Ebola virus: A deadly human pathogen: Mini Review

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ABSTRACT

Ebola is the causative agent of Ebola hemorrhagic fever, which known as a fatal disease in humans and nonhuman primates (like gorillas, monkeys, chimpanzees). Among all the subspecies of Ebola, ZEBOV is the most virulent specie, responsible for causing 50 to 90% case fatality rate. EHF is an acute viral syndrome characterized by high fever, chill, arthralgia, myalgia or other clinical manifestation. The most confirmatory or definite sign of Ebola Infection is bleeding. At early stage the infection sign is similar to cold but later, the heavy bleeding at the side of infection identify the disease. This is usually a deathly infection. Hence precaution and prevention is important to control the transmission of disease.

Key words: Hemorrhagic fever, Syndrome, Arthralgia, Transmission
INTRODUCTION

Ebola viruses (Zaire ebolavirus) are the main leading cause of hemorrhagic fever in humans now-a-days, with a huge number of deaths (Burke et al., 1978). This deadly virus not only affect human, but significantly affect the animal population. The Ebola virus originates from Africa, with the risk of spreading worldwide by emigration, travelling, and transportation of animals (Sodhi 1996, Bruce & Brysiewicz 2002, Colebunders & Borchert 2000). In 1976, the name Ebola was originated, when the first case of human infection of this virus in the area of Yambuku, near River Ebola in Democratic Republic of Congo, commonly called as Zaire (Ustun and Ozgukler 2005, Brown 2014). According to the forecasting the environmental impact of global warming worldwide will atarax the dispersion of Ebola virus. (Ustun and Ozgukler 2005, UKCIP 2002). There are five diagnostic subspecies of Ebolavirus, namely Ebola virus (Zaire ebolavirus), Bundibugyo virus (Bundibugyo ebolavirus), Taï Forest virus (Taï Forest ebolavirus, formerly Côte d’Ivoire ebolavirus), Reston virus (Reston ebolavirus) and Sudan virus (Sudan ebolavius). Among these subspecies of Zaire ebolavirus (ZEBOV), Sudan ebolavirus (SEBOV) and Ivory Coast ebolavirus (ICEBOV) are co-circulate in Africa (Feldmann et al 2004, Feldmann et al 2004, pourrut et al 2005). ZEBOV and SEBOV are considered as a most pathogenic specie for both human and nonhuman populations, (Feldmann et al 2003, Leroy et al 2004), and unfortunately not permitted or accepted therapeutics or vaccines are available up till now (Stroher and Feldmann 2006).

Structure of Ebola virus

From 1976 to till now there is a tremendous research has been done to illustrate the structure of Ebola virus (Groseth et al 2007). The Ebola viruses (EBOV) are non-segmented, long rods filamentous shapes with diameter of 1250 nm in length, lipid envelope and, negatively stranded RNA virus belongs to the family of Filoviridae (Hoenen et al 2006, Feldmann et al 2005). The general structure of Ebola virus shows in (figure 1). The EBOV contain 18.9-kb RNA genome of seven genes, which straightly synthesis seven non-infectious structure and one non-structural protein, including 30 non-coding region (leader), virion protein 35 (VP35), VP40, nucleoprotein (NP), glycoprotein (sGP and GP) (VP24, VP30, RNA-dependant RNA-polymerase (L) protein and 50 non-coding area which is present in central core or ribonucleoprotein (RNP) contain the complex of NP, VP35, VP30, L and the viral RNA covered by a lipid envelope, with which the left over proteins GP1,2, VP40 and VP24 are allied; (Sanchez et al., 2001, Hoenen et al 2006). Ebola virus glycoproteins (GP) are the major specific target for the establishment of new vaccines and entrance inhibitors. Attachment of host cell possessions by GP1, whereas the GP2 mediates fusion of host membranes and viral cell (Volchkov et al 1998, Feldmann et al 1993, Takada et al 1997, Wool-lewis and Bates 1998). The VP40’s protein also play important role in the infection mechanism of Ebola virus, these unique protein can arrange itself into three very different shapes show in (figure 2). Every specific structure has a different function in the life cycle of virus, like, when VP40 moves inside infected cells they formed butterfly shape, while near the nucleus of the cell where the viral genetic information copied its form a ring, whereas for the formation of new viruses they are arranged into a linear shape at the cell membrane (Gnida 2014).

Epidemiological Events

In 1976 the first case of Ebola virus appears in Central Africa during the month of June and July, at that time this disease was sporadic, but now as the time passes a huge number of mass event of this Ebola hemorrhagic fever (EHF) occur. In nature the epidemiology events of human Ebola infections are unknown (Hoenen et al 2006). The outbreak of Ebola infection started from the single person of cotton factory and latterly spread close individual of the infected person.
(Feldmann et al 2003). The history of Ebola virus was best described by Feldmann et al (2003) is shown in figure 3.

Figure 1: General structure of Ebola virus

Figure 2: The three mode structure of VP40’s protein in the different stages of life cycle of virus (Gnida 2014).

Figure 3: Summery of the historical event of Ebola (Feldmann et al 2003)
In Africa 2003, ten major outbreaks of Ebola fever occurred, which infected more than 1600 peoples and 1100 fatalities take place (Casillas 2003). Hence, the virus of Ebola is more likely found in the regions of South America, Africa, Central Asia (CDC 1988) and tropical regions of Sub-Saharan Africa. In the sum up about 1,000 people per year affected by Ebola virus from the year of 1976 to 2013 (CDC, a2014). In the recent year 2014 Guinea, Sierra Leone, Liberia (CDC, b2014) and Nigeria are largely affected (CDC, c 2014). More than 1848 cases with 1013 deaths have been reported on 12th August 2014 (CDC, b 2014, Who 2014).

Clinical manifestation and Transmission:

Ebola hemorrhagic fever (EHF) caused by Ebola virus is a zoonosis disease affecting human as well as non-human primates (Tamfum et al 2012). It is an acute syndrome and their onset is immediate after an incubation period of 4-10 days (Sanchez et al 2001) with an early symptoms of high fever with headache, sore throat, malaise (Baron et al 1983), diarrhea and abdominal pain (Bwaka et al 1999, Formenty et al 1999, Sureau 1989). Further clinical symptoms due to faster replication of virus within parenchymal cells including inflammation and necrosis of the liver, testes, spleen, ovaries, lymph nodes and kidney, testes, and ovaries (Klenk et al., 1995; Collier et al., 1998; Feldmann et al., 1999; Klenk and Feldmann 2001; Borio et al., 2002). This virus affects the homeostasis of the body by disruption the fluid balance as well as deteriorated the platelets and endothelial cells (Klenk et al., 1995; Feldmann et al., 1999; Chen and Cosgriff 2000; Borio and others 2002). According to the many scientists this highly pathogenic virus alters or suppress the immune system of body (Collier et al., 1998; Baize et al., 1999; Connoll et al., 1999; Feldmann et al., 1999; Klenk and Feldmann 2001; Baize et al., 2002; Borio et al., 2002). After the symptoms the death occurs in 6–16 days (Sanchez et al 2001). In the worse cases, individual experience haemorrhagic diathesis, rashes on shoulder and abdominal, delirium, coma, prostration cardiovascular distress and ultimately hypovolemic shock or death (Tamfum et al 2012). Pregnant women, which are influence with EHF are generally abort (Collier et al., 1998). Hence, because of this lethal property this virus is classified Class 4 for the biological pathogen (Casillas et al 2003).

This Virus spreads through the direct contact with an infected person's body secretions including blood, feces, saliva, urine, and other or by the use of contaminated needles. The good thing about this virus is that it is not spread through air, food or water (EVD 2014). However, the small droplet generated in the laboratory is harmful (Leffel and Reed 2004), therefore this virus categorized as a biological weapons (Johnson et al 1995). According to the Polesky and Bhatia (2003) due to the lethal property the Ebola virus has potentially used as a bioterrorism agent.

Laboratory Diagnosis

There are several techniques are present to identification the Ebola virus. These techniques include virus isolation, polymerase chain reaction (PCR) and ELISA testing. At the acute infection stage when the mature virus produces large numbers of virions (viral particles) an electron microscope, autopsy or biopsy can be used for isolation of virus. Skin biopsy for the more confirmatory result of Ebola virus can also be done, as huge amount of Ebola virus present in the skin of an infected individual. (Bruce and Brysiewicz 2002).

ELISA and reverse transcriptase polymerase chain reaction (RT-PCR) for the viral antigen determination are the rapid and sensitive technique. However, the one limitation is that, at the early stage these tests are not carried out, the antigen of Ebola viral is measurable in the blood within a few days after symptom appears, (Casillas et al 2013). After the recovery from Ebola infection or disease course IgM and IgG antibodies testing are done.
CONCLUSION

In conclusion, Ebola virus is the serious threat for human or primates, in the form of infection or bioterrorism agent. There is no accurate treatment of infection, Hence awareness of general public, isolation of patients from crowd and used of protective measures play an important role to control the disease. However, proper treatment or vaccination is needed to complete cure of this lethal disease in the society.

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