



Marburg Hemorrhagic Fever

Fact Sheet [Last updated May 5, 2010]

What is Marburg hemorrhagic fever?

Marburg hemorrhagic fever (Marburg HF) is a rare, severe type of hemorrhagic fever which affects both humans and non-human primates. Caused by a genetically unique zoonotic (that is, animal-borne) RNA virus of the filovirus family, its recognition led to the creation of this virus family. The five subtypes 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). A total of 31 people became ill; they included laboratory workers as well as several medical personnel and family members who had cared for them. There were 7 deaths among the reported cases. The first people infected had been exposed to African green monkeys or their tissues. In Marburg, the monkeys had been imported for research and to prepare polio vaccine. In addition to the 31 cases, an additional primary case was retrospectively serologically diagnosed.



Negative stain image of an isolate of Marburg virus, showing filamentous particles as well as the characteristic "Shepherd's Crook." Magnification approximately 100,000 times. Image courtesy of Russell Regnery, Ph.D., DVRD, NCID, CDC.

Where is Marburg virus found nature?

Recent scientific studies implicate the African fruit bat (*Rousettus aegyptiacus*) as the reservoir host of the Marburg virus. The African fruit bat is a sighted, cave-dwelling bat which is widely distributed across Africa. Fruit bats infected with Marburg virus do not show obvious signs of illness. Primates, including humans, can become infected with Marburg virus, which can progress to serious disease with high mortality. Further study is needed to determine if other species may also host the virus. Given the fruit bat's wide distribution, more areas are 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.

Where do cases of Marburg hemorrhagic fever occur?

Confirmed cases of Marburg HF have been reported in Uganda, Zimbabwe, the Democratic Republic of the Congo, Kenya, and Angola. Cases of Marburg HF have occurred outside Africa, though infrequently. The first confirmed cases of Marburg HF were recognized among laboratory workers and hospital staff in Germany and Yugoslavia. 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. Both travelers had visited a well-known cave inhabited by fruit bats in a national park. The American traveler recovered.

Marburg HF typically appears in sporadic outbreaks throughout Africa. Many of the outbreaks have occurred among male mine workers with the virus transmitted throughout their communities by ways of cultural practices, under protected family care settings and under protected health staff. It is also possible that sporadic, isolated cases occur as well, but go unrecognized. A table showing the chronological list of known cases and outbreaks is available below.

How do humans get Marburg hemorrhagic fever?

Just how the animal host first transmits Marburg virus to humans is unknown. However, as with some other viruses which cause viral hemorrhagic fever, humans who become ill with Marburg hemorrhagic fever may spread the virus to other people. This may happen in several ways. Persons who have handled infected monkeys and have come in direct contact with their fluids or cell cultures, have become infected. Spread of the virus between humans has occurred in a setting of close contact, often in a hospital. Droplets of body fluids, or direct contact with persons, equipment, or other objects contaminated with infectious blood or tissues are all highly suspect as sources of disease.

What are the symptoms of the disease?

After an incubation period of 5-10 days, the onset of the disease is sudden and is 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 then may appear. Symptoms become increasingly severe and may 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, diagnosis of the disease can be difficult, especially if only a single case is involved.

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

Are there complications after recovery?

Recovery from Marburg hemorrhagic fever may be prolonged and accompanied by orchitis, recurrent hepatitis, transverse myelitis or uveitis. Other possible complications include inflammation of the testis, spinal cord, eye, parotid gland, or by prolonged hepatitis.

Is the disease ever fatal?

Yes. The case-fatality rate for Marburg hemorrhagic fever is between 23-25%.

How is Marburg hemorrhagic fever treated?

A specific treatment for this disease is unknown. However, supportive hospital therapy should be utilized. This includes balancing the patient's fluids and electrolytes, maintaining their oxygen status and blood pressure, replacing lost blood and clotting factors and treating them for any complicating infections.

Sometimes treatment also has used transfusion of fresh-frozen plasma and other preparations to replace the blood proteins important in clotting. One controversial treatment is the use of heparin (which blocks clotting) to prevent the consumption of clotting factors. Some researchers believe the consumption of clotting factors is part of the disease process.

Who is at risk for the illness?

People who have close contact with a human or non-human primate infected with the virus are at risk. Such persons include laboratory or quarantine facility workers who handle non-human primates that have been associated with the disease. In addition, hospital staff and family members who care for patients with the disease are at risk if they do not use proper barrier nursing techniques.

How is Marburg hemorrhagic fever prevented?

Due to our limited knowledge of the disease, preventive measures against transmission from the original animal host have not yet been established. Measures for prevention of secondary 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.

What needs to be done to address the threat of Marburg hemorrhagic fever?

Marburg hemorrhagic fever is a very rare human disease. However, when it does occur, it has the potential to spread to other people, especially health care staff and family members who care for the patient. Therefore, increasing awareness among health-care providers of clinical symptoms in patients that suggest Marburg hemorrhagic fever is critical. Better awareness can help lead to taking precautions against the spread of virus infection to family members or 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.

A fuller understanding of Marburg hemorrhagic fever will not be possible until the ecology and identity of the virus reservoir are established. In addition, the impact of the disease will remain unknown until the actual incidence of the disease and its endemic areas are determined.



Marburg Hemorrhagic Fever

Known Cases and Outbreaks of Marburg Hemorrhagic Fever, in Chronological Order [Last updated May 5, 2010]

Year(s)	Country	Apparent or Suspected Origin	Reported number of human cases	Reported number (%) of deaths among cases	Situation
1967	Germany and Yugoslavia	Uganda	31	7 (23)	Simultaneous outbreaks occurred in laboratory workers handling African green monkeys imported from Uganda [1a]. In addition to the 31 reported cases, an additional primary case was retrospectively serologically diagnosed [1b].
1975	Johannesburg, South Africa	Zimbabwe	3	1 (33)	A man with a recent travel history to Zimbabwe was admitted to hospital in South Africa. Infection spread from the man to his traveling companion and a nurse at the hospital. The man died, but both women were given vigorous supportive treatment and eventually recovered [2].
1980	Kenya	Kenya	2	1 (50)	Recent travel history included a visit to Kitum Cave in Kenya's Mount Elgon National Park. Despite specialized care in Nairobi, the male patient died. A doctor who attempted resuscitation developed symptoms 9 days later but recovered [3].

1987	Kenya	Kenya	1	1 (100)	A 15-year-old Danish boy was hospitalized with a 3-day history of headache, malaise, fever, and vomiting. Nine days prior to symptom onset, he had visited Kitum Cave in Mount Elgon National Park. Despite aggressive supportive therapy, the patient died on the 11th day of illness. No further cases were detected [4].
1998-2000	Democratic Republic of Congo (DRC)	Durba, DRC	154	128 (83)	Most cases occurred in young male workers at a gold mine in Durba, in the north-eastern part of the country, which proved to be the epicentre of the outbreak. Cases were subsequently detected in the neighboring village of Watsa [5].
2004-2005	Angola	Uige Province, Angola	252	227	Outbreak believed to have begun in Uige Province in October 2004. Most cases detected in other provinces have been linked directly to the outbreak in Uige [6].
2007	Uganda	Lead and gold mine in Kamwenge District, Uganda	2	2 (50)	Small outbreak, with 2 cases in young males working in a mine. To date, there have been no reported cases among health workers [7].
2008	Netherlands ex Uganda	Cave in Maramagambo forest in Uganda, at the southern edge of Queen Elizabeth National Park.	1	1 (100)	A 40-year old Dutch woman with a recent history of travel to Uganda was admitted to a hospital in the Netherlands. Three days prior to hospitalization, the first symptoms (fever, chills) occurred, followed by rapid clinical deterioration. The woman died on the 10 th day of the illness. [8] [9]

References

1. (a) Siegert R. Marburg Virus. In. Virology Monograph. New York: Springer-Verlag; 1972; pp. 98-153.
1. (b) Feldmann, H., W. Slenczka, and H. D. Klenk. 1996. Emerging and reemerging of filoviruses. Arch. Virol. 11(Suppl.):77-100.
2. World Health Organization. Marburg virus disease: South Africa. [Weekly Epidemiological Record](#). 1975; 50(12):124-125.
3. Smith DH, Johnson BK, Isaacson M, et al. Marburg –virus disease in Kenya. Lancet. 1982; 1(8276):816-820.
4. Johnson ED, Johnson BK, Silverstein D, et al. Characterization of a new Marburg virus isolated from a 1987 fatal case in Kenya. Arch. Virol. 1996; 11(Suppl):101-114.
5. Bausch DG, Nichol ST, Muyembe-Tamfum JJ, et al. Marburg hemorrhagic fever associated with multiple genetic lineages of virus. N. Engl. J. Med. 2006; 355:909-919.
6. Towner JS, Khristova ML, Sealy TK, et al. Marburgvirus genomics and associated with a loarge hemorrhag fever outbreak in Angola. J. Virol. 2006; 80(13):6497-6516.
7. World Health Organization. [Marburg haemorrhagic fever](#), Uganda. Weekly Epidemiological Record. 2007; 82(33):297-298.
8. World Health Organization. Case of Marburg Haemorrhagic Fever Imported into the Netherlands from Uganda. 10 July 2008. http://www.who.int/csr/don/2008_07_10/en/index.html
9. Timen A, Koopmans M, Vossen A, et al. Response to Imported Case of Marburg Hemorrhagic Fever, the Netherlands. Emerg. Infect. Dis. 2009; 15(8). <http://www.cdc.gov/eid/content/15/8/1171.htm>