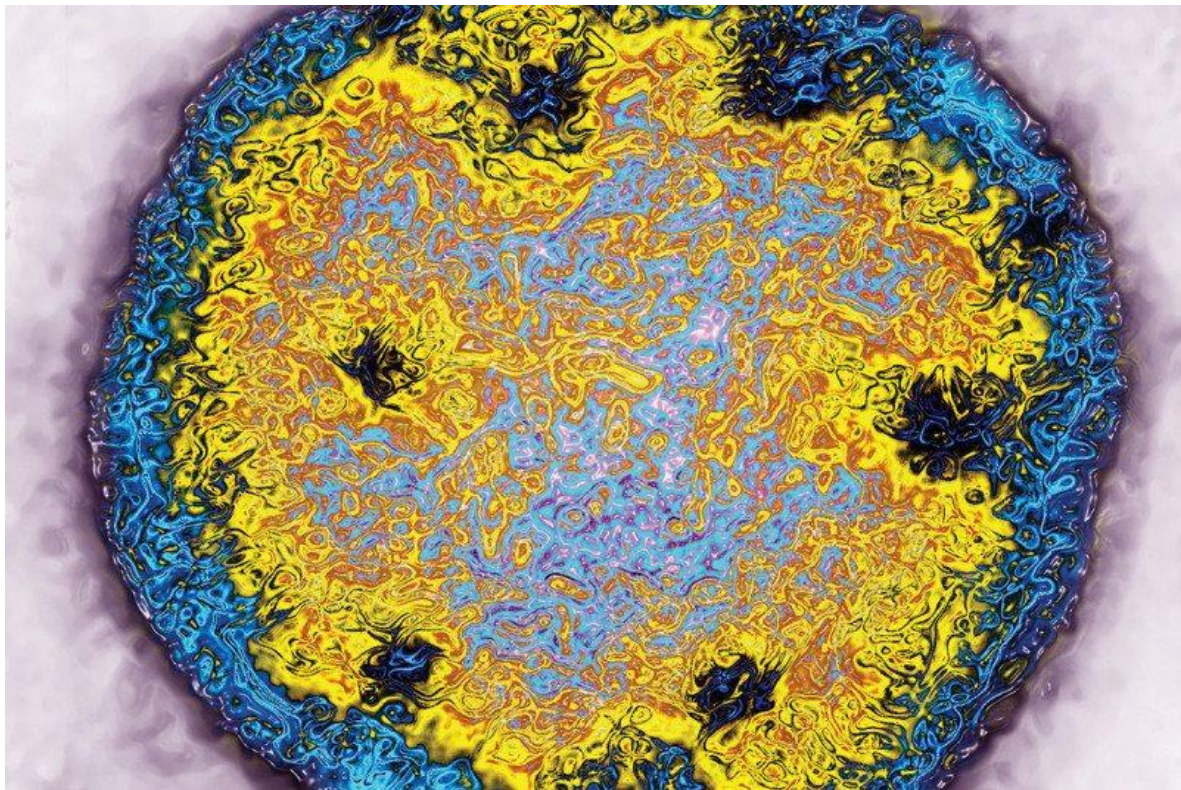


## The nine viruses of the apocalypse

These are the diseases the World Health Organization thinks we should find remedies for, fast. The first six are its highest priority.

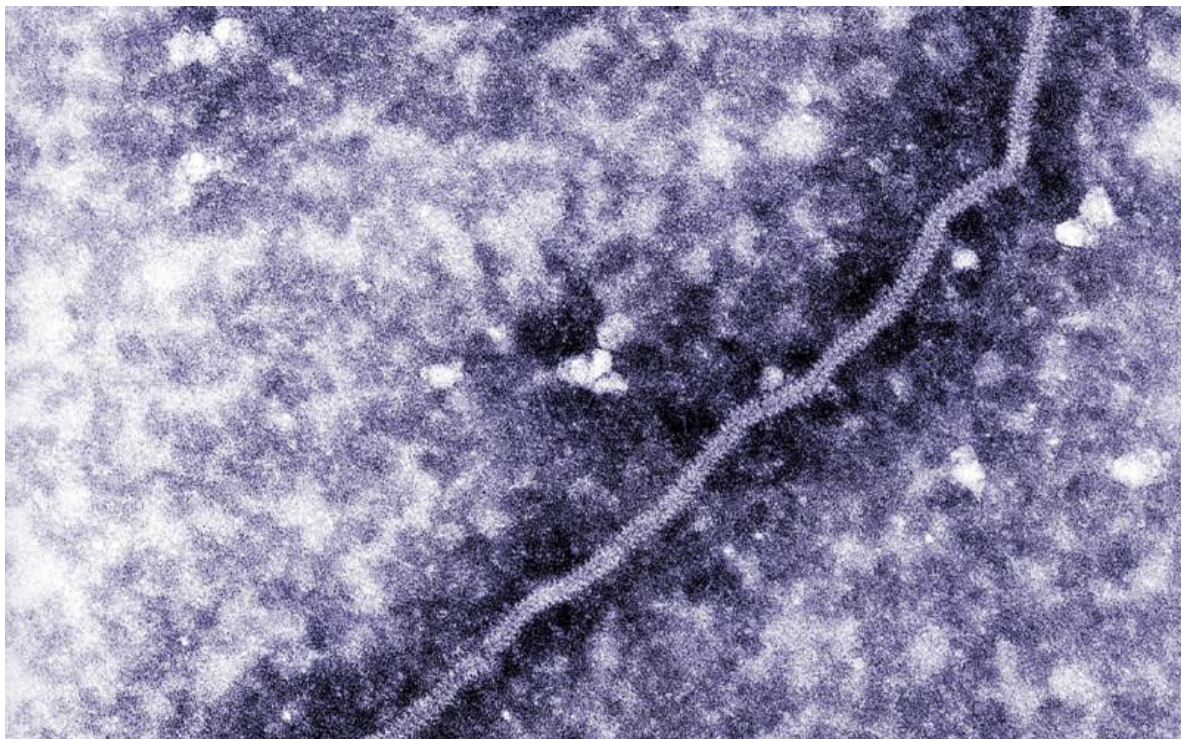
### *Lassa fever*



James Cavallini/SPL

This West African virus, carried by the common Natal multimammate rat, infects 300,000 people a year. Most have no symptoms, but it can cause diarrhoea and vomiting, then internal fluid accumulation, bleeding from orifices, shock, seizure and coma. It kills some 5000 people annually. Initial symptoms resemble other local diseases, making diagnosis tricky – one reason West Africa was slow to spot Ebola.

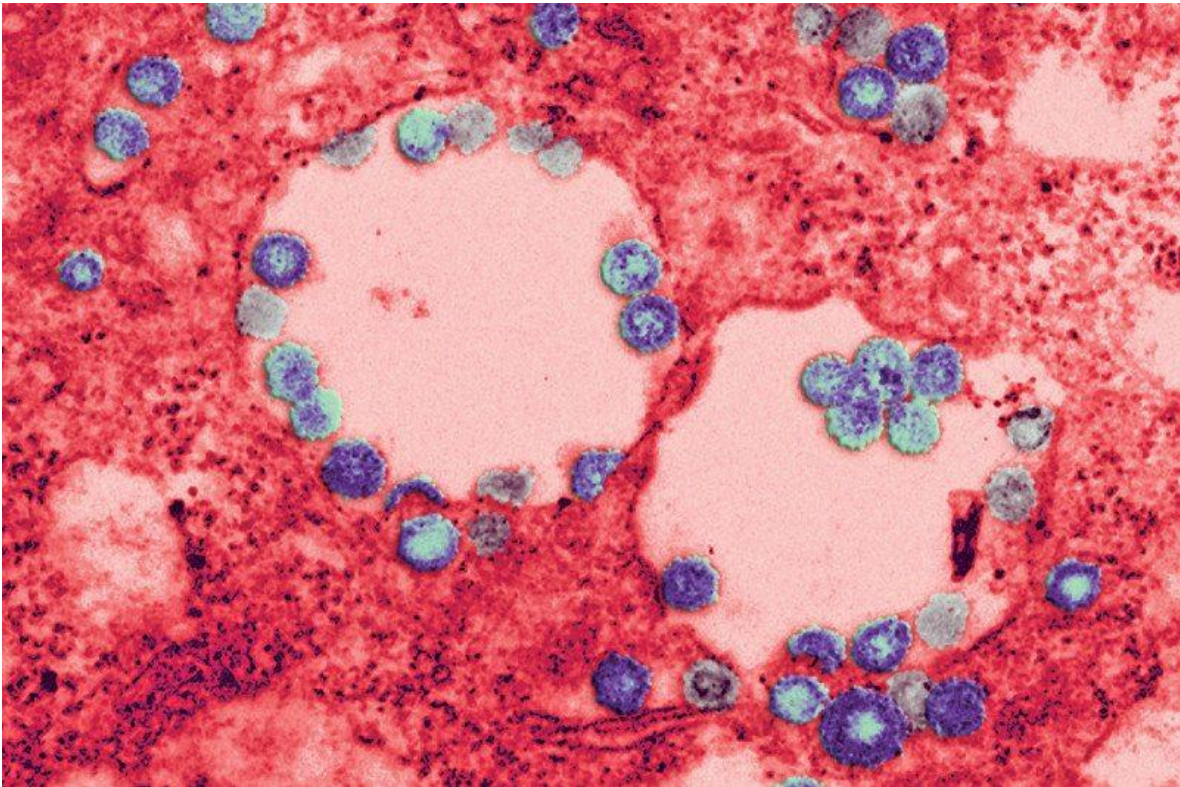
### *Nipah*



Science Source/SPL

This bat virus started killing people in 1999 in Malaysia after pig farms were built near fruit bats, which dropped half-eaten fruit into pigsties. People get it from pigs and bats, but it can also spread between humans. Nipah breaks out sporadically in and around densely populated Bangladesh, causes inflammation of the brain and has a high fatality rate.

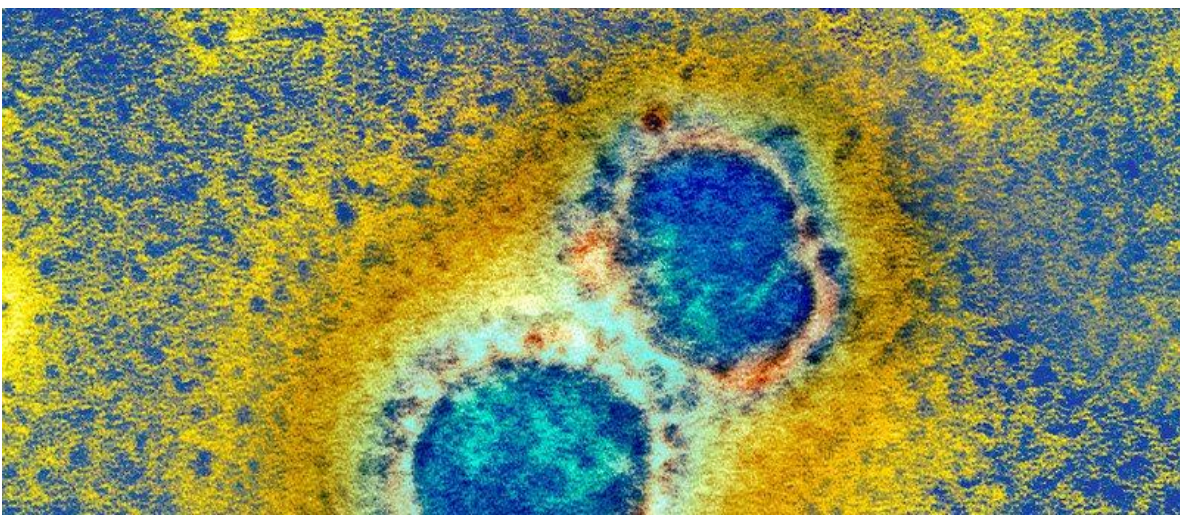
### *Rift Valley fever*

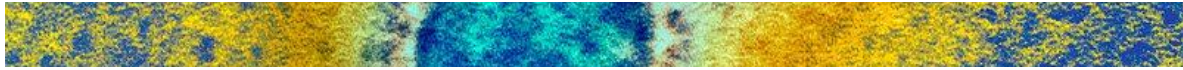


F. A. Murphy; J. Dalrymple/SPL

Widespread across Africa, this virus invaded the Arabian Peninsula in 2000, and could go further. It mainly infects cattle and is spread by mosquitoes; people can get it from mosquito bites or by eating infected beef. Symptoms are usually mild but it can cause haemorrhagic fever, which kills in half of cases.

### *SARS, MERS and emerging coronaviruses*





A. Dowsett, Public Health England/SPL

These related bat viruses infect a range of mammals and have already emerged in humans twice, resulting in severe pneumonia: SARS in 2003 and MERS in 2014. Both spread from human to human.

#### *Crimean-Congo haemorrhagic fever*

Found across Africa, Asia and south-east Europe, the virus is invading new territory as its tick hosts capitalise on global warming. It appeared in western Europe in 2010. Infected people generally have a mild fever but some strains cause severe haemorrhagic disease, with bleeding internally and from orifices, from which 30 per cent of people die.

#### *Chikungunya*

A virus spread by *Aedes* mosquitoes between monkeys and small mammals in East Africa, Chikungunya started causing large epidemics around 2000 and exploded into Asia in 2005, after mutations made it better adapted to a new mosquito host. In 2014, it invaded the Americas and has occurred in Europe. It rarely kills but causes debilitating joint pains, which can persist for months.

#### *Zika*

A monkey virus that has infected humans in Africa and Asia for decades, Zika suddenly entered the Americas in 2013. In 2015, it was linked to a wave of severe birth defects including microcephaly. Companies are already working on vaccines but the WHO wants extra research into the virus's effects on fetal brains.

#### *Severe fever with thrombocytopenia syndrome*

Flies under the radar – possibly because of its name. The virus, discovered in 2011, can cause fever and multi-organ failure, killing 12 per cent of people it infects. It has been found in east Asia, seems to be carried by farm animals, and is spread by ticks. A nearly identical virus, called heartland, has turned up in the US.

#### *Novel agent*

Given the rate at which previously unknown or obscure infections have suddenly emerged in humans and other animals, the WHO is leaving a slot on its list for a germ we don't yet know. Research here may include looking for agents that might explode.