

Can you help Dr Zoo escape a deadly virus?

An unknown virus (Virus X) has made the leap from animals to humans, causing a deadly outbreak.

To combat this potential pandemic, scientists with varying knowledge and skills work together to stop the virus in its tracks. Take on the role of Dr Zoo's assistant and use your skills as a virologist, vaccinologist, bio-mathematician and biosafety expert to evade this deadly disease.

Crack codes, solve clues, build viruses using scientific know-how to contain this deadly outbreak.



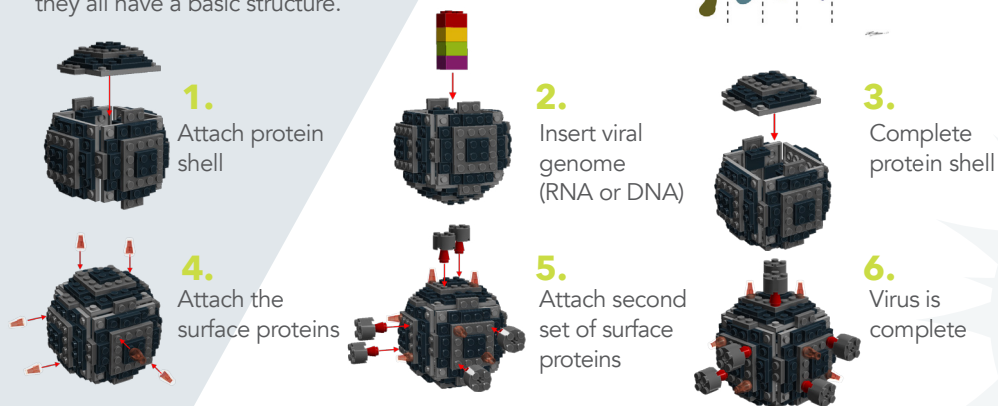
Escape infection

Enter Dr Zoo's Travelling Science Lab at your peril.

Working against the clock you have to combat deadly Virus X with a series of scientific puzzles and escape – will you survive the viral infection?

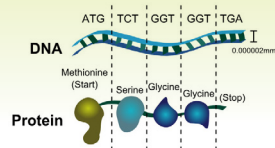
Build a virus

Viruses come in many shapes but they all have a basic structure.



Crack codes

DNA is made up of four bases (nucleotides) – adenine (A), thymine (T), cytosine (C) and guanine (G). These pair together as A-T and C-G to form the two strands in the double helix of DNA. A sequence of three bases codes for an amino acid and a sequence of amino acids results in a protein. Proteins are the building blocks of life. Viruses use their outer proteins to invade host cells and hosts use proteins to detect and fight viral intruders.



VIRAL SURVIVAL

Contagion control

Fighting viruses with science

Viruses that are spread from animals to people are called **zoonoses**. Some of the world's deadliest diseases are caused by zoonoses such as influenza. Predicting and controlling potentially deadly pandemics is a global priority.

- **Three quarters** of new emerging human viral diseases are zoonoses
- **Six out of ten** human infectious illnesses come from animals
- Viral zoonoses are the **biggest threat** to human and animal health

How can scientific research help stop the spread of disease?



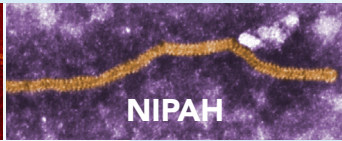
Pirbright preventing pandemics

Pirbright researchers employ a range of solutions to combat zoonotic diseases including:

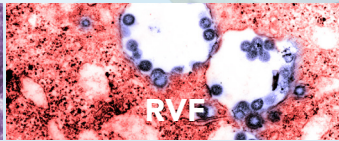
- Using genetic solutions to control the spread of disease
- Predicting the effects of climate change on the spread of disease
- Developing new and better vaccines to fight against deadly viruses that have the potential to become pandemics
- Gaining a greater understanding of the interaction between virus and host
- Exploring whether European mosquitoes can spread Rift Valley fever virus



CCHF



NIPAH



RVE

Top ten deadly virus threats

In 2018 the World Health Organization (WHO) published a list of ten viral infections that have the potential to become pandemics.

These are a priority for scientific research to aid in their prevention and control.

Pirbright studies five* of these diseases or the insects that transmit them (shown in red) in order to combat their spread through a combination of research to understand both virus and host, vaccine development, as well as diagnostics and surveillance.

*Influenza remains a disease of concern due to its potential to infect many hosts, and its ability to mutate rapidly and spread through populations quickly.



Aedes aegypti mosquito



Hyalomma tick



- 1 Zika
- 2 Nipah
- 3 Crimean-Congo haemorrhagic fever (CCHF)
- 4 Rift Valley fever (RVF)
- 5 Ebola
- 6 Marburg
- 7 Lassa
- 8 Middle East respiratory syndrome (MERS)
- 9 Severe acute respiratory syndrome (SARS)
- 10 Disease X (unknown)

Animals that spread diseases to humans



BATS

Bats harbour many viruses that cause different diseases without being affected by them. The viruses they carry, such as rabies, Ebola and Nipah, can be transmitted to humans through contact with infected bats or their urine and droppings, causing often fatal disease. A unique bat strain of influenza was also recently discovered.

Birds play host to one of our most common viral diseases – influenza or flu. Every year 250,000 to 500,000 people die from infection with influenza – although not all of these cases are directly transmitted from birds as flu spreads between people. However, wild birds infected with avian influenza virus can infect domestic poultry, giving the virus an opportunity to mutate and infect people.



BIRDS



PIGS

Pigs act as a stepping stone for several viral infections which can infect people. The pig anatomy is similar to a human's, which means viral mutations can make it easier for viruses of pigs to infect humans too. This is what happened in the 2009 H1N1 swine influenza pandemic. Nipah infections from pigs are also more easily transmitted to humans than Nipah in bats.

Ticks can cause severe disease by passing viral infections between animals and people. Crimean-Congo haemorrhagic fever is spread by *Hyalomma* ticks that suck blood from infected goats and sheep and then pass the virus on to people when they bite them, causing a disease which can have a 10-40% fatality rate.



TICKS



MOSQUITOES

Small but deadly, a number of species of mosquitoes cause the death of around 725,000 people every year by spreading nasty diseases. Female mosquitoes bite animals and then humans to feed on blood to produce their eggs, but as a result they can pass on infections such as West Nile, Zika, Rift Valley fever and chikungunya.

