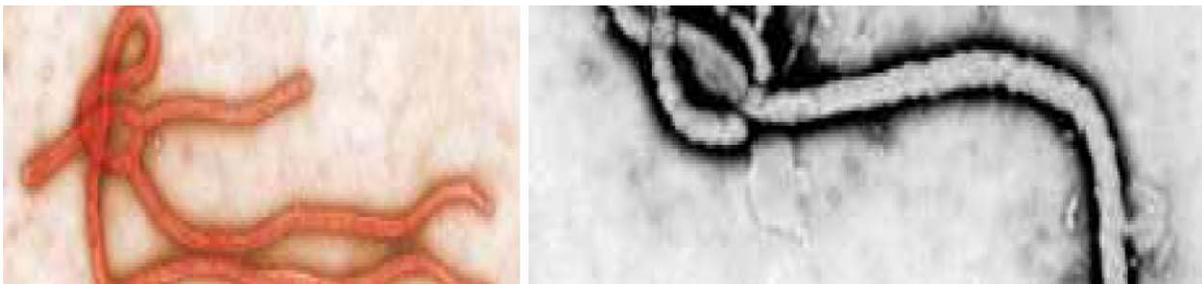


Ebola (Free CE'S)

Ebola was first discovered in 1976, in the Democratic Republic of the Congo near the Ebola River in a small isolated village of Boende, Equateur. Ebola is also known as Ebola virus disease (EVD) and Ebola hemorrhagic fever (EHF). Ebola is a serious but rare infectious illness that often becomes a fatal viral disease. The Ebola virus has appeared in sporadic outbreaks since 1976.

The outbreaks typically have appeared in remote areas of Central and West Africa, usually near tropical rainforests. The Ebola-Reston virus, a subtype, has also been found in the Philippines. However, this virus from the Philippines only affects animals.



Pictures 1 and 2.

According to the Centers for Disease Control and Prevention, there have been 2,265 reported Ebola cases since 2012 of these 1,531 resulted in death. That means 68% of the people infected with Ebola, die. In 1976, there were two simultaneous outbreaks; one in Nzara, Sudan and the other in Yambuku, Democratic Republic of the Congo.

Table 1: Chronology of previous Ebola virus outbreaks

Year	Country	Ebola Virus Species	Cases	Deaths	Case Fatality
2014 as of 12/14	Guinea, Sierra Leone, Liberia. Countries affected: Nigeria, Spain and U.S. Travel Associated: Senegal. Subject to change	1 st strain Zaire Ebolavirus (EBOV) Emergence of a 2 nd new strain in Guinea	20,000	7,000 +	To be determined
2012	Democratic Republic of Congo	Bundibugyo	57	29	51%
2012	Uganda	Sudan	7	4	57%
2012	Uganda	Sudan	24	17	71%
2011	Uganda	Sudan	1	1	100%
2008	Democratic Republic of Congo	Zaire	264	187	71%
2007	Uganda	Bundibugyo	149	37	25%
2007	Democratic Republic of Congo	Zaire	264	187	71%
2005	Congo	Zaire	12	10	83%
2004	Sudan	Sudan	17	7	41%
2003	Congo	Zaire	35	29	83%
2003	Congo	Zaire	143	128	90%
2001-2002	Congo	Zaire	59	44	75%
2001-2002	Gabon	Zaire	65	54	82%
2000	Uganda	Sudan	425	224	53%
1996	South Africa	Zaire	1	1	100%
1996	Gabon	Zaire	60	45	75%
1996	Gabon	Zaire	31	21	68%
1995	Democratic Republic of Congo	Zaire	315	254	81%
1994	Cote d'Ivoire	Tai Forest	1	0	0%
1994	Gabon	Zaire	52	31	60%
1979	Sudan	Sudan	34	22	65%
1977	Democratic Republic of Congo	Zaire	1	1	100%
1976	Sudan	Sudan	284	151	53%
1976	Democratic Republic of Congo	Bundibugyo	57	29	51%

Prior to the current outbreak reported in West Africa in March 2014, this region has never been affected by Ebola. It quickly spread from Nzerekore, a remote area of south-eastern Guinea, to urban areas including the capital Conakry. The current outbreak in West Africa is the largest and most complex Ebola outbreak caused by Ebola-Zaire.

There have been more Ebola cases and related deaths in the current outbreak than any other previous outbreaks combined. As of December 2014, the Ebola virus has killed at least 7,500 people. This number includes probable, confirmed and suspected cases.

This number includes:

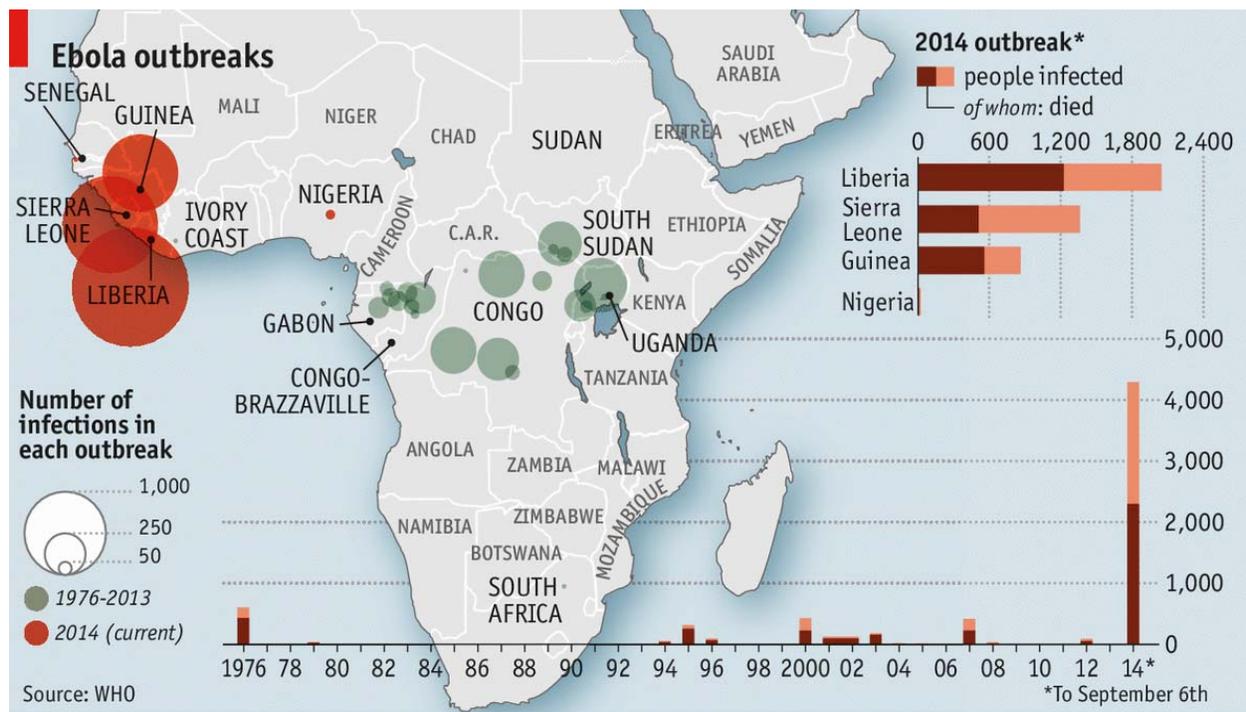
- ☐ 3,413 Liberia
- ☐ 2,732 Sierra Leone
- ☐ 1,697 Guinea
- ☐ 8 Nigeria

Source World Health Organization (WHO)

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- ☐ 3,413 Liberia
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Picture: 3

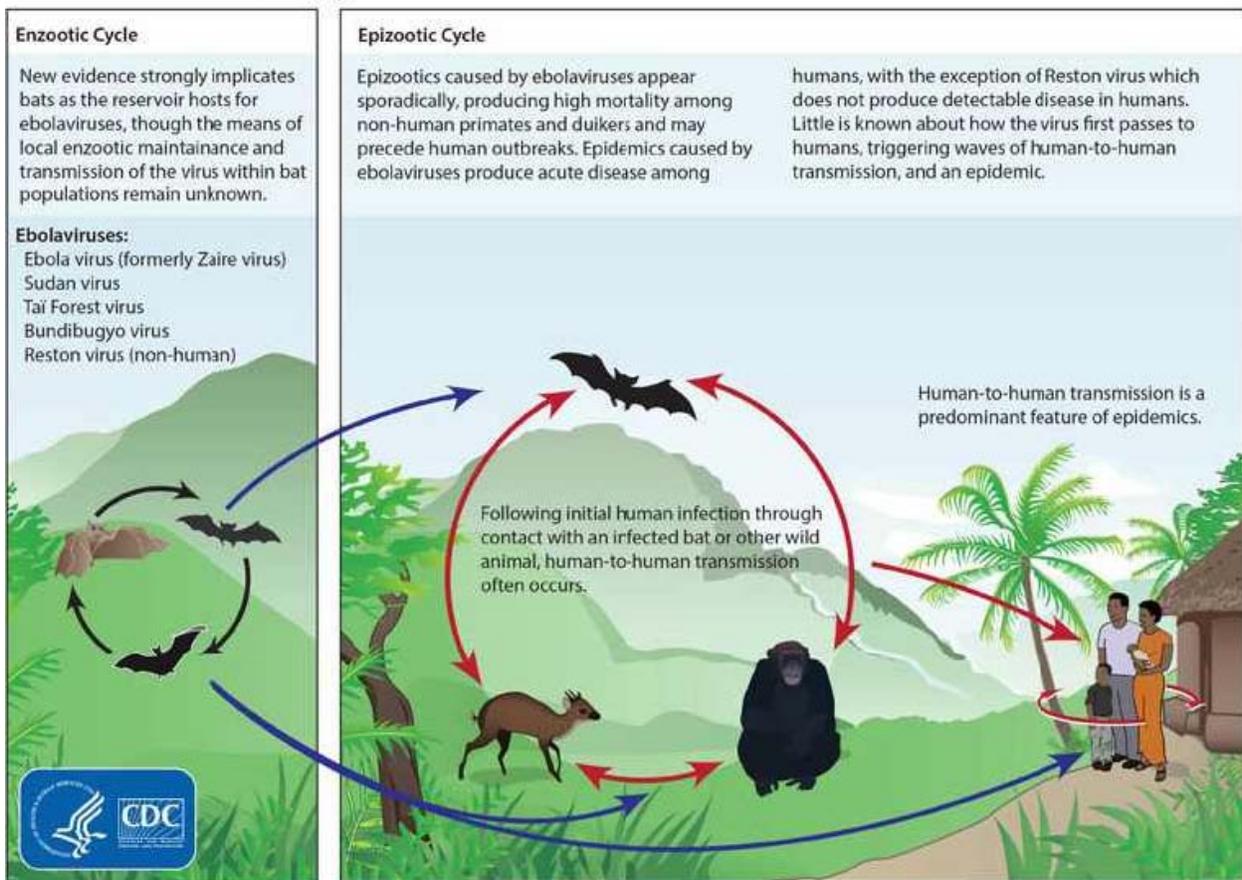
Many have died of the Ebola virus in Guinea, Liberia, Sierra Leone and Nigeria. More than 20,700 people have been infected during this outbreak and the number seems to keep growing. The most severely affected countries, Guinea, Sierra Leone and Liberia have very weak health systems. These regions (or areas) often lack infrastructure and human resources needed to combat Ebola; though these regions (or areas) have also been recovering from long periods of conflicts and instability. Ebola has claimed the lives of dozens of doctors and nurses including Sierra Leone's only virologist and Ebola expert, Sheik Umar Khan.

The United States has two imported cases and two locally acquired cases in health care workers have been reported. During this outbreak five health care workers and one journalist infected with Ebola have been transported to the United States. One of these health care workers from Sierra Leone died on November 17, 2014 in a Nebraska medical center. One confirmed case has been reported in Spain.

There are several different opinions on the family and subtypes of Ebola. Here are the different types mentioned, all from reliable sources. The virus family Filoviridae includes three genera: Cuevavirus, Marburgvirus, and Ebolavirus.

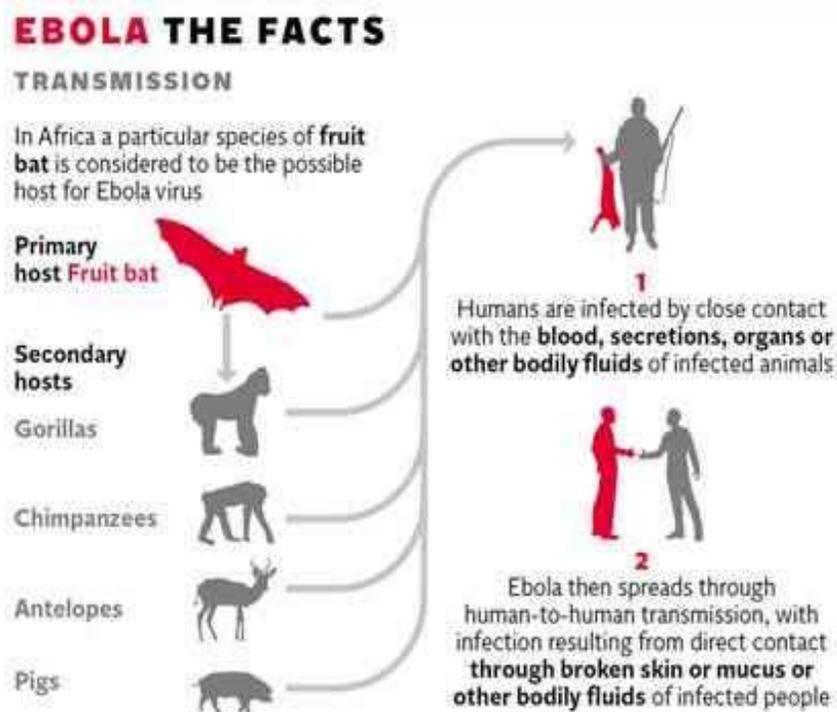
There are five species or subtypes that have been identified: Ebola-Zaire, Ebola-Bundibugyo, Ebola-Sudan, Ebola-Reston, and Tai Forest Ebola is mentioned on some sites and Ebola-Ivory coast on others as the fifth subtype. Bundibugyo ebolavirus, Sudan ebolavirus and Zaire ebolavirus have been associated with the largest outbreaks in Africa. The largest and most dangerous outbreak belongs to the Zaire species.

Ebolavirus Ecology



Picture: 4

The Ebola virus may have originated from infected bats, commonly fruit bats, is zoonotic origin. This means it is transmitted to human populations by direct contact with bats as thought in this case. However, the disease can also be spread through close contact with infected Primates (Apes, Monkeys, chimpanzees) pigs and forest antelope. Fruit bats are commonly suspected as an Ebola virus reservoir as previous outbreaks in Africa indicate. Another question is why the adults were not infected before or at the same time as the two-year-old boy who was the first to be infected according to the index case. Another possibility of infection may have occurred from a large colony of free-tailed insectivorous bats that were living in a hollow tree nearby the boy's home. Villagers reported that children often played in and around the tree.



Picture: 5

Initial Ebola infection occurs when there is contact with infected blood, bodily fluids or organs of an infected animal. It is believed that fruit bats are a carrier and may spread the virus without being affected. It then

spreads between humans by direct contact with infected blood, bodily fluids; including urine and semen. It can be spread indirectly through contact with contaminated environments including medical equipment, needles, bedding, clothing and surfaces thought to be through broken skin. It is unclear how long the virus can exist on surfaces; some evidence suggests up to six days. Bleach and Chlorine can kill Ebola.

The funerals of an Ebola victim can put the mourners at risk if any of them have direct contact with the body of the deceased. If a person has died from Ebola, their body will have a very high viral load. Bleeding is a usual symptom of the disease prior to death. Those who handle the body may come in contact with the blood or other bodily fluids are at an increased risk of catching the disease. Religious worship in Africa includes preparation of the bodies for burial and may include washing, touching (hugging) and kissing. The medical charity Medecins Sans Frontieres (MSF) has been trying to educate people of how their treatment of the dead bodies of those infected with Ebola can put themselves at risk, this is a very difficult message to give to grieving families. Due to the risk, deceased bodies infected with Ebola still pose prompt and safe burials are urged. In places where outbreaks have already occurred, there has been a cultural shift to avoid contact with persons who are infected.

The incubation period can last from two days to three weeks, and diagnosis is difficult. There has been a question with the spread of the Ebola virus to other countries if cold weather can affect the incubation period. Health care workers are at risk if they treat patients without taking the correct precautions or having the correct equipment to avoid contact.

People are infected as long as their blood and secretions contain the Ebola virus. In some cases, recovery has taken up to seven weeks. Men can transmit the virus through their semen for up to seven weeks after recovering from Ebola.

Symptoms of Ebola virus disease



Picture: 6

The incubation period from infection of the virus to onset of symptoms is 2 to 21 days. Humans are not infectious until they develop symptoms. The first symptoms are sudden with the rapid onset of:

- ☐ fever (which can be sudden)
- ☐ chills
- ☐ intense weakness
- ☐ fatigue, including joint and muscle soreness
- ☐ muscle pain
- ☐ headache
- ☐ anorexia
- ☐ sore throat

As Ebola first symptoms progress they are followed by:

- ☐ vomiting
- ☐ diarrhea

- ☐ rash (possibly progressing to a bleeding rash)
- ☐ swelling of genitals
- ☐ redness in the eyes
- ☐ symptoms of impaired kidney and liver function
- ☐ In some cases, both internal and external bleeding (e.g. oozing from the gums, blood in stools, bleeding from eyes, nose mouth, ears, or rectum). Laboratory findings include low white blood cell and platelet counts, and elevated liver enzymes.

Patients tend to die from dehydration, low blood pressure due to extreme loss of fluids and multiple organ failure.

If a person thinks they are infected, they should keep themselves isolated and seek professional help. Patients have a better chance for survival if they receive early treatment.

How is Ebola Fever diagnosed?

Ebola can be difficult to distinguish from other infectious diseases such as Malaria, Typhoid fever and Meningitis. A medical history is an important part of diagnosis, including travel, work history, and exposure to wildlife. Confirmation that symptoms are caused by Ebola virus infection is done with different lab tests. Ebola fever is diagnosed using blood tests to detect the Ebola virus. A blood test may be recommended if one has recently traveled into an area where the virus is found. Some of these tests are:

- ☐ antibody-capture enzyme-linked immunosorbent assay (ELISA) can be done for real time diagnosis
- ☐ antigen-capture detection tests
- ☐ serum neutralization test
- ☐ reverse transcriptase polymerase chain reaction (RT-PCR), assay can be used for real time diagnosis

☐ electron microscopy, can identify Filovirions in cell culture due to their unique filamentous shapes ☐ virus isolation by cell culture

Samples from patients are an extreme biohazard risk; laboratory testing on non-inactivated samples should be conducted under maximum biological containment conditions.

During an outbreak, virus isolation is often not feasible.

Treatment and Vaccines

No FDA approved vaccine or medicine (e.g., antiviral drug) is available for Ebola. Potential vaccines are being tested; if the trials are successful they would be used to protect healthcare workers first. As of yet, there is no proven treatment available for Ebola. Supportive basic interventions can significantly improve the chances of survival. Interventions are:

- ☐ Providing intravenous fluids (IV) and balancing electrolytes (body salts). Oral fluids, if tolerated, would also be advantageous. Drinks including Electrolytes may help.
- ☐ Maintaining oxygen status and blood pressure.
- ☐ Treating other specific symptoms or infections as they occur.

However, a range of potential treatments including blood products, immune therapies, and drug therapies are currently being evaluated. Two potential experimental vaccines and treatments that have not been fully tested for safety or effectiveness are undergoing human safety testing. The experimental drug ZMAPP has been given to several people who contracted Ebola: Two U.S. aid workers and a Briton have recovered after taking it. However, a Liberian doctor and a Spanish priest have died. The U.S. pharmaceutical company states it has run out of ZMAPP.

Blood products from survivors are also being tried as a potential therapy.

Recovery from Ebola depends on good supportive care and the patient's immune response. People who recover from Ebola infection develop antibodies that last for at least ten years, possibly longer. It is not known if people who recover are immune for life or if they can become infected with a different species of Ebola. Some people who have recovered from Ebola have developed long-term complications, such as joint and vision problems.

Richard Sacra, a Massachusetts doctor who recovered from Ebola, was hospitalized again for a respiratory condition with a cough and pink eye that is felt to be unrelated to Ebola. He was in the hospital for weeks recovering from Ebola. It is not known what factors allow some people to recover while others do not.

Prevention

The World Health Organization (WHO) warns against consuming raw bushmeat and recommends avoiding any contact with infected bats, monkeys or apes. Fruit bats are considered a delicacy in the area of Guinea where the outbreak started. Avoid contact with Ebola patients and their bodily fluids.

Another approach to stopping the spread of Ebola has been taken on by a geoinformatics researcher at Sweden's Royal Institute of Technology. They are mapping fruit bat habitats. Research could take the historical data and use it to predict the course of future epidemics and pandemics, helping to stop future spread of the disease.

Who is at risk?

Anyone in close contact with an Ebola patient is at risk. However, healthcare workers are using protective clothing including full-body suits and goggles, but hundreds of healthcare workers have still died. Health care workers are becoming scared of treating patients and are demanding better protective clothing when exposed to patients. They are also demanding better training and procedures to be put in place.

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