A REVIEW ARTICLE ON WEST AFRICA EBOLA OUTBREAK

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Abstract

The first Ebola virus disease outbreak was reported in Zaire (now Democratic Republic of Congo (DRC) in 1976 and the causative agent was named after the nearby River,Ebola. Ebola viruses are found in several African countries. Past Ebola outbreaks have occurred in the following countries: Democratic Republic of the Congo (DRC), Gabon, South Sudan, Ivory Coast, Uganda and South Africa (imported). West Africa has only known to be affected by a limited episode in *Taï Forest ebolavirus*(TEBOV) in Ivory Coast in 1994. The severe epidemics, starting in 2013-14, affect a large West African region (Guinea, Sierra Leone, and Liberia) with imported cases in Nigeria and Senegal. Field studies and epidemiological surveys in Africa have demonstrated widespread antibody prevalence to Ebola viruses in fruit bats suggesting that fruit bats may be natural hosts for EBOV. Monkeys are not considered as natural hosts because of their high sensitivity to the virus and their high mortality rate when infected. There is no evidence that domestic animals play an active epidemiological role in the transmission of the disease to humans. Ebola is not spread through the air or by water, or in general, by food. However, in Africa, Ebola may be spread as a result of handling “bush meat” (wild animals hunted for food) and contact with infected bats. There is no evidence that mosquitoes or other insects can transmit Ebola virus. Symptoms may appear anywhere from 2 to 21 days after exposure to Ebola virus and the incubation period of Ebola virus disease (EVD) varies from 2 to 21 days. Diagnosing Ebola in an individual who has been infected for only a few days is difficult because the early symptoms, such as fever, are nonspecific to Ebola virus infection and are seen often in patients

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with more common diseases, such as malaria and typhoid fever. However, if a person has the early symptoms of Ebola and there is reason to believe that Ebola should be considered, the patient should be isolated and public health professionals should be notified. Control activities supported by WHO, UNICEF and Médecins Sans Frontières are being implemented, including contact tracing, enhanced surveillance and strengthening of infection control practices, free-of-charge access to healthcare for suspected cases, case isolation and management, and social mobilization.

Keywords: Ebola: Infection:Outbreak: Transmission:Virus

Introduction

The first EVD outbreak was reported in Zaire (now Democratic Republic of Congo (DRC) in 1976 and the causative agent was named after the nearby river called Ebola River. The five known species in the genus *Ebola virus*(EBOV) are: ***Zaire Ebola virus*** (ZEBOV); ***Sudan Ebola virus*** (SEBOV); ***Bundibugyo Ebola virus*** (BEBOV); ***RestonEbola virus*** (REBOV) and ***Taï Forest Ebola virus*** (TEBOV). Their genomes can differ by 30-40%. All but REBOV have been detected only in Africa. REBOV was isolated in 1989-90 in Reston (USA) from macaques imported from the Philippines. In 2008, pigs from pig farms close to Manilla (Philippines) also tested positive for REBOV. The related Marburg virus, genus *Marburgvirus*, is morphologically indistinguishable and induces symptoms similar to *Ebolavirus*. 1989-1991: Another Ebola subtype discovered in Reston, Virginia, among dying cynomolgus monkeys imported from the Philippines that infected four animal caretakers who remained clinically well. Episodes with the Reston strain occurred in Italy in 1992 and in the US in 1996[1].

Structure and distribution of Ebola virus

Ebola viruses are found in several African countries. Past Ebola outbreaks have occurred in the following countries:Democratic Republic of the Congo (DRC),Gabon,SouthSudan,IvoryCoast,Uganda,Republic of the Congo (ROC),South Africa (imported).[2]

Disease Name: Ebola hemorrhagic fever

Family:*Filoviridae*;

Genus: *Ebolavirus*

Nucleic acid: Linear, negative-sense, single-stranded,RNA, ~18,900 kb in length

Size: Enveloped, helical, Cross-striated nucleocapsid, filamentous or pleomorphic virionsthat are flexible with extensive branching, 80 nm in diameter and 970-1200 nm in length.

Physicochemical properties: Stable at room temperature and can resist desiccation; inactivated at 60°C for 30 minutes; infectivity greatly reduced or destroyed by UV light and gamma irradiation, lipid solvents, b-propiolactone, formaldehyde, sodium hypochlorite, and phenolic disinfectants.

Occurrence

Up to 2013, EVD occurred mainly in the rainforest areas of Central Africa (DRC, Sudan, Gabon, and Uganda). West Africa has only known to be affected by a limited episode in *Taï Forest ebolavirus*(TEBOV) in Ivory Coast in 1994. The severe epidemics, starting in 2013-14, affect a large West African region (Guinea, Sierra Leone, and Liberia) with imported cases in Nigeria and Senegal. Another alarming event is that the epidemics penetrate densely populated areas including capital cities. Evidence for REBOV infection has been found in Asia (China, the Philippines)[1].

Hosts and Transmission

Field studies and epidemiological surveys in Africa have demonstrated widespread antibody prevalence to Ebola viruses in fruit bats suggesting that fruit bats may be natural hosts for EBOV, when bats and other vertebrate species were experimentally inoculated, only bats became infected and shed virus in faeces without showing any clinical signs. Monkeys are not considered as natural hosts because of their high sensitivity to the virus and their high mortality rate when infected. The related Marburg virus has been isolated from fruit bats (*Roussettusaegyptiacus*) in Uganda. The role of pigs in EVD epidemiology is unclear. There is no evidence that domestic animals play an active epidemiological role in the transmission of the disease to humans[1].

Ebola virus natural reservoir has not yet been identified.However, researchers believe that the first patient becomes infected through contact with an infected animal, such as a fruit bat or nonhuman primate.

When an infection does occur in humans, the virus can be spread in several ways to others. Ebola is spread through direct contact (through broken skin or unprotected mucous membranes in, for example, the eyes, nose, or mouth) with

- Blood or body fluids (including but not limited to feces, saliva, sweat, urine, vomit, breast milk, and semen) of a person who is sick with Ebola.
- Objects (like needles and syringes) that have been contaminated with the virus.
- Infected fruit bats or primates (apes and monkeys).

Ebola is not spread through the air or by water, or in general, by food. However, in Africa, Ebola may be spread as a result of handling "bushmeat" (wild animals hunted for food) and contact with infected bats. There is no evidence that mosquitoes or other insects can transmit Ebola virus. Only a few species of mammals (for example, humans, bats, monkeys, and apes) have shown the ability to become infected with and spread Ebola virus.

Once people recover from Ebola, they can no longer spread the virus to people in the community. Although Ebola virus has been detected in semen after patients have recovered, it is not known if the virus can be spread through sex (including oral sex). As a precaution, men who have recovered from Ebola are advised to abstain from sex (including oral sex) for three months. If abstinence is not possible, condoms may help prevent the spread of disease[2].

Signs and Symptoms

A person infected with Ebola virus is not contagious until symptoms appear. Signs and symptoms of Ebola include fever, severe headache, fatigue, muscle pain, weakness, diarrhea, vomiting, abdominal (stomach) pain, and unexplained hemorrhage (bleeding or bruising).

Symptoms may appear anywhere from 2 to 21 days after exposure to Ebola virus, but the average is 8 to 10 days[2].

Incubation period

The incubation period of Ebola virus disease (EVD) varies from 2 to 21 days, with an observed average of 8 to 10 days[2].

Pathogenicity and Diagnosis

Ebola viruses have all been associated with hemorrhagic fever in humans and/or non-human primates with differences in pathogenicity. Based on available evidence, the REBOV strain is

fatal in macaques although it has a lower case fatality rate than ZEBOV. It is unclear whether REBOV infection in domestic pigs in the Philippines resulted in clinical symptoms in this species[3]

4.11 Diagnosis

Diagnosing Ebola in an individual who has been infected for only a few days is difficult because the early symptoms, such as fever, are nonspecific to Ebola virus infection and are seen often in patients with more common diseases, such as malaria and typhoid fever.Ebola virus is detected in blood only after onset of symptoms, most notably fever, which accompany the rise in circulating virus within the patient's body. It may take up to three days after symptoms start for the virus to reach delectable levels[2].

Laboratory tests used in diagnosis include:

Timeline of Infection	Diagnostic tests available
1.Within a few days after symptoms begin	-Antigen-captureenzyme-linked immunosorbent assay (ELISA) testing - IgM ELISA - Polymerase chain reaction (PCR) - Virus isolation
2.Later in disease course or after recovery	- IgM and IgG antibodies
3.etrospectively in deceased patients	- Immunohistochemistry testing - PCR -Virus isolation

Treatment

No specific approved vaccine or specific treatment (e.g., antiviral drug) is available for Ebola.Symptoms of Ebola and complications are treated as they appear butproviding intravenous fluids and balancing electrolytes (body salts), maintaining oxygen status and blood pressure and treating other infections if they occur.These can significantly improve the chances of survival.

Prevention

Experimental vaccines and treatments for Ebola are under development, and the vaccine available are not yet been approved thus travelling in an area affected by an EVD virus requires some precautions among which includes;

- Practice careful hygiene. For example, wash your hands with soap and water or an alcohol-based hand sanitizer and avoid contact with blood and body fluids.

- Do not handle items that may have come in contact with an infected person's blood or body fluids (such as clothes, bedding, needles, and medical equipment).
- Avoid funeral or burial rituals that require handling the body of someone who has died from Ebola.
- Avoid contact with bats and nonhuman primates or blood, fluids, and raw meat prepared from these animals.
- Avoid facilities in West Africa where Ebola patients are being treated. The U.S. embassy or consulate is often able to provide advice on facilities.
- After you return, monitor your health for 21 days and seek medical care immediately if you develop symptoms of Ebola.

Healthcare workers who may be exposed to people with Ebola should follow these steps:

- Wear appropriate PPE.
- Practice proper infection control and sterilization measures.
- Isolate patients with Ebola from other patients.
- Avoid direct contact with the bodies of people who have died from Ebola.

Notify health officials if you have had direct contact with the blood or body fluids, such as but not limited to, feces, saliva, urine, vomit, and semen of a person who is sick with Ebola. The virus can enter the body through broken skin or unprotected mucous membranes in, for example, the eyes, nose, or mouth[2].

SummarySituationof EVD in West Africa as of 31 July 2014

Table 1. Cases and deaths from EVD in Guinea, Liberia, Nigeria, and Sierra Leone as of 31 July 2014

Country	Cases	Deaths	Case Fatality Rate (%)	Health care workers affected (Cases/Deaths)
Guinea	470	346	73	(33/20)
Liberia	360	181	50	(47/28)
Nigeria	1	1	100	0

Sierra Leone	574	215	37	(44/23)
Total	1407	743	57	(124/71)

SOURCE: WHO archive of disease. (Ebola).

An outbreak of haemorrhagic fever due to EVD in Guinea and Liberia, West Africa, with onset in early February 2014, is ongoing. The first cases were reported from the forested region of south-eastern Guinea in Guéckédou prefecture near the border with Liberia and Sierra Leone. The Ebola viral aetiology was confirmed on 22 March 2014 by the National Reference Centre for Viral Haemorrhagic Fevers (Institute Pasteur, INSERM BSL4 laboratory, Lyon, France)[3]. Sequencing of part of the outbreak virus L-gene has shown that it is 98% homologous with an EBOV last reported in 2009 in Kasai-Occidental Province of the Democratic Republic of Congo[4, 5, 6, &7]. This ebolavirus species has been associated with a high case-fatality during previous outbreaks.

Infections with Ebola viruses originating from Africa cause a severe disease in humans, Ebola virus disease (EVD). Since the first documented EVD outbreak in Zaire (now: the Democratic Republic of Congo) in 1976, five species of the genus Ebolavirus (Filoviridae family) have been identified from samples collected from humans and non-human primates during outbreaks of the disease: Zaireebolavirus (EBOV), Sudan ebolavirus, Reston ebolavirus, Taï Forest ebolavirus and Bundibugyo ebolavirus[8, 9].

The incubation period is usually four to ten days but can vary from two to 21 days. The case-fatality ratio for Zaireebolavirus (EBOV) infections is estimated to be between 50% and 90%[10]. Ebola viruses are highly transmissible by direct contact with infected blood, secretions, tissues, organs or other bodily fluids of dead or living infected persons. Transmission through sexual contact may occur up to seven weeks after clinical recovery, as observed for Marburg filovirus, and it is supposed to be possible for Ebola viruses[11].Transmission to humans can also occur by contact with dead or living infected animals, e.g. primates (such as monkeys and chimpanzees), forest antelopes, duikers, porcupines and bats[12]. Bats remain the most likely, but still

unconfirmed, reservoir host for Ebola viruses[13, 12]. To date, the reservoir of virus in West Africa is unknown.

Risk of transmission may increase with transition to later stages of the disease with increasing viral titres[14&15]. In a household study, secondary transmission only took place if direct physical contact occurred. No transmission was reported without direct contact[16]. During an outbreak of Sudan ebolavirus in 2000 in Uganda, the most important risk factor was direct repeated contact with a sick person's bodily fluids during the provision of care.

As of 7 April 2014, the Ministry of Health of Guinea has reported 151 clinically compatible cases of EVD, including 95 deaths. Cases have been reported from Conakry, Guéckédou, Macenta, Kissidougou, and from Dabola and Djingaraye prefectures[17]. Fifty-four cases have tested positive for Ebola virus by PCR. At least 14 of the cases in Guinea have been healthcare workers, and eight of them have died, which indicates the need to further strengthen health facility-based infection prevention and control. Thirty-three patients had recovered after palliative treatment and were discharged from the isolation centers (Guéckédou 16, Macenta 9, Conakry 5, and Kissidougou 3). As of 7 April, 623 contacts are under follow-up[18].

On 31 March 2014, the Liberian Ministry of Health announced an outbreak of EVD[17, 19]. As of 7 April, five confirmed and 16 suspected cases have been reported from Lofa, Nimba, Bong, Montserrado and Margibi counties in Liberia, of which ten have been fatal. Three cases have occurred in healthcare workers, all of whom have died. The date of onset of the most recent confirmed case is 6 April, with six patients currently hospitalized. At present 28 contacts remain under medical observation[18].

Sierra Leone has reported two suspected fatal cases of viral haemorrhagic fever; both were subsequently laboratory confirmed as Lassa fever, an endemic disease in Sierra Leone. Active surveillance activities have identified no new cases[17&18]. However due to the proximity of the affected district to Guinea, a similar environment and cross-border movement of people, additional suspected cases compatible with EVD may be detected.

Guinea, Sierra Leone and Liberia have activated their national emergency committees, prepared response plans and carried out needs assessments [17].

The Ministry of Health in Guinea has issued recommendations for early case detection, prevention of transmission in healthcare settings, and preventive individual and community measures (educational public health messages for risk reduction) to prevent further

transmission[20]. According to the BBC, Guinea has banned the sale and consumption of bats to prevent the spread of the virus[21]. Control activities supported by WHO, UNICEF and Médecins Sans Frontières are being implemented, including contact tracing, enhanced surveillance and strengthening of infection control practices, free-of-charge access to healthcare for suspected cases, case isolation and management, and social mobilization. A team of scientists from the EU-funded project 'European Mobile Laboratory' (EMLab) has established a field laboratory to test suspect cases, working alongside Médecins Sans Frontières at an isolation center near the borders with Sierra Leone and Liberia with partners from Germany, Italy, France, Hungary, Switzerland, Slovenia and the United Kingdom.

The French Ministry of Foreign Affairs issued a travel advisory warning to French citizens against travel to the affected parts of Guinea or areas of northern Liberia near the border between the two countries[22&23]. The Ministry of Health in France has implemented measures, including directives, and released information material regarding the outbreak, including travel advice and information for health professionals[24]. The Ministry of Health of Guinea has deployed a medical team at Conakry airport to check boarding passengers. Air France delivered thermal cameras and other equipment so health officials can check the body temperature of passengers.

On 26 March 2014, Senegal closed its land border with Guinea in an attempt to prevent the spread of the outbreak[25].The Public Health Agency of Canada issued a travel health notice on 26 March 2014 recommending that travelers in Guinea should avoid direct contact with blood or bodily fluids of a person or corpse infected with the Ebola virus and avoid contact with, or handling, an animal suspected of having EVD[26].

In summary, three countries, Guinea, Liberia and Nigeria have reported confirmed cases of Ebola viral disease, while three others, Sierra Leone, Mali and Ghana are investigating suspected cases. Local transmission from person-to-person has occurred in several areas of Guinea and in Liberia according to the media. WHO indicates that every case so far has been traced back to a specific contact with an earlier case.

CONCLUSION

In conclusion, Ebola virus disease caused by Ebola virus had been discovered since 1976, but since then, the disease remained endemic. Recently Ebola outbreaks have occurred in the following countries: Nigeria, Gabon, South Sudan, Ivory Coast, Uganda and South Africa (imported). Field studies and epidemiological surveys in Africa have demonstrated widespread antibody prevalence to Ebola

viruses in fruit bats suggesting that fruit bats may be natural hosts for EBOV.However, researchers believe that the first patient becomes infected through contact with an infected animal, such as a fruit bat or nonhuman primate. Control activities supported by WHO, UNICEF and Médecins Sans Frontières are being implemented, including contact tracing, enhanced surveillance and strengthening of infection control practices, free-of-charge access to healthcare for suspected cases, case isolation and management, and social mobilization.

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