The Royal College of Pathologists
Pathology: the science behind the cure

Viruses and Vaccines

Hands-on activities for primary schools.

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This pack provides simple ideas for exploring topics related to viruses and vaccines with children aged 5 to 11. It can support delivery of the 'humans and other animals' programme of study in the science National Curriculum. There are also calculations as part of the activities that can support maths learning. For the 'Size matters' activity you'll need to download the 'Virus collection' activity resource from the the Royal College of Pathologists' **'Viruses and Vaccines' resource page.**

Catch it!

Everyone knows how to 'dab' – this popular dance move looks similar to someone sneezing into the crook of their elbow. Get your students or event attendees showing their best dabbing and see who the best is at catching a sneeze! If you're running an in-person event (such as in a classroom), you could award a small prize to the best dabber/ sneeze-catcher.

Why not share the Catch It! Challenge on social media – it's an opportunity for sharing photos/videos of how to catch a sneeze! Please tag us @RCPath on Twitter and @royalcollegeofpathologists on Instagram.

Introducing the activity

When we sneeze, cough or shout, droplets from our mouth and nose (i.e., our respiratory system) fly out. If we are infectious, these droplets contain disease-causing organisms such as viruses. Droplets released in a cough travel at 50 mph (22.2 ms^{-1}) and sneezes travel at 100mph (= 44.7 ms^{-1}) So, if we don't cover our mouth and nose, how far could droplets from our respiratory system travel?

Activity – measuring a sneeze

In a small box (e.g., matchbox or food container) place some pompoms, cotton wool balls, or lightly scrunched up pieces of tissue. These are our respiratory system droplets containing viruses. Make sure you're in an open space. Now spin around and fling all the 'droplets' out of the box. How far have they spread?

You can also demonstrate this with a water pistol! Water from a water pistol travels at about 7 ms^{-1} so about a third as fast as a cough. So a cough can spread droplets about three times as far as a water pistol can shoot, and a sneeze six times as far!

Follow questions and discussion points

Ask students:

- Why are facemasks needed if you have an illness that might be COVID-19 or flu?
- Why do you think we are still told to keep a distance of two metres between ourselves and other people?
- How else can we stop the spread of viruses like colds and COVID-19?

Final summary

This is why we need to wear face coverings, and to catch our sneezes in tissues and bin them. We also need to maintain social distancing of at least two metres if we want to be sure not to infect others or become infected ourselves. Surfaces can also be contaminated, so we must still remember to regularly wash our hands thoroughly. These are good hygiene behaviours that when they become our habits, can protect everyone from many other diseases too. We don't always know if we are infectious – we can't wait for the symptoms to appear. Best to be safe if we want to protect others.

Size matters

Introducing the activity

Viruses come in a variety of shapes and forms and are microscopic. This means they are so small you can't see them using your naked eyes. Scientists use microscopes to see them.

The coronaviruses are round with spikes, which is why they have the word 'corona' in their name, meaning 'crown' or 'wreath' in Latin.

Viruses contain genetic material which are the instructions for making proteins – the building blocks of living things. For example, regions of these instructions make the spike protein in SARS-CoV-2 which is what helps the virus get into our cells, starting the infection.

Respiratory viruses enter through our nose or mouth. Others can be transmitted by mosquitoes or other biting insects into our bloodstream, or via the exchange of bodily fluids.

With younger children you can explain cells using content from this BBC resource and this video.

The activity – imagining the size of viruses compared to our own cells.

Have a look at the different viruses in the Viruses Collection pack. We have Zika, HPV (Human Papilloma Virus), Yellow fever, COVID-19, Influenza, HIV (Human Immunodeficiency Virus), Smallpox and Ebola viruses. Look at the differences in size and shape and what diseases and symptoms they cause in the descriptions under the illustrations.

Cells of our body and disease-causing organisms like viruses are so tiny they are measured using extra-small measurements called micrometres and nanometres.

There are 1000 micrometres in 1 millimetre, and 1000 nanometres in 1 micrometre, so 1,000,000 nanometres in 1 millimetre.

If an average human cell is 100 micrometres, how big would a cell look like if it was right next to these viruses?

Worked example:

Yellow fever viruses, one of the smallest out of our example group, is around 50 nanometres in diameter, on average. An average human cell is 100 micrometres in diameter. To compare these sizes, if we convert micrometres to nanometres by multiplying by 1000, an average human cell is 100,000 nanometres in diameter.

So let's imagine this in centimetres. If a Yellow fever virus was 50 cm in diameter (which is a little less than two 30 cm rulers) then a human cell would be 100,000 cm in diameter…that's 1000 metres or 1 kilometre! Can you imagine that size difference? Human cells are so much bigger than viruses.

Now try to compare the sizes of the other viruses featured in our 'Virus collection'. Use the same method by converting nanometres to centimetres. Discuss the differences between the various viruses featured and why they might be so different to each other in size and shape. *Encourage the children to read about how they are caught/ transmitted.*

Why not try the other activities on our Viruses and Vaccines resource page?