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Universal Journal of Pharmaceutical Research
An International Peer Reviewed Journal
ISSN: 2831-5235 (Print); 2456-8058 (Electronic)

REVIEW ARTICLE

EBOLA VIRUS DISEASE AND ITS COMPLICATIONS

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Article Info:

Article History:
Received: 5 August 2016
Reviewed: 10 September 2016
Accepted: 12 October 2016
Published: 15 November 2016

Cite this article:
Keservani RK, Sharma AK, Jarouliya U, Singh AK. Ebola virus disease and its complications. Universal Journal of Pharmaceutical Research 2016; 1(1): 30-32.
http://doi.org/10.22270/ujpr.v1i1.RW1

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Abstract

In African countries Ebola virus has been responsible for several deaths. In addition to being a global health concern, the virus is also considered a potential biological threat. Ebola viruses are incompletely understood pathogens that cause severe, often fatal, illnesses in humans and non-human primates. Ebola virus disease affects most of the human being and finally mortality rate increases in that county. Most of the countries are on alert for the ebola virus because peoples have worked within the boundaries of the affected area of Africa. Such people are not permitted to enter in the resident country without proper test at airport or other places. In this review we have discussed ebola virus disease and it affects the peoples worldwide.

Keywords: Ebola virus, Ebola Virus Disease (EVD), filoviruses, hemorrhagic fever.

INTRODUCTION

Ebola is a rare but deadly virus that causes bleeding inside and outside the body. As the virus spreads through the body, it damages the immune system and body organs. Ultimately, it causes levels of blood-clotting cells to drop, which eventually leads to severe uncontrollable bleeding. The disease, also known as Ebola hemorrhagic fever or Ebola virus, kills up to 90% of people having Ebola infection. Ebola cases shown up in Central and West Africa have proved grave enough to cause death of patients. Ebola can spread from country to country whenever people travel. Ebola could appear like the flu or other illnesses. Symptoms show up to 2-21 days following infection[1-4]. There were different cases and deaths from EVD in Guinea, Liberia, Nigeria, and Sierra Leone on 31 July 2014. The spread of EVD between and within the three neighboring countries accounting for the majority of the cases noted so far Guinea, Liberia, and Sierra Leone is due to high cross-border movement and the introduction of EVD in additional neighboring countries in the sub region might not be excluded due to the existence of similarly porous borders[5].

Structure of ebola virus

EBOV (Ebola Virus) carries a negative-sense RNA genome in virions that are cylindrical/tubular, and contain viral envelope, matrix, and nucleocapsid components. The overall cylinders are generally approx. 80 nm in diameter, and having a virally encoded glycoprotein (GP) projecting as 7-10 nm long spikes from its lipid bilayer surface[6] (Figure 1).
The Ebola has characteristic "threadlike" structure, however, a more general morphologic characteristic of filoviruses (alongside their GP-decorated viral envelope, RNA nucleocapsid, etc[7].

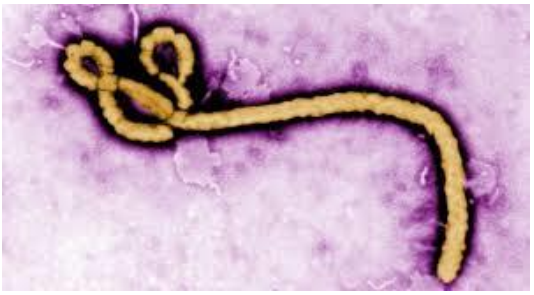

Figure 1: Structure of Ebola virus (Transmission electron micrograph).

Etiology

The species is avirological taxon species included the genus in Ebolavirus family Filoviridae (members known as Filovirus)[8], order Mononegavirales[9]. The Zaire ebolavirus species is also the type species (reference or example species) for ebolavirus. Its natural reservoir is bats, particularly fruit bats. The EBOV genome is approximately 19,000 base pairs long. It encodes 7 structural proteins: nucleoprotein (NP), polymer as cofactor (VP35), (VP40), GP, transcription activator (VP30), VP24, and RNA polymerase (L)[10] (Figure 2). The virulent nature of the virus poses difficulties in its investigations.

Spread

Ebola spreads to people by contact with the skin or body fluids of an infected animal, like a monkey, chimp, or fruit bat. Subsequently it moves from one person to another person by the same way. Persons who care for a sick person or bury someone who has died from the disease often get it. Ebola also spreads by touching contaminated needles or surfaces. Ebola cannot spread through air, water and food, handling the meat from infected animals, coming into contact with the infected person's blood. A person who has Ebola but has no symptoms cannot spread the disease, either[11,12].

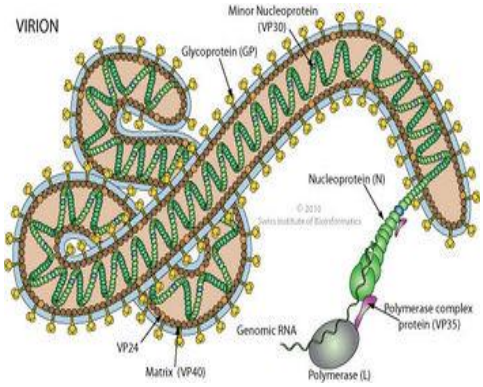

Figure 2: Virion structure of Ebola virus.

Pathogenesis

Ebola virus enters into the body through the mucous membrane, rupturing skin and via the parenteral route. Due to outbreak conditions all data of ebola virus pathogenesis obtained by laboratory experiments on guinea pigs, mice and other nonhuman primates[13].

Attacking system of ebola virus in human

When Ebola enters into the human body system, ebola virus protein called VP24 binds with the human host protein known as KPNA5. KPNA5's mainly responsible for the communication between cells and transfer signal into and out of nucleus. It works just like a messenger. After that KPNA5 transfers all these signals to nucleus of other structures of the cells. These signals regulate various functions in an organism including immune response. When Ebola protein VP24 binds with the messenger protein STAT1, important immune signal transmission is blocked; STAT1 is the transporter inside the nucleus and activates the genes for antiviral responses as per Daisy Leung. Inhibition of PY-STAT1 by eVP-24 is due to direct competitions by eVP-24 for NPI-1 subfamily KPNA binding. Nucleus receives STAT-1 protein; it sounds like alarm and releases interferons to combat against virus, bacteria or whoever other pathogen is attacking the cells. The immune system can't communicate properly because of VP24 is still stationed at STAT1 seat[14] (Figure 3).

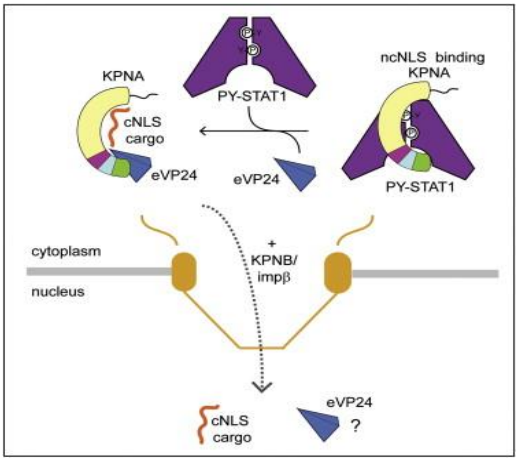

Figure 3: Schematic representation of Ebola virus killing host system.

Symptoms

Ebola symptoms include headache high fever, Joint aches, muscle aches, weakness, sore throat, pain in stomach and lack of appetite. Bleeding occurs within the body, as well as from the eyes, ears, and nose upon worsening of disease. Some people will vomit or cough up blood, have bloody diarrhoea, and get a rash[15].Transaminitis, leukopenia, thrombocytopenia, coagulations abnormalities and renal abnormalities often occur in patient with ebola virus by laboratory findings[16].

Diagnosis

Doctors may prescribe tests like CBC (Complete Blood Count), coagulation studies (a test to check for the amount of time a person's blood needs to clot), viral antigen testing (a test to check for the presence of the viral antigen) and a liver function test.

Prognosis

As per WHO reports, on an average, 80% of the people infected with Ebola virus do die. Their death is usually due to a drop in their blood pressure and failure of organs[3].

PREVENTION

Control

The 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[4].

Treatment

Standard treatment currently consists of supportive therapy, including maintenance of blood volume and electrolyte balance, as well as analgesics and standard nursing care[17]. Progression of Ebola virus in infected

mice is inhibited by some drugs like clomiphene and toremiphene. Amiodarone is used in the treatment of heart arrhythmias, is an ion channel blocker, which blocks the ebola virus entry into cells as shown by few in vitro studies[18]. Other promising treatments rely on antisense technology. Both small interfering RNAs (siRNAs) and phosphorodiamidate morpholino oligomers (PMOs) targeting the Zaire Ebola virus (ZEBOV) RNA polymerase L protein could prevent disease in nonhuman primates[19,20]. TKM-Ebola is a small-interfering RNA compound, currently being tested in a phase I clinical trial in people[21,22].

Vaccination

There aren't any vaccinations available as of now but According to BBC News dated 30 August 2014, ZMapp is a Ebola vaccine which shows 100% success rate, and has been tested on 18 laboratory monkeys, is due to be put through human trials[23,24].

AUTHOR'S CONTRIBUTION

Keservani RK: writing original draft, methodology, investigation, formal analysis, conceptualization. **Sharma AK:** writing, review and editing, methodology, formal analysis, conceptualization. **Singh AK:** writing, review, and editing, methodology. Final version of manuscript is approved by all authors.

ACKNOWLEDGEMENTS

The authors extend their thanks and appreciation to the Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal, India to provide necessary facilities for this work.

DATA AVAILABILITY

Data will be made available on request.

CONFLICT OF INTEREST

No conflict of interest associated with this work.

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