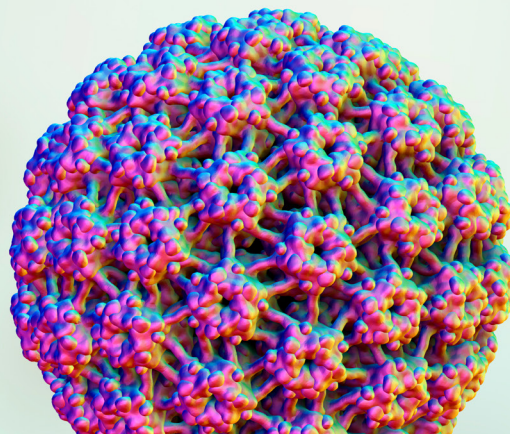


ACTIVITY SHEET



COLLECT AND ANALYSE AIRBORNE BACTERIA AND FUNGI USING GRAVITATION

You can grow and count bacteria and fungi in your school! By collecting samples from the air, you will be able to see what bacteria and fungi colonies look like and examine the differences between them.



LEARNING OUTCOMES:

- Practical skills in microbiology
- Understanding airborne microorganisms and the factors that affect their abundance
- Understanding the scientific method, making and testing predictions (builds to hypothesis testing)



EQUIPMENT NEEDED:

To make about 30 plates

- Sterile petri dishes *
- 4 teaspoons/cubes of beef stock powder
- 8 teaspoons of sugar
- Gelatine or agar (unflavoured, enough to make 1 litre of jelly) **
- 1 litre of water (distilled if available, but tap water is fine)
- Saucepan and lid
- Metal spoon
- Sticky tape or parafilm (to seal the petri dishes)
- Pen or sticky labels (to label the plates)
- Stove or microwave
- Fridge, if storing the plates

* Petri dishes are available to buy online; 20 dishes will cost about €10. Petri dishes can be substituted with plastic containers like takeaway dishes with lids; simply sterilize with baby bottle disinfectant (e.g., Milton).

** Pre-prepared sterile agar plates are available to buy online; 10 agar plates will cost about €30. Use any non-selective nutrient medium (e.g., Luria/Lennox (LB), Tryptic Soy Agar (TSA), or Potato Dextrose Agar (PDA)).

CAUTION: With the use of boiling water and other hot liquids, there is a risk of burns. Bacteria and fungi grown on plates may also be hazardous. After exposure to air (or after microbial growth), ensure that the plates are sealed with tape around the edges (parafilm is ideal, but any tape will work). Dispose of the plates in a sealed bag (e.g., steam cooking bag) and then autoclave them (e.g., in a pressure cooker) before disposing of them in the bin. An autoclave is a sterilization mechanism that uses pressure and steam to prevent microorganisms and spores from surviving and spreading. Please check local/national disposal regulations.



MAKING THE AGAR PLATES:

1. Pour the water into the saucepan.
2. Add the beef stock, sugar and gelatine.
3. Bring to the boil, stirring to dissolve the ingredients.
4. The mixture needs to be sterilized, so keep it boiling for at least 5 minutes.
5. Allow the mixture to cool slightly with the lid on. Avoid exposing the mixture to the air as microbes that land on it now could contaminate it.
6. Pour approximately 20-30 ml of the mixture into each plate.
7. Allow to cool, with the lids on.
8. Store the plates upside down in a fridge. They will last for 2-4 weeks, longer in a humid environment.

NOTE: To keep the plates sterile, only take the lid off when pouring and replace it immediately. Do not touch the inside of the plates, avoid breathing over the plates and mixture, and do not move your hands over the open plates.

COLLECTING YOUR MICROBES:

1. Prepare your agar and fill some petri dishes to create agar plates (see instructions above).
2. Place half the agar plates, lids off, in the classroom and the remaining agar plates outdoors, again with the lids off. Leave them for 4 hours.
CAUTION: in some countries, there may be restrictions. For example, the use of environmental samples that may contain level 2 microorganisms could be prohibited in the classroom. See the risk classification here: www.handlingsolutions.eppendorf.com/sample-handling/centrifugation/biosafety/biosafety-levels-and-their-meaning
3. Make a note of which locations you think will collect the most and least fungi and bacteria. Explain your reasoning.
4. After sampling, put the lids on the agar plates, seal them with tape and label where each plate was located during sample collection. Place the agar plates upside in a warm, dark room. The agar must be at the top of the plate, not the bottom.
5. Leave for 2-3 days. If you need to wait more than 2-3 days, move the agar plates to a fridge to stop them becoming overgrown.
6. Count the number of colonies in each of the 'indoor' plates, and record this in your book.
7. Count the number of colonies in each of the 'outdoor' plates, and record this in your book.
8. Note the differences in colour and shape between the different colonies that have grown, and record this in your book. What are the differences between fungal and bacterial colonies?
9. Compare the number of bacterial and fungal colonies grown in the classroom and outdoors.