-dwelling bat widely distributed across Africa. Given the fruit bat's wide distribution, more areas are potentially at risk for outbreaks of Marburg HF than previously suspected. The virus is not known to be native to other continents, such as North America.

Marburg HF typically appears in sporadic outbreaks throughout Africa; laboratory confirmed cases have been reported in Uganda, Zimbabwe, the Democratic Republic of the Congo, Kenya, Angola, and South Africa. Many of the outbreaks started with male mine workers working in bat-infested mines. The virus is then transmitted within their communities through cultural practices, under-protected family care settings, and under-protected health care staff. It is possible that sporadic, isolated cases occur as well, but go unrecognized.

Cases of Marburg HF have occurred outside Africa, such as during the 1967 outbreak, but are infrequent. In 2008, a Dutch tourist developed Marburg HF after returning to the Netherlands from Uganda, and subsequently died. Also in 2008, an American traveler developed Marburg HF after returning to the US from Uganda and recovered. Both travelers had visited a well-known cave inhabited by fruit bats in a national park. See the History of Outbreaks table for a chronological list of known cases and outbreaks.

Transmission

It is unknown how Marburg virus first transmits from its animal host to humans; however, for the 2 cases in tourists visiting Uganda in 2008, unprotected contact with infected bat feces or aerosols are the most likely routes of infection.

After this initial crossover of virus from host animal to humans, transmission occurs through person-to-person contact. This may happen in several ways: direct contact to droplets of body fluids from infected persons, or contact with equipment and other objects contaminated with infectious blood or tissues.

In previous outbreaks, persons who have handled infected non-human primates or have come in direct contact with their fluids or cell cultures have become infected. Spread of the virus between humans has occurred in close environments and direct contacts. A common example is through caregivers in the home or in a hospital (nosocomial transmission).

Signs and Symptoms

After an incubation period of 5-10 days, symptom onset is sudden and marked by fever, chills, headache, and myalgia. Around the fifth day after the onset of symptoms, a maculopapular rash, most prominent on the trunk (chest, back, stomach), may occur. Nausea, vomiting, chest pain, a sore throat, abdominal pain, and diarrhea may then appear. Symptoms become increasingly severe and can include jaundice, inflammation of the pancreas, severe weight loss, delirium, shock, liver failure, massive hemorrhaging, and multi-organ dysfunction.

Because many of the signs and symptoms of Marburg hemorrhagic fever are similar to those of other infectious diseases such as malaria or typhoid fever, clinical diagnosis of the disease can be difficult, especially if only a single case is involved.

The case-fatality rate for Marburg hemorrhagic fever is between 23-90%. For a complete listing of the case fatality rates for previous outbreaks, please see the History of Outbreaks table

Risk of Exposure

People who have close contact with African fruit bats, humans patients, or non-human primates infected with Marburg virus are at risk.

Historically, the people at highest risk include family members and hospital staff who care for patients infected with Marburg virus and have not used proper barrier nursing techniques. Particular occupations, such as veterinarians and laboratory or quarantine facility workers who handle non-human primates from Africa, may also be at increased risk of exposure to Marburg virus.

Exposure risk can be higher for travelers visiting endemic regions in Africa, including Uganda and other parts of central Africa, and have contact with fruit bats, or enter caves or mines inhabited by fruit bats.

Diagnosis

Many of the signs and symptoms of Marburg hemorrhagic fever are similar to those of other more frequent infectious diseases, such as malaria or typhoid fever, making diagnosis of the disease difficult. This is especially true if only a single case is involved.

However, if a person has the early symptoms of Marburg HF and there is reason to believe that Marburg HF should be considered, the patient should be isolated and public health professionals notified. Samples from the patient can then be collected and tested to confirm infection.

Antigen-capture enzyme-linked immunosorbent assay (ELISA) testing, virus isolation, polymerase chain reaction (PCR), and IgM-capture ELISA can be used to confirm a case of Marburg HF within a few days of symptom onset. The IgG-capture ELISA is appropriate for testing persons later in the course of disease or after recovery. In deceased patients, immunohistochemistry, virus isolation, or PCR of blood or tissue specimens may be used to diagnose Marburg HF retrospectively.

Treatment

There is no specific treatment for Marburg hemorrhagic fever. Supportive hospital therapy should be utilized, which includes balancing the patient's fluids and electrolytes, maintaining oxygen status and blood pressure, replacing lost blood and clotting factors, and treatment for any complicating infections.

Experimental treatments are validated in non-human primates models, but have never been tried in humans.

Prevention

Preventive measures against Marburg virus infection are not well defined, as transmission from wildlife to humans remains an area of ongoing research. However, avoiding fruit bats, and sick non-human primates in central Africa, is one way to protect against infection.

Measures for prevention of secondary, or person-to-person, transmission are similar to those used for other hemorrhagic fevers. If a patient is either suspected or confirmed to have Marburg hemorrhagic fever, barrier nursing techniques should be used to prevent direct physical contact with the patient. These precautions include wearing of protective gowns, gloves, and masks; placing the infected individual in strict isolation; and sterilization or proper disposal of needles, equipment, and patient excretions.

In conjunction with the World Health Organization, CDC has developed practical, hospital-based guidelines, titled: Infection Control for Viral Haemorrhagic Fevers In the African Health Care Setting. The manual can help health-care facilities recognize cases and prevent further hospital-based disease transmission using locally available materials and few financial resources.

Marburg hemorrhagic fever is a very rare human disease. However, when it occurs, it has the potential to spread to other people, especially health care staff and family members who care for the patient. Therefore, increasing awareness in communities and among health-care providers of the clinical symptoms of patients with Marburg hemorrhagic fever is critical. Better awareness can lead to earlier and stronger precautions against the spread of Marburg virus in both family members and health-care providers. Improving the use of diagnostic tools is another priority. With modern means of transportation that give access even to remote areas, it is possible to obtain rapid testing of samples in disease control centers equipped with Biosafety Level 4 laboratories in order to confirm or rule out Marburg virus infection.

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