



# Ebola Virus- A Deadly Virus its Causes, Symptoms, Prevention and Treatment

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## ARTICLE INFO

### Article history:

Received: 19 February 2015;

Received in revised form:

15 July 2015;

Accepted: 23 July 2015;

### Keywords

Ebola virus,  
Deadly disease.

## ABSTRACT

Ebola is a deadly disease caused by a virus. There are five strain, and four of them can make people sick. After entering the body, it kills cells, making some of them explode. It wrecks the immune system, causes heavy bleeding inside the body, and damages almost every organ. The virus is scary, but it also rare. You can get it only from direct contact with infected persons body fluids. The on-going Ebola outbreak in the West African countries is so far the worst in the history of the deadly disease. The virus seems to have gripped the world's interest due to its destructive potential, claiming nearly 7000 lives in Sierra Leone, Liberia and Guinea -- worst-hit Ebola nations in West Africa. Although a few cases of Ebola have been reported from Australia, America and other nations of the world, no positive cases of Ebola virus in India have been reported till date. According to the WHO reports, on an average, 80% of the people infected with this virus do die. Their death is usually due to a drop in their blood pressure and failure of organs.

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## Introduction

Ebola virus and Marburg virus are related viruses that cause hemorrhagic fevers — illnesses marked by severe bleeding (hemorrhage), organ failure and, in many cases, death. Both viruses are native to Africa, where sporadic outbreaks have occurred for decades. Ebola virus and Marburg virus live in animal hosts, and humans can contract the viruses from infected animals. After the initial transmission, the viruses can spread from person to person through contact with body fluids or contaminated needles. No drug has been approved to treat either virus. People diagnosed with Ebola or Marburg virus receive supportive care and treatment for complications. Scientists are coming closer to developing vaccines for these deadly diseases. The Centers for Disease Control and Prevention monitors the United States for conditions such as Ebola infection, and its labs can test for the Ebola virus.

Scientists are working on a variety of vaccines that would protect people from Ebola or Marburg viruses. Some of the results have been promising, but further testing is needed. Virus Ebola, A notoriously deadly virus that causes fearsome symptoms, the most prominent being high fever and massive internal bleeding. Ebola virus kills as many as 90% of the people it infects. It is one of the viruses that is capable of causing hemorrhagic (bloody) fever. Epidemics of Ebola virus have occurred mainly in African countries including Zaire (now the Democratic Republic of Congo), Gabon, Uganda, the Ivory Coast, and Sudan. Ebola virus is a hazard to laboratory workers and, for that matter, anyone who is exposed to it. The Ebola virus gained widespread attention in the fall of 2014 when an outbreak in West Africa became the largest outbreak reported in history. In this outbreak, imported case from Liberia and associated locally acquired cases in health-care workers were identified in the U.S. Infection with Ebola virus in humans is incidental -- humans do not "carry" the virus. The way in which the virus first appears in a human at the start of an outbreak has not been determined. However, it has been hypothesized that the first patient (the index case) becomes infected through contact

with an infected animal. Ebola virus is transmitted by contact with blood, feces, or body fluids from an infected person or by direct contact with the virus, as in a laboratory. People can be exposed to Ebola virus from direct contact with the blood or secretions of an infected person. This is why the virus has often been spread through the families and friends of infected persons: in the course of feeding, holding, or otherwise caring for them, family members and friends would come into close contact with such secretions. People can also be exposed to Ebola virus through contact with objects, such as needles, that have been contaminated with infected secretions. The initial symptoms are usually high fever, headache, muscle aches, stomach pain, and diarrhea. There may also be sore throat, hiccups, and red and itchy eyes. The symptoms that tend to follow include: vomiting, rash, and bleeding problems that include bloody nose (epistaxis), spitting up blood from the lungs (hemoptysis), vomiting blood from the stomach (hematemesis), and bloody eyes (conjunctival hemorrhages). Then finally come chest pain, shock, and death. A protein on the surface of the virus has been discovered that is responsible for the severe internal bleeding (the death-dealing feature of the disease). The protein attacks and destroys the endothelial cells lining blood vessels, causing the vessels to leak and bleed. There is no specific treatment for the disease. Currently, patients receive supportive therapy. This consists of balancing the patient's fluids and electrolytes, maintaining their oxygen level and blood pressure, and treating them for any complicating infections. Death can occur within 10 days of the onset of symptoms. The prevention of the spread of Ebola fever involves practical viral hemorrhagic fever isolation precautions, or barrier nursing techniques. These techniques include the wearing of protective clothing, such as masks, gloves, gowns, and goggles; the use of infection-control measures, including complete equipment sterilization; and the isolation of Ebola fever patients from contact with unprotected persons. The aim of all of these techniques is to avoid any person's contact with the blood or secretions of any patient. If a

patient with Ebola fever dies, it is equally important that direct contact with the body of the deceased patient be prevented.

### History

Ebola was discovered in 1976 near the Ebola River in the Democratic Republic of the Congo. Since then, several small outbreaks have occurred in Africa. The 2014 outbreak is the largest. Countries affected in this recent outbreak include:

- Guinea
- Liberia
- Sierra Leone

Ebola has also been reported in:

1. Nigeria
2. Senegal
3. United States
4. Spain
5. Mali

Most of these cases are due to people traveling from a country where Ebola is present. In October 2014, the World Health Organization (WHO) declared both Nigeria and Senegal free of Ebola virus transmission. As of November 2014, there have been 4 people diagnosed with Ebola in the United States. One case occurred in a man traveling from West Africa to Texas. He died from the disease. Two health care providers who cared for the man also contracted Ebola. A doctor who had treated Ebola patients in Guinea returned to New York City and was diagnosed with Ebola after developing symptoms. All three health care providers have recovered and no longer have the Ebola virus.

### How Ebola Can Spread

The Ebola virus disease (EVD), formerly known as Ebola hemorrhagic fever is a severe condition caused by a virus from the *Filoviridae* family. According to scientists there are five different types of the virus, all of which have the potential to infect humans.

According to the WHO (World Health Organisation) this disease can be transmitted from close contact with the blood, secretions, organs or other bodily fluids of infected animals.

Ebola does not spread as easily as more common illnesses such as colds, the flu, or measles. There is no evidence that the virus that causes Ebola is spread through the air or water. A person who has Ebola CANNOT spread the disease until symptoms appear.

Ebola can ONLY spread between humans by direct contact with infected body fluids including but not limited to urine, saliva, sweat, feces, vomit, breast milk, and semen. The virus can enter the body through a break in the skin or through mucous membranes, including the eyes, nose, and mouth.

Ebola can also spread by contact with ANY surfaces, objects, and materials that have been in contact with body fluids from a sick person, such as:

1. Bedclothes and bedding
2. Clothing
3. Bandages
4. Needles and syringes
5. Medical equipment

In Africa, Ebola may also be spread by:

- Handling infected wild animals hunted for food (bushmeat)
- Contact with blood or body fluids of infected animals
- Contact with infected bats

Ebola does NOT spread through:

- Air
- Water
- Food
- Insects (mosquitoes)

Health care workers and people caring for sick relatives are most at risk for developing Ebola because they are more likely to come in to direct contact with body fluids.

### Symptoms

The time between exposure and when symptoms occur (incubation period) is 2 to 21 days. On average, symptoms develop in 8 to 10 days.

Early symptoms of Ebola include:

1. Fever greater than 101.5°F (38.6°C)
2. Chills
3. Severe headache
4. Sore throat
5. Muscle pain
6. Weakness
7. Fatigue
8. Rash
9. Abdominal (stomach) pain
10. Diarrhea
11. Vomiting

Late symptoms include:

1. Bleeding from the mouth and rectum
2. Bleeding from eyes, ears, and nose
3. Organ failure

A person who does not have symptoms 21 days after being exposed to Ebola will not develop the disease.

### Causes

Ebola virus has been found in African monkeys, chimps and other nonhuman primates. A milder strain of Ebola has been discovered in monkeys and pigs in the Philippines. Marburg virus has been found in monkeys, chimps and fruit bats in Africa.

### Transmission from animals to humans

Experts suspect that both viruses are transmitted to humans through an infected animal's bodily fluids. Examples include:

**1. Blood.** Butchering or eating infected animals can spread the viruses. Scientists who have operated on infected animals as part of their research have also contracted the virus.

**2. Waste products.** Tourists in certain African caves and some underground mine workers have been infected with the Marburg virus, possibly through contact with the feces or urine of infected bats.

### Transmission from person to person

Infected people typically don't become contagious until they develop symptoms. Family members are often infected as they care for sick relatives or prepare the dead for burial.

Medical personnel can be infected if they don't use protective gear, such as surgical masks and gloves. Medical centers in Africa are often so poor that they must reuse needles and syringes. Some of the worst Ebola epidemics have occurred because contaminated injection equipment wasn't sterilized between uses.

There's no evidence that Ebola virus or Marburg virus can be spread via insect bites.

### Risk factors

For most people, the risk of getting Ebola or Marburg viruses (hemorrhagic fevers) is low. The risk increases if you:

**1. Travel to Africa.** You're at increased risk if you visit or work in areas where Ebola virus or Marburg virus outbreaks have occurred.

**2. Conduct animal research.** People are more likely to contract the Ebola or Marburg virus if they conduct animal research with monkeys imported from Africa or the Philippines.

**3. Provide medical or personal care.** Family members are often infected as they care for sick relatives. Medical personnel also

can be infected if they don't use protective gear, such as surgical masks and gloves.

**4. Prepare people for burial.** The bodies of people who have died of Ebola or Marburg hemorrhagic fever are still contagious. Helping prepare these bodies for burial can increase your risk of developing the disease.

#### Complications

Both Ebola and Marburg hemorrhagic fevers lead to death for a high percentage of people who are affected. As the illness progresses, it can cause:

1. Multiple organ failure
2. Severe bleeding
3. Jaundice
4. Delirium
5. Seizures
6. Coma
7. Shock

One reason the viruses are so deadly is that they interfere with the immune system's ability to mount a defense. But scientists don't understand why some people recover from Ebola and Marburg and others don't.

For people who survive, recovery is slow. It may take months to regain weight and strength, and the viruses remain in the body for weeks. People may experience:

1. Hair loss
2. Sensory changes
3. Liver inflammation (hepatitis)
4. Weakness
5. Fatigue
6. Headaches
7. Eye inflammation
8. Testicular inflammation

#### Prevention

There is no vaccine to protect against Ebola. The CDC urges all United States residents to avoid travel to Liberia, Guinea, and Sierra Leone because of unprecedented outbreaks of Ebola in those countries.

If you plan to travel to one of the countries where Ebola is present, the CDC recommends taking the following steps to prevent illness:

1. Practice careful hygiene. Wash your hands with soap and water or an alcohol-based hand sanitizer. Avoid contact with blood and body fluids.
2. Avoid contact with people who have a fever, are vomiting, or appear ill.
3. Do not handle items that may have come in contact with an infected person's blood or body fluids. This includes clothes, bedding, needles, and medical equipment.
4. Avoid funeral or burial rituals that require handling the body of someone who has died from Ebola.
5. Avoid contact with bats and nonhuman primates or blood, fluids, and raw meat prepared from these animals.
6. Avoid hospitals in West Africa where Ebola patients are being treated. If you need medical care, the United States embassy or consulate is often able to provide advice about facilities.
7. After you return, pay attention to your health for 21 days. Seek medical care right away if you develop symptoms of Ebola, such as a fever. Tell the health care providers that you have been to a country where Ebola is present.

Health care workers who may be exposed to people with Ebola should follow these steps:

- Wear protective clothing, including masks, gloves, gowns, and eye protection.
- Practice proper infection control and sterilization measures.

- Isolate patients with Ebola from other patients.
- Avoid direct contact with the bodies of people who have died from Ebola.
- Notify health officials if you have had direct contact with the blood or body fluids of a person who is sick with Ebola.

#### Diagnosis

Diagnostic studies that may be helpful include the following:

1. Basic blood tests – Complete blood count (CBC) with differential, bilirubin, liver enzymes, blood urea nitrogen (BUN), creatinine, pH
2. Studies for isolating the virus – Tissue culture (only to be performed in one of a few high-containment laboratories throughout the world), reverse-transcription polymerase chain reaction (RT-PCR) assay
3. Serologic testing – Enzyme-linked immunosorbent assay (ELISA) for antigens or for immunoglobulin M (IgM) and immunoglobulin G (IgG) antibodies
4. Other studies – Immunochemical testing of postmortem skin, electron microscopy
5. See Workup for more detail.

#### Management

General principles of care are as follows:

1. Supportive therapy with attention to intravascular volume, electrolytes, nutrition, and comfort care is of benefit to the patient
2. Such therapy must be administered with strict attention to barrier isolation; all body fluids contain infectious virions and should be handled with great care
3. No specific therapy is available that has demonstrated efficacy in the treatment of Ebola hemorrhagic fever

There are no commercially available Ebola vaccines; however, neutralizing antibodies have been studied that may be useful in vaccine development or as passive prophylactic agents. At present, no specific anti-*Ebolavirus* agents are available. Agents that have been studied for the treatment or prevention of Ebola virus disease include the following:

1. Ribavirin (possesses no demonstrable anti-*Ebolavirus* activity in vitro and has failed to protect *Ebolavirus*-infected primates)
2. Nucleoside analogue inhibitors of S-adenosylhomocysteine hydrolase (SAH)
3. Interferon beta
4. Horse- or goat-derived immune globulins
5. Human-derived convalescent immune globulin preparations
6. Recombinant human interferon alfa-2
7. Recombinant human monoclonal antibody against the envelope glycoprotein (GP) of Ebola virus
8. DNA vaccines expressing either envelope GP or nucleocapsid protein (NP) genes of Ebola virus
9. Activated protein C<sup>[2]</sup>
10. Recombinant inhibitor of factor VIIa/tissue factor<sup>[3]</sup>

In those patients who do recover, recovery often requires months, and delays may be expected before full resumption of normal activities. Weight gain and return of strength are slow. Ebola virus continues to be present for many weeks after resolution of the clinical illness.

#### Treatment

There is no known cure for Ebola. Experimental treatments have been used, but none have been fully tested to see if they work well and are safe.

People with Ebola must be treated in a hospital. There, they can be isolated so the disease cannot spread. Health care providers will treat the symptoms of the disease.

Treatment for Ebola includes:

- Fluids given through a vein (IV)
- Oxygen
- Blood pressure management
- Treatment for other infections
- Blood transfusions

#### Conclusion

There aren't any vaccinations available as of now, so basic hygiene is of importance and a must be followed in order to prevent the onset of the condition. Simple activities like washing your hands well, drinking water from a clean source, maintaining general hygiene and cooking your meat well, can all serve as precautionary measures. Apart from that people should avoid crowded places, or those that are known to have an outbreak. It is also important that if they notice any early symptoms, they should visit a doctor immediately.

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