

Life forms and processes

Finding and growing microbes

Microbes are found almost everywhere, but they are mostly far too small to be seen by the naked eye. When microbes grow, they multiply and form colonies that can be seen easily. You are going to grow microbes from different places by supplying them with suitable growth conditions.

Learning objectives

To show:

- ▷ that microbes are everywhere
- ▷ the variety of microbes
- ▷ that the microbial population varies from place to place

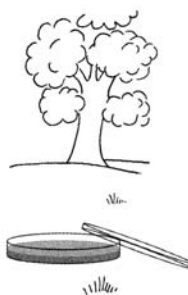
Techniques required

See *Basic Practical Microbiology*

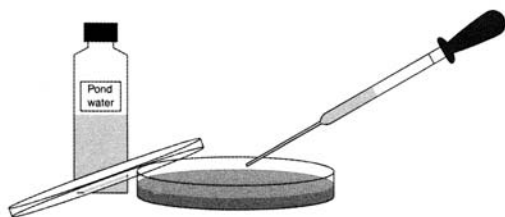
- ▷ flaming the neck of a bottle (pp. 10–11)
- ▷ using a pipette (p. 10)
- ▷ using a spreader (p. 15)

Procedure

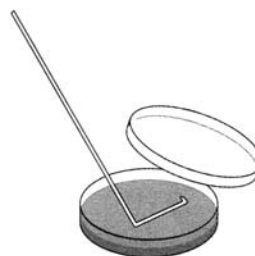
1. Take one agar plate. Choose a suitable place to leave it open to the air. Label the base with your name, the date and the place. Take the lid off the dish and keep it open until the end of the lesson. Replace the lid.



2. Label another agar plate with your name, the date and 'pond water'. Shake your bottle of pond water to mix the contents. Remove the top, flame the neck in the Bunsen burner and draw up a small amount of water with a dropping pipette. Flame the neck again and replace the top. Lift the lid of the dish and dispense 2 or 3 drops on to the surface of the agar. Use a sterile glass spreader to spread the drops evenly over the agar. Discard pipette and spreader into the beaker of disinfectant.



3. Follow the same procedure as (2), labelling the plate 'soil', using the bottle of soil suspension, a clean dropper and a fresh spreader.
4. Retrieve your plate from (1). Tape up all three agar plates and turn them upside down. They will be incubated until the next lesson.



⚠ Safety! Do not open the plates.

Next lesson...

5. Examine your agar plates and answer the questions.

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Microbes are found everywhere. A litre of pond water can contain millions of microbes. A similar number can be present in a gram of soil. Many microbes and their spores can be carried by winds, waters and animals across and between continents.

Learning objectives

To show:

- ▷ that microbes are everywhere
- ▷ the variety of microbes
- ▷ that the microbial population varies from place to place

Age range

Year 7 and above

Duration

Session 1 40 minutes

Session 2 20 minutes

Incubation period: min. 48 h between sessions

Recommendations

1. To limit the number of agar plates required, each group should use either nutrient or malt agar plates. Nutrient agar supports the growth of a wide range of bacteria and fungi from soil and air. Malt extract agar supports better growth of fungi because the low pH and nutrient content reduce competition from bacteria.
2. The plates exposed to the air should be left in a variety of places both inside and outdoors. Do not place the dishes in toilets. Ensure that other students/teachers are aware of why the plates are there or the experiment may be disrupted.
3. The students should be told that one agar plate is being kept unopened in the classroom/laboratory as a control.
4. The plates should be kept at room temperature or incubated at 20–25°C for 2–3 days. After incubation the plates should be taped around the circumference so that the lids cannot be removed.

Materials (each group)

- ▷ 3 nutrient agar plates
- or
- 3 malt extract agar plates
- ▷ bottle containing 1 g soil suspended in 100 cm³ tap water
- ▷ bottle containing 10 cm³ pond water
- ▷ 2 sterile glass or plastic spreaders
- ▷ 2 sterile dropping pipettes
- ▷ beaker of disinfectant
- ▷ Bunsen burner
- ▷ adhesive tape
- ▷ marker pen

Notes

Exposure of the agar plates in a variety of places should, after incubation, produce growth of bacteria and fungi. The number of colonies may be a reflection of the disturbance of the air by convection currents or people. Microbes in disturbed air may not be detected as they are held in suspension. Soil and water will probably yield more microbial colonies than air.

Questions

Session 1

1. Where do you think microbes may be found?
2. Is a single microbial cell visible to the naked eye?
3. What conditions do you think would encourage the growth of microbes?
4. What different kinds of microbes exist?
5. Do you expect any difference between the malt agar plates and the nutrient agar plates? If so, why?
6. What is the purpose of the 'control' plate?

Session 2

7. Describe the appearance of each of your plates. Do they all look the same?
8. Which plate shows most microbial growth? Can you suggest any reasons for this?
9. Do your plates look the same as those from other groups, using a different kind of growth medium? If not, suggest a reason why.
10. Write down any ideas you have about how microbes might be important in the places you have investigated.