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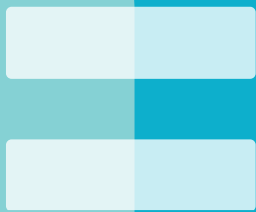
**SCIENCE  
WEEK**

#scienceweek

12-19 November 2023

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# Classroom Resource



## My Body's Incredible Defences



# Investigation

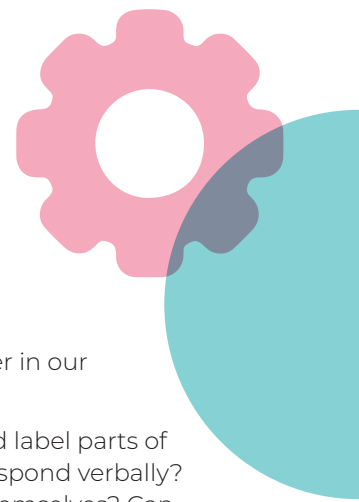
## My Body's Incredible Defences

**Class Level** - Senior

### Curriculum Links

<b>Strand:</b>	Living Things, Data
<b>Strand Unit:</b>	Human Life, Representing and Interpreting Data
<b>Curriculum Objectives:</b>	Identify and understand ways in which the body protects itself against disease and infection.
<b>Skills Development:</b>	Observation, predicting, estimating and measuring, investigating and experimentation; Collect, organise and represent data
<b>New words/vocabulary:</b>	Bacteria, viruses, fungi, protozoa, infection, contagious
<b>Focail nua:</b>	Cosaint (Defences), Ionfhabhtú (Infection), Galar (Disease), Baictéir (Bacteria), Víreas (Virus), Fungais (Fungi)
<b>Cross curricular links:</b>	SPHE, Geography
<b>Equipment/materials</b>	Spray bottle, water, balloon, flour (use gluten-free flour if needed), funnel, sliced bread, soap, computer with access to the internet/printer, labels, paper, ziplock bags, pens, sticky paper or tape, sweeping brush and pan





## Engage

### Prompt questions

- Our bodies are incredible; they have a range of features that help protect us from danger in our environment, disease and infection.
- Ask learners to think of ways in which our bodies protect us. Can they draw a picture and label parts of the body that they think help us defend ourselves from germs and injury, or can they respond verbally? What type of special features or abilities do their favourite superheroes have to protect themselves? Can they think of any special features or senses they have themselves? These might be skin which acts as a barrier; eye lashes that catch dirt; taste buds that tell us if something tastes bad etc.
- Once learners have had a chance to think about what defences their bodies have, ask them to explore how these defences work, how does skin form a barrier between us and the outside world, and how do our senses (eyes, ears) see and hear danger. How do the hairs in our nostrils or the cilia or mucus in our trachea (windpipe) work?
- We may also want to explore dangers in our environment. What do the learners perceive as dangerous and why? What causes disease and infection? What types of micro-organism have learners heard of? What is a germ? Are bacteria and viruses living things? Are they new, or have they been around for a long time? What questions do learners have about germs? Have learners ever had a cold or flu? How did they feel? Have learners ever seen posters about germs? What did they look like, and what kind of advice did the posters give?

### Exploring

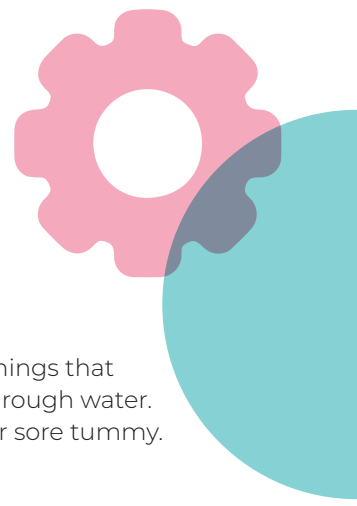
Ask learners to consider how germs spread. Using a spray bottle with water, ask some volunteers to demonstrate how germs can spread by touching things. Ask the learners to first wash and dry their hands with soap and water and a towel. Ask them to stand with their hands outstretched in front of them, palms up. Spray their hands with water. Then, ask them to return to their desks and touch their table / chair / pencil / school bag. Did these items get wet? Explain how germs can pass from our skin to other objects just like the water droplets did.

Next explore how germs spread through coughs and sneezes. **Note:** You may want to do this demonstration in the schoolyard or outside, as it can get messy in the classroom! Put some flour (you may need to use gluten-free flour) into a balloon by using a funnel to pour the flour through the narrow opening (a tablespoon or two is enough). Blow up the balloon (carefully, ensuring no flour is inhaled) and tie it. Pop the balloon. It may help to have this demonstration recorded as a slow-motion video on a mobile device so that students can watch it afterwards.

### Background information

Our bodies have different types of defences. The first line of defence is known as non specific barriers, and they can be either physical or chemical. These include our skin, the hairs and mucus in our noses, and the cilia (tiny finger-like projections which line the surface of our trachea or windpipe, and the tubes and tiny channels that transport air from our nose and mouth to our lungs), and the mucus or sticky substance that surrounds the cilia.

The cilia function by constantly moving the mucus from these pathways back to our throats, where we swallow it into our stomachs. Here, our stomach acid kills most germs. However, for those that get through our physical and chemical defences, we have our immune system. Micro-organisms include bacteria, archaea, fungi (yeasts and molds), algae, protozoa, and viruses. These tiny living things are everywhere and generally cause us no harm, in fact some are useful, such as yeast, which is a fungus used in baking. Some live in our gut and help digestion (some types of bacteria). However, there are those that cause us harm, and these are called pathogens or germs. They invade plants and other animals, as well as humans. The disease causing microbes/germs are bacteria, viruses, fungi and protozoa.



## Engage

### Bacteria

Bacteria are single-celled creatures. They feed on nutrients within the environment they live in, which can be the human body. They can reproduce inside or outside the body. As they reproduce, they can cause infections such as ear infections and sore throats. But not all bacteria are bad. Some live in our gut and help us digest food, while others are used in labs by scientists to make medicines and vaccines.

### Viruses

Viruses need to be inside living cells to grow and reproduce. Most can only live for short amounts of time outside the body on surfaces such as table tops and door handles, so it helps if we wash our hands regularly. The animal a virus lives in is called a host. Viruses include Covid-19, chickenpox, measles and the flu.

### Fungi

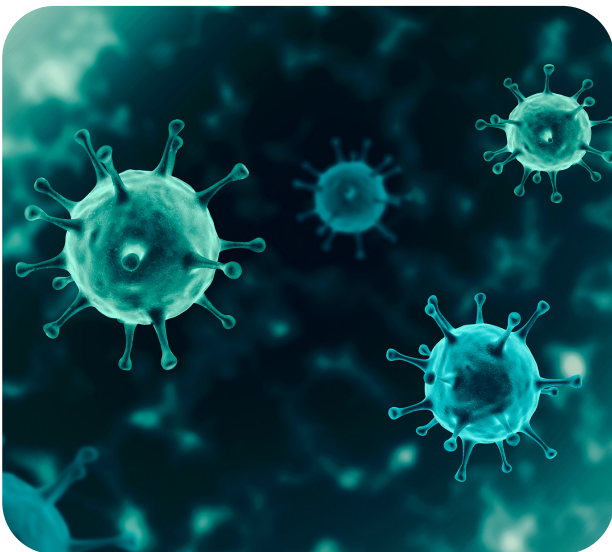
Fungi are multi-celled (have many cells) plant-like organisms that get their nutrients from plants, animals and people (they don't make their own food using the sun, water and soil). Most are not dangerous to healthy people. An example of a fungus that likes to live on people is athlete's foot, an itchy rash that can develop in between the toes, where it can get damp and warm.

### Protozoa

Protozoa are single-celled living things that love moisture and often spread through water. Some protozoa can cause a sick or sore tummy.

### Real-world application

Our battle with germs and micro-organisms has been something humans have had to live with since we evolved. Scientific discoveries such as vaccines have been instrumental in protecting us from a range of diseases. As we develop new ways to stop and slow the spread of these living things, they evolve to survive. As humans, we are part of a rich biodiverse ecosystem, but our actions such as the capture and sale of wild animals, habitat destruction or disturbance put us in the path of new micro-organisms which may be more common in the animal world, but new to us. We can also learn a lot from these living things, with scientists exploring how they can be used for medical purposes. This is called Biomedical Research and Development – where we use living things in our advancement of medicine.



## Investigate

### Starter question

Which surface in the classroom has the most micro-organisms on it?

### Predicting

Ask learners to make a list of surfaces/objects in the classroom. Which one do they think will have the most micro-organisms on it?

Explain that you are going to use the bread to investigate the level of micro-organisms on different surfaces and objects in the classroom. By rubbing the bread on a surface or object micro-organisms will transfer to the bread (if there are any there), where they can grow and reproduce as the bread will provide them with a food source.

Ask learners to think about how to set up the investigation. How will we make the investigation a fair test? Will our hands need to be clean? How long will the bread be rubbed on each surface? Will there be a 'control' slice which has touched nothing? Where will we store the samples? How will we label the samples? What surfaces will we use? How long will we leave the bread? How will we record our results and display our data?

### Conducting the investigation

Once the learners have designed their investigation, you can get started. Things to consider include:

- Have learners cleaned their hands?
- Have you got a control sample? (a slice which has touched nothing)
- Have all bags been labelled and marked with the surface type and date?

- Have you decided on a set time for exposing the bread to the surface?
- Have you decided on recording methods such as an estimate of the percentage of mould coverage on the piece of bread or regular images or a video of each sample?
- Have you decided on where the samples will be kept? NOTE: bags should remain sealed during this activity.
- Will samples be taped to a board in the classroom?
- How long will you run the investigation?
- How will you share the information with the other classes in the school/ wider community?

Once your investigation has been set up, ask the learners to make predictions e.g. which sample will have the most mould grow on it. Ask them to record this prediction. Monitor the samples regularly over the coming weeks (daily or every second or third day).

Note which samples seem to remain the same and which change e.g. develop mould (using estimates of % cover, such as 25%, 50%, 75% or 100%, or using images/videos).

### Sharing data/results

Ask learners to write up their results or record a video at the end of the investigation. Were their predictions correct? Were there any results they were surprised by? What would they do differently if they were to repeat the investigation?



## Take the Next Step

### Adapt for home:

Repeat the investigation at home with your family and try making two of some of the same samples (two samples exposed to the same surface but in separate bags). Place one in a sunny environment and the other in the dark, or one in a warm place and one in the freezer. Do these different environmental conditions affect the growth of the micro-organisms?

### Adapt for junior level:

Remove the investigation step and continue with the balloon pop activity. Ask learners to consider how the hairs in our nose and the cilia in our air pipes help trap germs.

Repeat the balloon pop with different types of paper placed nearby. Use plain paper, and sticky paper (such as fly paper or paper with sticky tape placed on top in a curl so that a sticky layer is facing upward). Try catching some 'germs' by holding a piece of paper with some sticky areas on it. Examine the paper after the balloon has popped. Did some of the flour get caught by the sticky surface? This is how the hairs and mucus in our noses and airways work.

### Follow-up challenge/project/citizen science link:

- Try this activity with different types of bread. Do you get different results with bread made with higher yeast quantities?

