



# **Ebola Virus Disease (EVD)**

Essential information

# Ebola Virus Disease (EVD)

## Origins

The Ebola virus is named after the Ebola River in what was Zaire (now Democratic Republic of Congo) where the first outbreak of the virus occurred in Yambuku, Democratic Republic of Congo, in 1976 along with a simultaneous outbreak in Nzara, Sudan.

Outbreaks of the infection, Ebola virus disease (EVD), (previously Ebola Hemorrhagic Fever or Ebola HF) has occurred more than 20 times in Africa since the initial 1976 outbreaks. EVD is a severe disease with a high mortality rate (40-90%) that can occur in people and some primates (monkeys, chimps, and gorillas).

The virus causing EVD (genus Ebolavirus) is one of three viruses in the Filoviride family of viruses. There are five subspecies of Ebolavirus that have been identified to date. Four of the five (Zaire ebolavirus, Sudan ebolavirus, Tai Forest ebolavirus, and Bundibugyo ebolavirus) are believed to have caused disease in humans. The fifth (Reston ebolavirus) is believed to infect and cause disease in primates. It can also infect people, but thus far has not caused disease in people.

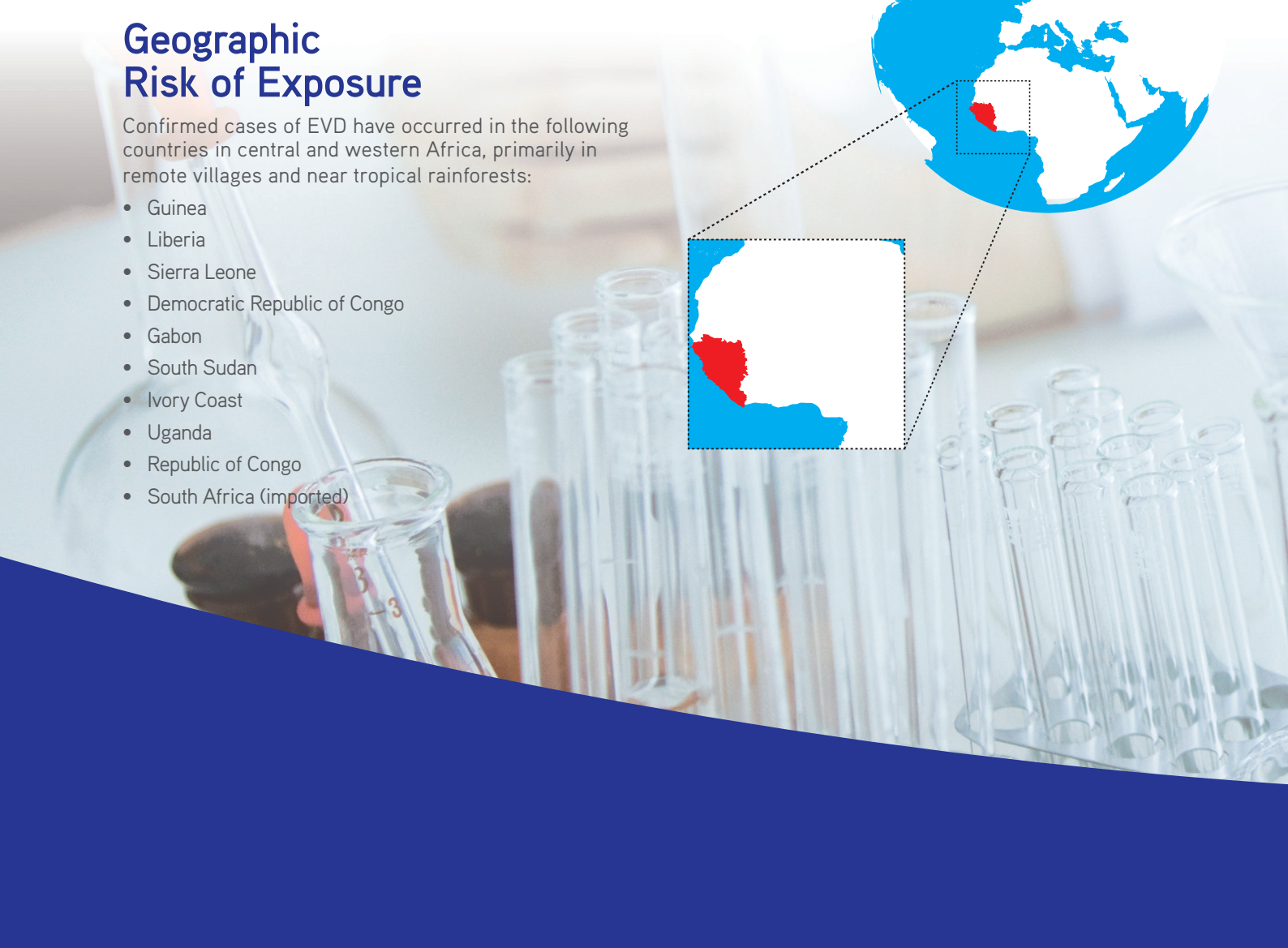
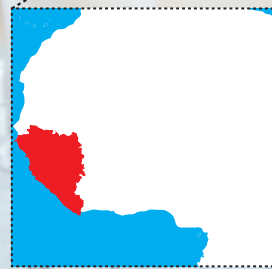
## Geographic Risk of Exposure

Confirmed cases of EVD have occurred in the following countries in central and western Africa, primarily in remote villages and near tropical rainforests:

- Guinea
- Liberia
- Sierra Leone
- Democratic Republic of Congo
- Gabon
- South Sudan
- Ivory Coast
- Uganda
- Republic of Congo
- South Africa (imported)

## Source/Natural Reservoir

There has been much investigation into the host that carries the virus, but thus far, the natural reservoir remains unproven. Researchers believe that the virus is carried by animals (zoonotic), with fruit bats (pteropodidae family) being the most likely host. According to the World Health Organization (WHO), infection of people has been documented through handling of infected chimps, gorillas, fruit bats, monkeys, forest antelope, and porcupines that have been found ill or dead in the rainforest. Because pig farms in Africa can draw fruit bats and pig farms seem to amplify outbreaks of EVD, measures should be taken to limit transmission via pig farms.



## Method of Transmission

The manner in which the virus appears (method of transmission) is also not firmly established. However, best evidence to date suggests that contact with an infected animal (a bite or contact with bodily secretions or organs) causes the initial transmission from animals to people, with person to person transmission occurring through broken skin or mucous membranes and contact with infected blood or body fluids causing the outbreak.

EVD is not believed to be transmitted by air, water, or food, although consumption of raw milk, raw meat, or raw organs of an infected animal are also believed to be a potential source of infection for people. All food (especially meat) should be thoroughly cooked to prevent any risk of transmission.

Previous EVD outbreaks have spread to the family and friends of infected people. This is believed to occur through close contact with infection secretions while caring for a sick family member or handling of the body after death, causing similar exposure to infected bodily fluids.

During an outbreak, the disease can spread rapidly through direct contact and exposure to infected blood or body fluids or indirectly through contact with the environment contaminated with infected blood or body fluids. This is especially the case when people close to the infected person (family, healthcare workers, cleaning staff, clergy, etc.) do not use proper barriers, such as masks, gowns, and gloves. Equipment and instruments are also believed to be a source of infection if they have been contaminated with blood or body fluids and are not disinfected or sterilized appropriately after contamination. This also includes reuse of contaminated needles and syringes without sterilization.

While initially, an infected person must have symptoms of EVD to be contagious, recent evidence indicates that people can transmit the Ebola virus through body fluids while the virus is still in their blood/body fluids. This may occur after symptoms have stopped and as a result is under further investigation.

Once transmission to a human host occurs, the virus can be transmitted to other people through:

- Contact with blood or secretions of an infected person (direct contact)
- Exposure to contaminated needles, bandages, clothing, or other infected objects (indirect contact)

Initial symptoms include: sudden onset fever, intense weakness, muscle pain, headache and sore throat. Following the initial symptoms, the person develops vomiting, diarrhea, rash, reduced kidney and liver function, and in some cases, bleeding. The full symptom list includes the following.

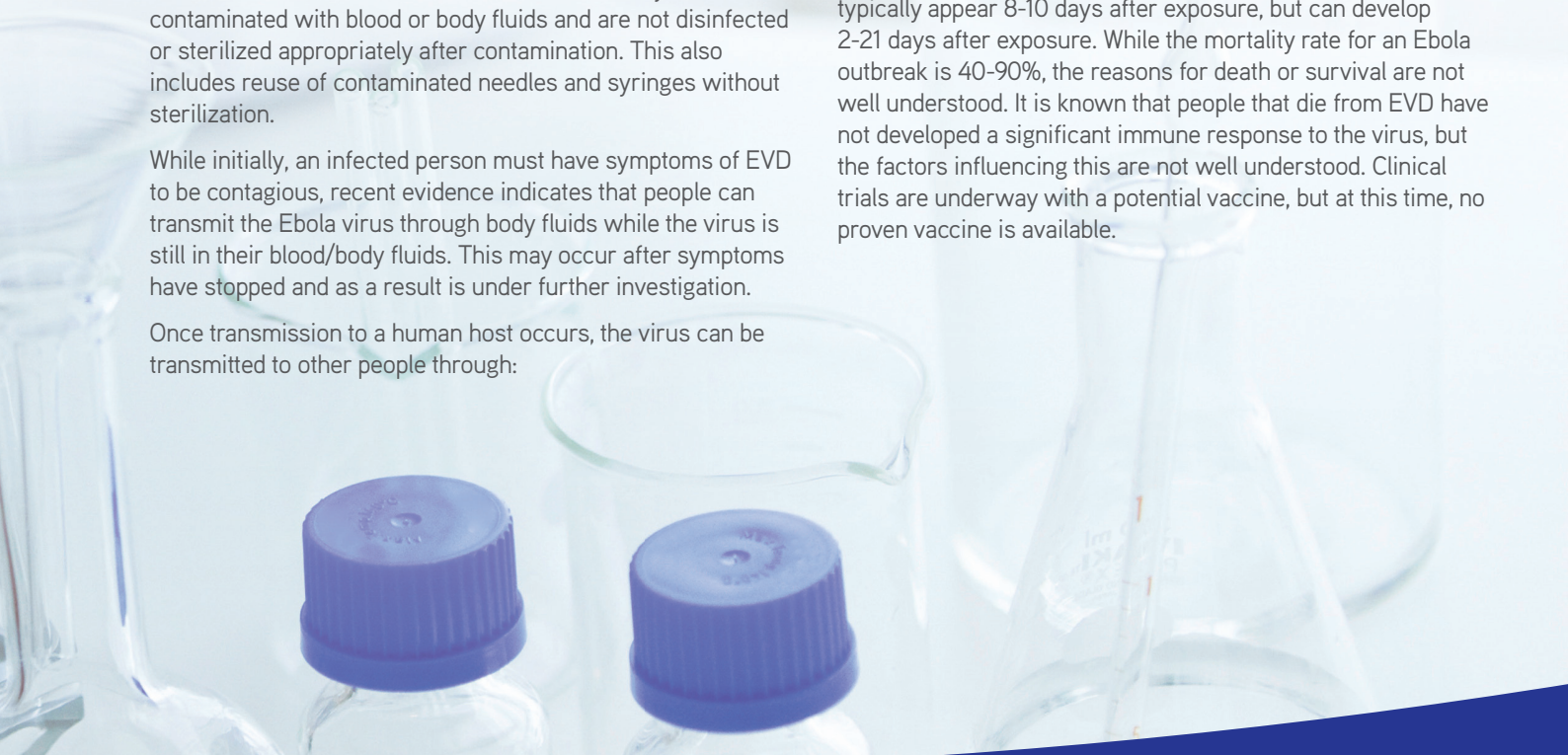
### Signs and Symptoms of EVD

- Rash
- Red eyes
- Hiccups
- Cough
- Sore throat
- Chest pain
- Difficulty breathing
- Difficulty swallowing
- Bleeding inside and outside the body

### Some patients may also experience

- Fever
- Headache
- Joint and muscle aches
- Weakness
- Diarrhea
- Vomiting
- Stomach pain
- Lack of appetite

Once infection occurs, symptoms appear rapidly. Symptoms typically appear 8-10 days after exposure, but can develop 2-21 days after exposure. While the mortality rate for an Ebola outbreak is 40-90%, the reasons for death or survival are not well understood. It is known that people that die from EVD have not developed a significant immune response to the virus, but the factors influencing this are not well understood. Clinical trials are underway with a potential vaccine, but at this time, no proven vaccine is available.



## Diagnosis

Performing a diagnosis on a person infected for only a few days is difficult because the early symptoms (headache, fever, red eyes, skin rash, etc) can be non-specific of Ebolavirus infection. The symptoms likely to present early in the illness are often seen in patients with more commonly occurring diseases. Diagnosis and treatment should only be performed by a trained physician who can rule out other potential diseases including: malaria, typhoid fever, shigellosis, cholera, leptospirosis, plague, rickettsiosis, relapsing fever, meningitis, hepatitis, and other viral hemorrhagic fevers.

If there is a reason to suspect EVD, such as early symptoms of EVD, the physician will order that the patient should be isolated and public health authorities should be informed. Samples will be taken from the patient and sent in for laboratory testing to confirm the diagnosis. Only trained staff should handle the samples of a potential EVD patient as they must be processed under Bio-Safety Level 4 containment (BSL-4). Persons infected with EVD will become severely ill and require intensive supportive care, which will require trained Healthcare workers.

Because patients with EVD may also have other conditions or illnesses at the same time, the patient may need to be treated for other conditions or illnesses in addition to EVD. This discussion is limited to considerations related to EVD for purposes of clarity.



# Prevention

Because the specific routes of infection are poorly understood, the primary prevention methods are considered best practice recommendations, but not necessarily evidence based. The Centers for Disease Control and Prevention (CDC) and WHO recommend standard contact and droplet precautions for hospitalized patients.

People caring for the patient with EVD risk exposure when providing care. The primary consideration is prevention of contact with blood or body fluids of an infected person, which could result in the virus crossing their mucus membrane barriers or entering through cuts in the skin and thus becoming infected. For a suspected case of EVD, facilities should be prepared to implement viral hemorrhagic fever isolation precautions including:

- Appropriate Personal Protective Equipment (PPE) as recommended by the WHO includes double gloving with the outer glove reaching to mid-forearm to cover the cuff from the gown, disposable fluid resistant long-sleeved gown or coverall, disposable waterproof apron, fluid resistant mask (that does not collapse against the mouth), eye protection (face shield or goggles) that completely covers the eyes, nose, and mouth, waterproof boots or boot covers, and the use of a fluid resistant respirator if performing aerosol generating procedures. Single use PPE is never to be reused. The CDC additionally recommends the use of a Powered Air Purifying Respirator (PAPR) with a full face shield and helmet or an N-95 respirator and surgical hood to ensure all skin above the shoulders is covered. Both WHO and CDC recommend PPE be used under the guidance of a trained observer who can monitor that PPE is being donned and doffed correctly.
- Infection control measures, such as equipment decontamination, disinfection, and sterilization as appropriate. For environmental surfaces and patient care equipment, use of a country government approved disinfectant is preferred, but in a country of limited means, the WHO recommends a 5,000 ppm (0.5%) solution of sodium hypochlorite (bleach). The WHO also recommends a cleaning step to ensure that all organic matter is removed which might inactivate the disinfectant prior to disinfection. The CDC doesn't specifically recommend this in their Ebola guidance because all EPA registered disinfectants in the US must pre-clean any surface where there is visible soil. The CDC recommends using registered disinfectants with non-enveloped virus claims to ensure effectiveness against Ebola. A full set of PPE is to be worn when cleaning the environment and handling infectious waste.
- Hand hygiene as per the WHO five moments and before/after glove use.
- Isolation of suspected EVD patients from contact with unprotected persons.

- If a patient with EVD dies, it is equally important to prevent direct contact with the body of the deceased.
- While incineration is often the current method of waste disposal, the WHO has actively been promoting autoclaving as a preferred option. After incineration or autoclaving, burial in a pit is an acceptable method of disposal for the inactivated waste. In countries such as the US, Ebola contaminated waste would require a special permit for transportation. The CDC recommends incineration, autoclaving or other methods of inactivating the waste. Ebola-associated waste that has been appropriately incinerated, autoclaved, or otherwise inactivated is not infectious, does not pose a health risk, and is not considered to be regulated medical waste or a hazardous material under US federal law. Therefore, such waste no longer is considered a Category A infectious substance.
- Handling of linens should include use of leak proof bags, a full set up PPE and heavy rubber gloves and an apron when handling soiled linens, avoiding sorting and pretreatment procedures, and an assessment of whether laundering can render the laundry hygienic. While standard Healthcare laundry procedures for contaminated fabrics are capable of making the fabric hygienic, because of the hazard posed by Ebola, the CDC recommends disposing of contaminated fabrics. This may need to include incineration, autoclaving, or other methods of inactivation to allow for transportation. The WHO recommends laundering if it can be done reliably and if not, incineration instead reliably, including a 15 min soak in 500 ppm of chlorine, and if not incineration or autoclaving.

Guidelines are available from the CDC and WHO to aid in better understanding of the disease and its prevention. These references were used in the preparation of this document.

[www.cdc.gov/vhf/ebola/](http://www.cdc.gov/vhf/ebola/)

[www.who.int/csr/disease/ebola/en/](http://www.who.int/csr/disease/ebola/en/)





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These materials are provided for information purposes only and are by their very nature only a summary and detailed guidelines are available from the Centers for Disease Control (CDC) or the World Health Organization (WHO) which should be considered the authoritative source of information and guidelines on Ebola and its prevention. These materials are subject to change at any time and for the up to date version please refer to [www.diversey.com/ebolaoutbreak](http://www.diversey.com/ebolaoutbreak).

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