



The Ebola outbreak Tackling a new disease

Workers at the Red Cross Ebola treatment centre in Kenema, Sierra Leone.

Key words

Ebola
virus
antibodies
vaccine

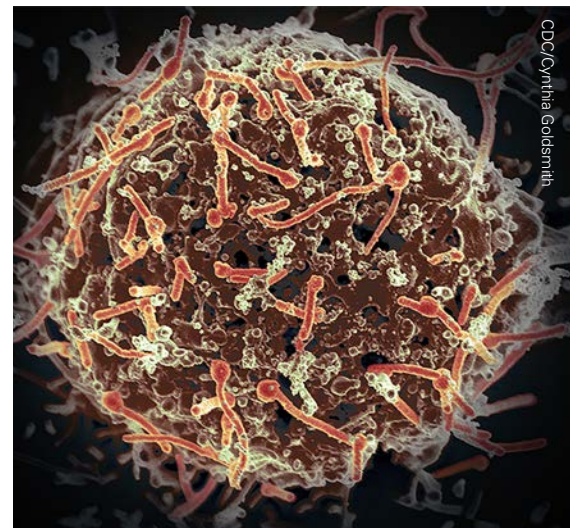
In 1976 a new and deadly disease, Ebola, appeared in Africa. In Sudan, 284 people were infected, 151 of whom died. In northern Zaire there were 318 cases with 280 deaths. In 1995, 254 died in Zaire. Through the early 2000s sporadic outbreaks occurred in Uganda and the Republic of Congo, claiming hundreds more lives.

Then, in March 2014, a new outbreak of the disease began in West Africa. The disease seems to have begun in a two year old child called Emile Ouamouno or, in the epidemiological literature, 'patient zero'. Emile died in December 2013 in the village of Meliandou, Guinea. Very soon after, members of his family also died, as did a nurse, a doctor and other health workers. The disease quickly spread to Conakry, the capital of Guinea with a population over 1 million. From there it quickly spread into neighbouring Liberia and then on into Sierra Leone, Nigeria and, by the summer of 2014, Senegal.

By the end of the summer of 2015 the World Health Organisation (WHO) reported 28 256 cases with 11 306 deaths, a mortality rate of 40%. They went on to say that this might be under reported by as much as 70%. They also stated that 10% of the dead were health workers.

Cause and origin

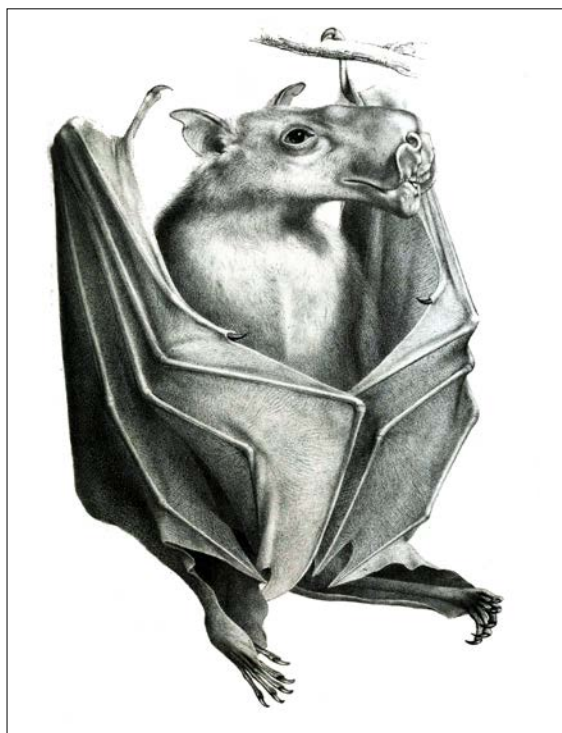
Ebola is caused by the Ebola virus. The symptoms include fever, headache, joint and muscle pain, vomiting and diarrhoea. It has a 50–90% death rate, occurring just one to two weeks after symptoms start.



The Ebola virus (red 'worms') attacking a single human cell.

Although no one is yet sure, the natural reservoir may be in fruit bats of the family Pteropodidae. The only species in this family that has yielded Ebola RNA is the hammer-headed bat (*Hypsignathus monstrosus*). No one knows how bats infect humans, even if they are the reservoir. Simple contact is assumed to be the mechanism. The range of this species certainly fits with the occurrence of the disease.

Once a human is infected, Ebola is spread via body fluids containing the virus, such as blood, diarrhoea, sweat, vomit, urine, semen or breast milk which can enter the mouth, nose, or eyes. The virus may also enter in these fluids through a cut.



The hammer-headed bat

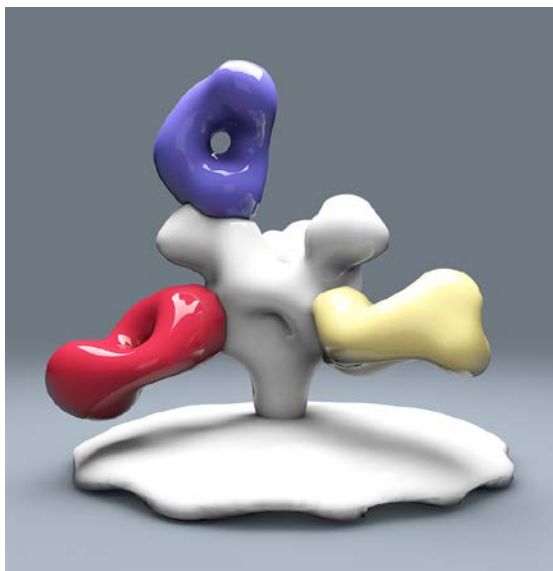
What can be done?

The key for the containment of viral diseases such as Ebola, against which antibiotics do not work, is very strict hygiene surrounding treatment and burial of victims. In addition, contact tracing and quarantine are vital.

The severity of the recent West African outbreak of Ebola coupled with the high mortality rate has led to some unprecedented actions. Drugs against Ebola, in the early stage of development, have been fast tracked and tried on patients at a stage in the development earlier than would normally be allowed.

One of these is ZMapp™, a cocktail of three monoclonal antibodies, requiring three separate manufacturing processes. Each is manufactured in tobacco plants and the process is very slow, so availability is currently low. So far, ZMapp™ has been used on seven sufferers, two of whom subsequently died.

The three antibodies are designed to join to glycoprotein spikes on the outer coat of the virus. These spikes are essential for virus entry into cells and the idea is that the antibodies will prevent this from happening.



A model showing the ZMapp antibodies (coloured) which attach to the glycoprotein which Ebola uses to recognise host cells, thereby blocking it

Ebola, contagious and dangerous, has given rise not only to tens of thousands of cases and many deaths, but a change in the way we look at epidemic diseases, their containment and treatment.

Gary Skinner is Biology editor of Catalyst

A vaccine against Ebola

Scientists are developing a vaccine to protect people from Ebola. They started trials in March 2015. It's tricky work as the vaccine must be kept cold, at -80°C .

Mohamed Soumah, 27 years old, was the first person to receive the Ebola vaccine. "It wasn't easy. People in the village said that the injection was to kill me. I was afraid. I was the first one to be injected, the very first, here in my village. I've been monitored for 3 months and I've had no problems."



Turn to the next page to learn more about how the Ebola outbreak of 2014-15 was brought under control.

Responding to Ebola

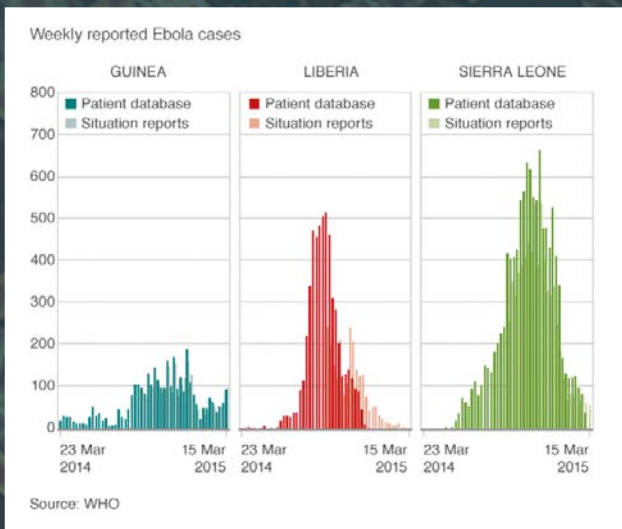
The Ebola outbreak of 2014-15 was brought under control by the application of strict hygiene measures. A parallel effort focused on development and trials of a vaccine.



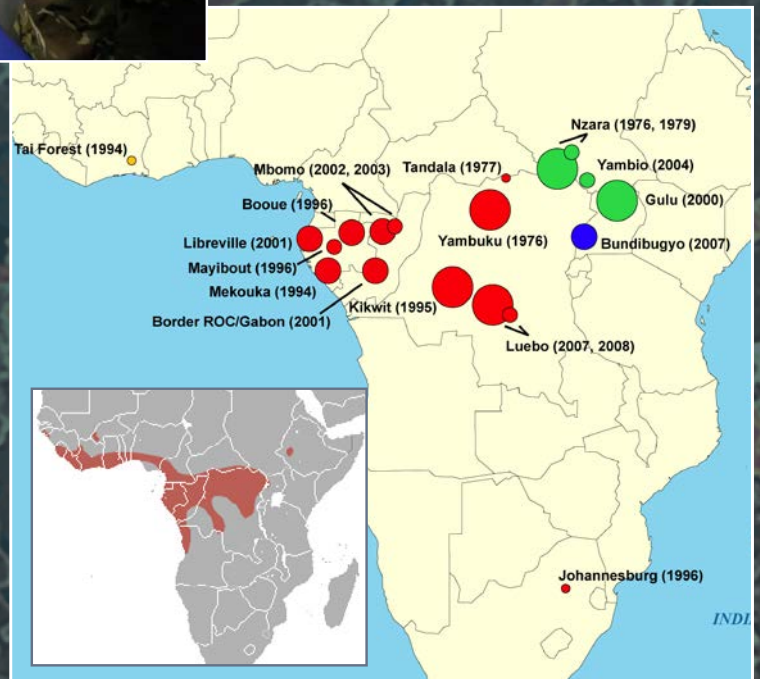
A medical team from the UK's National Health service is trained at York before travelling to West Africa.



One of several World Health Organisation teams prepares for vaccine trials in Guinea.



In Liberia, the spread of the disease was brought under control within six months; it took longer in other countries.



Is Ebola transmitted by fruit bats? These maps show the distribution of the hammer-headed bat (inset) and outbreaks of Ebola in Africa.



A poster in Monrovia, Liberia, gives advice on how to avoid becoming infected.



An over-reaction? CNN compares Ebola to the threat from the ISIS terrorist group.