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Review Article

**EBOLA VIRUS DISEASE – A SHORT REVIEW****E. Priyanka\*, K. Aruna, B. Mounica, D. Charitha, A. NagaJyothi, Ch. Kavya,  
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**Abstract:**

*Ebola virus, being highly pathogenic for humans and non-human primates and the subject of former weapons programmes, is now one of the most feared pathogens worldwide. In addition, the lack of pre- and post-exposure interventions makes the development of rapid diagnostics, new antiviral agents and protective vaccines a priority for many nations. Further insight into the ecology, immunology and pathogenesis of Ebola virus will promote the delivery of these urgently required tools.*

**Key Words:** *Ebolavirus, Leptospirosis, Plague, Rickettsiosis*

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## INTRODUCTION

Ebola virus Disease (formerly known as Ebola Hemorrhagic Fever) is a severe, often fatal illness, with a death of up to 90%. The illness affects humans and non-human primates (monkeys, gorilla and chimpanzees). Genus Ebola virus is 1 of 3 members of the Filoviridae family (filovirus), along with genus Marburgvirus and genus cuevavirus. Genus Ebola virus comprises 5 distinct species:

1. Bundibugyoebolavirus(BDBV)
2. Zaire ebolavirus(EBOV)
3. Reston ebolavirus(RESTV)
4. Sudan ebolavirus(SUDV)
5. Tai forest ebolavirus(TAFV)

As on 18<sup>th</sup> may 2014, the ministry of Health (MOH) of Guinea has reported a cumulative total of 253 clinical cases of Ebola virus Disease (EVD), including 176 deaths.

## HISTORY

- Ebola virus was first described in 1976
- Ebola virus and its genus were both originally named for Zaire (Now the Democratic republic of congo), the country where it was first described and at first suspected to be a new “stain” of the closely related Marburg virus. The virus was renamed “Ebola virus” in 2010 to avoid confusion. Ebola virus is the single member of the species “Zaire ebolavirus”
- The name “Ebolavirus” is derived from the “Ebolariver”-a river that was at first thought to be in close proximity to the area in Democratic Republic of Congo.
- The EBO virus genome is a single stranded RNA approximately 19000 nucleotides long it encodes seven structural proteins:
  - Nucleoprotein
  - Polymerase cofactor
  - RNA polymerase
- EBO virus carries a “negative-sense” RNA genome in virions that are cylindrical / tubular, and contain viral envelop, Matrix, and nucleocapsid components.
- The overall shape of virions after purification and visualization by electron microscope.
- Each virion contains one molecules of linear, single-stranded, negative-sense RNA 18959 to 18961 nucleotides in length.

## TRANSMISSION<sup>1</sup>

- Ebola is introduced into the human population through close contact with the blood, secretions, organs or other bodily fluids of infected animals, chimpanzee, gorilla, fruit bats, monkeys forest antelopes and porcupines

- Humans-to human transmission, with infection resulting from direct contact (through broken skin or mucous membranes) with environments contaminated with such fluids, health-care works have frequently been infected while treating patients with suspected or confirmed EVD.
- The virus can be transmitted through semen of affected person upto 7 weeks after recovery from illness
- Health-care workers have frequently been infected while treating patients with suspected or confirmed EVD. This has occurred through close contact with patients when infections control precautions are not strictly practiced.
- People are infections as long as their blood and secretions contain the virus. Ebola virus was isolated from semen 61 days after onset of illness in a man who was infected in a laboratory.

## SIGNS AND SYMPTOMS<sup>2</sup>:

EVD is a severe acute viral illness often characterized by the sudden onset of

- Fever
- Intense weakness
- Muscle pain
- Headache
- Sore throat
- Vomiting
- Diarrhoea
- Rash
- Impaired kidney and liver functions, and
- In some cases, both internal and external bleeding

### DAY 7-9:

- ❖ Headache
- ❖ Fatigue
- ❖ Muscle soreness

### DAY 10:

- ❖ Sudden high fever
- ❖ Vomiting blood
- ❖ Passive behavior

### DAY 11:

- ❖ Bruising
- ❖ Brain damage
- ❖ Bleeding from nose
- ❖ Mouth
- ❖ Eyes
- ❖ Anus

### DAY 12:

- ❖ Loss of consciousness
- ❖ Seizures
- ❖ Massive internal
- ❖ Bleeding

- ❖ Death
- ❖ Laboratory findings include low white blood cell and platelet counts and elevated liver enzymes.
- ❖ Incubation period: 2 to 21 days.

#### **CASE DEFINITION EBVD**

##### **Suspected (Clinical) Case:**

- ❖ Any person ill or decreased who has or had fever with acute clinical symptoms and signs of hemorrhage, such as bleeding of the gums, nose-bleeds, conjunctive injection, red spots on the body, bloody stools and/or melena (black liquid stools), or vomiting blood (Haematemesis) with the history of travel to the affected area. Documented prior contact with an EBVD case is not required.

##### **Probable Case (With or without Bleeding):**

- ❖ Any person (living or dead) having had contact with a clinical case of EHF and with a history of acute fever.

(or)

- ❖ Any person (living or dead) with a history of acute fever and three or more of the following symptoms: headache/vomiting/nausea/loss of appetite/diarrhea/intense fatigue/abdominal pain/general muscular or articular pain/difficulty in swallowing/difficulty in breathing/hiccoughs.

##### **Any Unexplained Death**

- ❖ The distinction between a suspected case and a probable case in practice relatively unimportant as far as outbreak control is concerned.

##### **CONTACT:**

A person without any symptoms having had physical contact with a case or the body fluids of a case within the last three weeks. The notion of physical contact may be proven or highly suspected such as having shared the same room or bed, cared for patient, touched body fluids, or closely participated in a burial (e.g. physical contact with the corpse)

##### **CONFIRMED CASE:**

- ❖ A suspected or probable case with laboratory confirmation (positive IGM antibodies, positive PCR or viral isolation)

##### **DIAGNOSIS:**

- ❖ Other diseases that should be ruled out before a diagnosis of EVD can be made include: malaria, typhoid fever, shigellosis, cholera, leptospirosis, plague, rickettsiosis, relapsing fever, meningitis, hepatitis and other viral haemorrhagic fevers.

- ❖ Ebola virus infections can be diagnosed definitely in a laboratory through several types of tests:

- Antibody-capture enzyme-linked immunosorbent assay (ELISA)
- Antigen detection tests
- Serum neutralization test
- Reverse transcriptase polymerase chain reaction (RT-PCR)
- Electron microscopy
- Virus isolation by cell culture.
- Samples from patients are an extreme biohazard risk; testing should be conducted under maximum biological conditions.

##### **PREVENTION AND CONTROL<sup>3</sup>:**

- ❖ Casual contacts in public places with people that do not appear to be sick do not transmit Ebola. One cannot contract Ebola virus by handling money, groceries or swimming in a pool. Mosquitoes do not transmit the Ebola virus.

- ❖ Ebola virus is easily killed by soap, bleach, sunlight, or drying. Ebola virus survives only a short time on surfaces that have dried in the sun.

##### **REDUCING THE RISK OF EBOLA INFECTION IN PEOPLE:**

- ❖ In the absence of effective treatment and a human vaccine, raising awareness of the risk factors for Ebola infection and the protection measures individuals can take is the only way to reduced human infection and death.

- ❖ Reducing the risk of wildlife-to-human transmission from contact with infected fruit bats or monkeys/apes and the consumption of their raw meat. Animals should be handled with gloves and other appropriate protective clothing. Animals produces (blood and meat) should be thoroughly cooked before consumption.

- ❖ Reduced the risk of human-to-human transmission in the community arising from direct or close contact with infected patients, particularly with their body fluids. Close physical contact with Ebola patients should be avoided. Gloves and appropriate personal protective equipment should be worn when taking care of ill patients at home and should be disposed after use as per biosafety guidelines. Regular hand washing is required after visiting patients hand washing is required after visiting patients in hospital, as well as after taking care of patients at home

- ❖ Dead patients to be handled for cremation/burial under biosafety precautions

##### **CONTROLLING INFECTION IN HEALTH-CARE SETTINGS<sup>4</sup>:**

- ❖ Human-to human transmission of the Ebola virus is primarily associated with direct or indirect contact with blood and body fluids. Transmission to health-care workers has been reported when

appropriate infection control measures have not been observed.

❖ It is not always possible to identify patients with EBV early because initial symptoms may be non-specific. For this reason, it is important that health-care workers apply standard precautions consistently with all patients regardless of their diagnosis in all work practices at all times. These include basic hand hygiene, respiratory hygiene, use of personal protective equipment (according to the risk of splashes or other contact with infected materials), safe injection practices and safe handling after death of infected patient.

❖ Health-care workers caring for patient with suspected or confirmed Ebola virus should apply, in addition to standard precautions, other infection control measures to avoid any exposure to avoid any exposure to the patient's blood and body fluids and direct unprotected contact with the possibly contaminated environment. When in EBV, 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 human and animals Ebola cases for diagnosis should be handled by trained staff and processed in suitably equipped laboratories.

#### **US BASED DRUG COMPANY MAPP BIOPHARMACEUTICAL MADE AVAILABLE DRUG ZMAPP TO TREAT EBOLA:**

Mapp Biopharmaceutical in the first week of August 2014, made available the drug Zmapp to treat Ebola. The drug has been dubbed as secret serum and is a cocktail of drugs produced by Mapp Biopharmaceuticals and Canadian company Defyrus. The Zmapp was first given to two US doctors Kent Brantley and Nancy Writebol who got affected with the Ebola disease while treating Ebola affected patients

in Liberia. The drug was given after a special approval from the Food and drug administration of the US. The drug Zmapp has been tested only on monkeys so far and it was to be tested on healthy human volunteers in 2015. However, the sudden outbreak of Ebola and early promise shown by drug in curing the disease has speeded up the process and trials may be advanced now due to the global emergency.

#### **HOW ZMAPP IS DEVELOPED?**

The drug uses a new method of passive immunization to treat Ebola infection. First antibodies are extracted from infected patients and then induced into mice. The Ebola protein is then genetically altered and then inserted into tobacco leaves through a unique method developed by a German company, Icon Genetics. The antibodies are then inserted into tobacco leaves using this technology and grown in large numbers for extraction. Finally the antibodies against the Ebola virus are then administered to patients to develop immunity to tackle the disease. Mapp Biopharmaceuticals was set up in 2003 in San Diego, California, US. It was founded by ex-John Hopkins University faculty, Mr Larry Zeitlin and Dr Kevin J Whaley. The company with its nine employees rather scientists has been quietly working in the field of biological warfare related fields for the US Defence Department.

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