World Health Organization

Ebola virus disease

30 May 2019

Key facts

- **Ebola virus disease (EVD), formerly known as Ebola haemorrhagic fever, is a rare but severe, often fatal illness in humans.**
- **The virus is transmitted to people from wild animals and spreads in the human population through human-to-human transmission.**
- **The average EVD case fatality rate is around 50%. Case fatality rates have varied from 25% to 90% in past outbreaks.**
- **Community engagement is key to successfully controlling outbreaks.**
- **Good outbreak control relies on applying a package of interventions, namely case management, infection prevention and control practices, surveillance and contact tracing, a good laboratory service, safe and dignified burials and social mobilisation.**
- **Vaccines to protect against Ebola are under development and have been used to help control the spread of Ebola outbreaks in Guinea and in the Democratic Republic of the Congo (DRC).**
- **Early supportive care with rehydration, symptomatic treatment improves survival. There is no licensed treatment proven to neutralize the virus but a range of blood, immunological and drug therapies are under development.**

The Ebola virus causes an acute, serious illness which is often fatal if untreated. EVD first appeared in 1976 in 2 simultaneous outbreaks, one in what is now Nzara, South Sudan, and the other in Yambuku, DRC. The latter occurred in a village near the Ebola River, from which the disease takes its name.

The 2014–2016 outbreak in West Africa was the largest Ebola outbreak since the virus was first discovered in 1976. The outbreak started in Guinea and then moved across land borders to Sierra Leone and Liberia. The current 2018-2019 outbreak in eastern DRC is highly complex, with insecurity adversely affecting public health response activities.

The virus family Filoviridae includes three genera: Cuevavirus, Marburgvirus, and Ebolavirus. Within the genus Ebolavirus, six species have been identified: Zaire, Bundibugyo, Sudan, Taï Forest, Reston and Bombali. The virus causing the current outbreak in DRC and the 2014–2016 West African outbreak belongs to the Zaire ebolavirus species.

Transmission

It is thought that fruit bats of the Pteropodidae family are natural Ebola virus hosts. Ebola is introduced into the human population through close contact with the blood, secretions, organs or other bodily fluids of infected animals such as fruit bats, chimpanzees, gorillas, monkeys, forest antelope or porcupines found ill or dead or in the rainforest.

Ebola then spreads through human-to-human transmission via direct contact (through broken skin or mucous membranes) with:

- **Blood or body fluids of a person who is sick with or has died from Ebola**
- **Objects that have been contaminated with body fluids (like blood, feces, vomit) from a person sick with Ebola or the body of a person who died from Ebola**

Health-care workers have frequently been infected while treating patients with suspected or confirmed EVD. This occurs through close contact with patients when infection control precautions are not strictly practiced.

Burial ceremonies that involve direct contact with the body of the deceased can also contribute in the transmission of Ebola.

People remain infectious as long as their blood contains the virus.

Symptoms

The incubation period, that is, the time interval from infection with the virus to onset of symptoms, is from 2 to 21 days. A person infected with Ebola cannot spread the disease until they develop symptoms.

Symptoms of EVD can be sudden and include:

- **Fever**
- **Fatigue**
- **Muscle pain**
- **Headache**
- **Sore throat**

This is followed by:

- **Vomiting**
- **Diarrhoea**
- **Rash**
- **Symptoms of impaired kidney and liver function**
- **In some cases, both internal and external bleeding (for example, oozing from the gums, or blood in the stools).**
- **Laboratory findings include low white blood cell and platelet counts and elevated liver enzymes.**

Diagnosis

It can be difficult to clinically distinguish EVD from other infectious diseases such as malaria, typhoid fever and meningitis. Confirmation that symptoms are caused by Ebola virus infection are made using the following diagnostic methods:

- **antibody-capture enzyme-linked immunosorbent assay (ELISA)**
- **antigen-capture detection tests**
- **serum neutralization test**
- **reverse transcriptase polymerase chain reaction (RT-PCR) assay**
- **electron microscopy**
- **·virus isolation by cell culture.**

Careful consideration should be given to the selection of diagnostic tests, which take into account technical specifications, disease incidence and prevalence, and social and medical implications of test results. It is strongly recommended that diagnostic tests, which have undergone an independent and international evaluation, be considered for use.

- **Diagnostic tests evaluated through the WHO Emergency Use Assessment and Listing process**

Current WHO recommended tests include:

- **Automated or semi-automated nucleic acid tests (NAT) for routine diagnostic management.**
- **Rapid antigen detection tests for use in remote settings where NATs are not readily available. These tests are recommended for screening purposes as part of surveillance activities, however reactive tests should be confirmed with NATs.**

The preferred specimens for diagnosis include:

- **Whole blood collected in ethylenediaminetetraacetic acid (EDTA) from live patients exhibiting symptoms.**
- **Oral fluid specimen stored in universal transport medium collected from deceased patients or when blood collection is not possible.**

Samples collected from patients are an extreme biohazard risk; laboratory testing on non-inactivated samples should be conducted under maximum biological containment conditions. All biological specimens should be packaged using the triple packaging system when transported nationally and internationally.

Treatment

Supportive care - rehydration with oral or intravenous fluids - and treatment of specific symptoms improves survival. There is as yet no proven treatment available for EVD. However, a range of potential treatments including blood products, immune therapies and drug therapies are currently being evaluated.

In the ongoing 2018-2019 Ebola outbreak in DRC, the first-ever multi-drug randomized control trial is being conducted to evaluate the effectiveness and safety of drugs used in the treatment of Ebola patients under an ethical framework developed in consultation with experts in the field and the DRC.

Vaccines

An experimental Ebola vaccine proved highly protective against EVD in a major trial in Guinea in 2015. The vaccine, called rVSV-ZEBOV, was studied in a trial involving 11 841 people. Among the 5837 people who received the vaccine, no Ebola cases were recorded 10 days or more after vaccination. In comparison, there were 23 cases 10 days or more after vaccination among those who did not receive the vaccine.

The rVSV-ZEBOV vaccine is being used in the ongoing 2018-2019 Ebola outbreak in DRC. Initial data indicates that the vaccine is highly effective.

WHO's Strategic Advisory Group of Experts has stated the need to assess additional Ebola vaccines.

Prevention and control

Good outbreak control relies on applying a package of interventions, including case management, surveillance and contact tracing, a good laboratory service, safe burials and social mobilisation. Community engagement is key to successfully controlling outbreaks. Raising awareness of risk factors for Ebola infection and protective measures (including vaccination) that individuals can take is an effective way to reduce human transmission. Risk reduction messaging should focus on several factors:

- **Reducing the risk of wildlife-to-human transmission from contact with infected fruit bats, monkeys, apes, forest antelope or porcupines and the consumption of their raw meat. Animals should be handled with gloves and other appropriate protective clothing. Animal products (blood and meat) should be thoroughly cooked before consumption.**
- **Reducing the risk of human-to-human transmission from direct or close contact with people with Ebola symptoms, particularly with their bodily fluids. Gloves and appropriate personal protective equipment should be worn when taking care of ill patients. Regular hand washing is required after visiting patients in hospital, as well as after taking care of patients at home.**
- **Outbreak containment measures, including safe and dignified burial of the dead, identifying people who may have been in contact with someone infected with Ebola and monitoring their health for 21 days, the importance of separating the healthy from the sick to prevent further spread, and the importance of good hygiene and maintaining a clean environment.**
- **Reducing the risk of possible sexual transmission, based on further analysis of ongoing research and consideration by the WHO Advisory Group on the Ebola Virus Disease Response, WHO recommends that male survivors of EVD practice safer sex and hygiene for 12 months from onset of symptoms or until their semen tests negative twice for Ebola virus. Contact with body fluids should be avoided and washing with soap and water is recommended. WHO does not recommend isolation of male or female convalescent patients whose blood has been tested negative for Ebola virus.**

Controlling infection in health-care settings

Health-care workers should always take standard precautions when caring for patients, regardless of their presumed diagnosis. These include basic hand hygiene, respiratory hygiene, use of personal protective equipment (to block splashes or other contact with infected materials), safe injection practices and safe burial practices.

Health-care workers caring for patients with suspected or confirmed Ebola virus should apply extra infection control measures to prevent contact with the patient’s blood and body fluids and contaminated surfaces or materials such as clothing and bedding. When in close contact (within 1 metre) of patients with EVD, health-care workers should wear face protection (a face shield or a medical mask and goggles), a clean, non-sterile long-sleeved gown, and gloves (sterile gloves for some procedures).

Laboratory workers are also at risk. Samples taken from humans and animals for investigation of Ebola infection should be handled by trained staff and processed in suitably equipped laboratories.

Care for people who recovered from EVD

A number of medical complications have been reported in people who recovered from Ebola, including mental health issues. Ebola virus may persist in some body fluids, including semen. Ebola survivors need comprehensive support for the medical and psychosocial challenges they face and also to minimize the risk of continued Ebola virus transmission. To address these needs, a dedicated programme can be set up for care for people who recovered from Ebola.

- **For more, read the Guidance on clinical care for survivors of Ebola virus disease**

Ebola virus is known to persist in immune-privileged sites in some people who have recovered from Ebola virus disease. These sites include the testicles, the inside of the eye, and the central nervous system. In women who have been infected while pregnant, the virus persists in the placenta, amniotic fluid and fetus. In women who have been infected while breastfeeding, the virus may persist in breast milk.

Relapse-symptomatic illness in someone who has recovered from EVD due to increased replication of the virus in a specific site is a rare event, but has been documented. Reasons for this phenomenon are not yet fully understood.

Studies of viral persistence indicate that in a small percentage of survivors, some body fluids may test positive on reverse transcriptase polymerase chain reaction (RT-PCR) testing for Ebola virus for longer than 9 months.

More surveillance data and research are needed on the risks of sexual transmission, and particularly on the prevalence of viable and transmissible virus in semen over time. In the interim, and based on present evidence, WHO recommends that:

- **All Ebola survivors and their sexual partners should receive counselling to ensure safer sexual practices until their semen has twice tested negative. Survivors should be provided with condoms.**
- **Male Ebola survivors should be offered semen testing at 3 months after onset of disease, and then, for those who test positive, every month thereafter until their semen tests negative for virus twice by RT-PCR, with an interval of one week between tests.**
- **Ebola survivors and their sexual partners should either:**
  - **abstain from all types of sex, or**
  - **oobserve safer sex through correct and consistent condom use until their semen has twice tested negative.**

- **Having tested negative, survivors can safely resume normal sexual practices without fear of Ebola virus transmission.**
- **Based on further analysis of ongoing research and consideration by the WHO Advisory Group on the Ebola Virus Disease Response, WHO recommends that male survivors of Ebola virus disease practice safe sex and hygiene for 12 months from onset of symptoms or until their semen tests negative twice for Ebola virus.**
- **Until such time as their semen has twice tested negative for Ebola, survivors should practice good hand and personal hygiene by immediately and thoroughly washing with soap and water after any physical contact with semen, including after masturbation. During this period, used condoms should be handled safely, and safely disposed of, so as to prevent contact with seminal fluids.**
- **All survivors, their partners and families should be shown respect, dignity and compassion.**

Interim advice on the sexual transmission of the Ebola virus disease

WHO response

WHO aims to prevent Ebola outbreaks by maintaining surveillance for Ebola virus disease and supporting at-risk countries to develop preparedness plans. This document provides overall guidance for control of Ebola and Marburg virus outbreaks:

- **Ebola and Marburg virus disease epidemics: preparedness, alert, control, and evaluation**

When an outbreak is detected WHO responds by supporting community engagement, disease detection, contact tracing, vaccination, case management, laboratory services, infection control, logistics, and training and assistance with safe and dignified burial practices.

WHO has developed detailed advice on Ebola infection prevention and control:

- **Infection prevention and control guidance for care of patients with suspected or confirmed Filovirus haemorrhagic fever in health-care settings, with focus on Ebola**

Table: Chronology of previous Ebola virus disease outbreaks

Year	Country	EVD	Cases	Deaths	Case fatality
2018-2019	Democratic Republic of the Congo	Zaire	ongoing		
2018	Democratic Republic of the Congo	Zaire	54	33	61%
2017	Democratic Republic of the Congo	Zaire	8	4	50%
2015	Italy	Zaire	1	0	0%
2014	Spain	Zaire	1	0	0%

Year	Country	EVD	Cases	Deaths	Case fatality
2014	UK	Zaire	1	0	0%
2014	USA	Zaire	4	1	25%
2014	Senegal	Zaire	1	0	0%
2014	Mali	Zaire	8	6	75%
2014	Nigeria	Zaire	20	8	40%
2014-2016	Sierra Leone	Zaire	14124*	3956*	28%
2014-2016	Liberia	Zaire	10675*	4809*	45%
2014-2016	Guinea	Zaire	3811*	2543*	67%
2014	Democratic Republic of the Congo				
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	32	14	44%
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 (Nov-Dec)	Congo	Zaire	35	29	83%
2003 (Jan-Apr)	Congo	Zaire	143	128	90%
2001-2002	Congo	Zaire	59	44	75%
2001-2002	Gabon	Zaire	65	53	82%
2000	Uganda	Sudan	425	224	53%
1996	South Africa (ex-Gabon)	Zaire	1	1	100%
1996 (Jul-Dec)	Gabon	Zaire	60	45	75%
1996 (Jan-Apr)	Gabon	Zaire	31	21	68%
1995	Democratic Republic of Congo	Zaire	315	254	81%
1994	Côte d'Ivoire	Taï 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	Zaire	318	280	88%

* Include Suspect, Probable and Confirmed EVD cases.

- Ebola virus disease
- Ebola outbreak 2014-2015
- FAQs on Ebola virus disease
- WHO strategic response plan 2015: West Africa Ebola outbreak
- Clinical care for survivors of Ebola virus disease
- Technical guidance on case management, and infection prevention and control
- All publications on Ebola
- More on Ebola virus disease
- All technical guidance