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Ebola Virus Disease

Aetiology of Ebola virus disease

Ebola virus disease (EVD) is also known as Ebola haemorrhagic fever. EVD is a severe contagious disease affecting humans and non-human primates. It can be transmitted to humans through direct contact with blood, tissue, body fluids and secretions from an infected animal or human. The causative agent is classified in the genus *Ebolavirus* of the *Filoviridae* family. As members of the order *Mononegavirales*, filoviruses are filamentous enveloped viruses containing a non-segmented, negative-strand genomic RNA of approximately 19 kilobases.

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 Ebola River.

The five known species in the genus *Ebolavirus* (EBOV) are: ***Zaire ebolavirus*** (ZEBOV); ***Sudan ebolavirus*** (SEBOV); ***Bundibugyo ebolavirus*** (BEBOV); ***Reston ebolavirus*** (REBOV) and ***Taï Forest ebolavirus*** (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*.

Pathogenesis

Ebola viruses have all been associated with haemorrhagic 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. Several animal handlers manipulating monkeys in Reston (USA) or pigs in Manilla (Philippines) have developed antibodies to REBOV while remaining asymptomatic. It is thus presumed that REBOV has a low pathogenicity or is non-pathogenic in humans whilst the ZEBOV and SEBOV strains are known for their virulence and high case fatality rate (53 -90%) in humans.

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).

Natural hosts

Field studies and epidemiological surveys in Africa have demonstrated widespread antibody prevalence to Ebolaviruses 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 (*Roussettus aegyptiacus*) 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.

Transmission to humans

Ebola is a disease transmitted from wild animals to humans most likely through hunting and collection of sick or dead wild animals and handling or consumption of uncooked bush meat. Although the source of infection for non-human primates often remains unclear, most evidence indicates direct infection from one or more natural hosts. In rural areas fruit bats are a popular source of forest meat for humans and are prepared by hand to be dried, smoked and/or cooked. Infection could also be transmitted to humans by consumption of forest fruits contaminated with bat saliva or faeces

It is recommended that in affected countries contact with wild animals, including bats, rodents or monkeys should be avoided and that communities in contact with these animals practice basic hygiene measures such as regular hand washing at all times. The hunting of susceptible wild animal species listed above for food in affected countries should be avoided.

Human to human transmission occurs through contact with body fluids of an infected person. It is thought that the current epidemics throughout West Africa originated from **a single animal-human transmission event** that occurred in the forest at the border between Guinea, Sierra Leone and Liberia.

Ebola disease in humans

The incubation period of EVD in humans is usually 2-21 days.

EVD is transmitted between humans by body fluids such as blood, vomit, urine, saliva, stool (faeces) or semen. An important source of infection for local communities in the affected countries occurs when relatives perform the ritual washing Ebola victims at funerals, bringing them into direct close contact with body fluids and secretions and indirect contact with environments contaminated with such fluids. In some cases the dead are buried in a shallow grave which is easily discovered by stray dogs which expose the corpse leading to further

spread of the disease. Hospital acquired infections are also common in the absence of adequate personal protective equipment and medical supplies.

In August 2014, EVD was detected in the Northwestern region of the Democratic Republic of Congo (DRC). Epidemiological investigation has linked the index case to the preparation of bush meat for consumption. The causative virus was identified to be ZEBOV but most closely related to ZEBOV from the 1995 DRC outbreak and with no epidemiological link to the outbreak in West Africa.

Supplementary information:

http://africacheck.org/factsheets/factsheet-what-is-ebola/
http://www.sciencedaily.com/releases/2009/08/090801185900.htm
http://jvi.asm.org/content/77/18/9733.full
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