

Growing Bacterial & Fungal Colonies – Teacher Notes

It is rare for pure water to exist in nature. Even water melting from a glacier may have fungal spores present. In the summer in Antarctica "watermelon stains" appear near crevasses in ice fields. They are caused by fungal colonies with red sporing bodies. There are also tiny arthropods found in lakes trapped under the ice caps.



Students may wish to examine the evidence of macroscopic living things in pond water using hand lenses, magnifying glasses or Proscopes.

Water from a frog pond, birdbath or bog teems with life. Collect samples from the bottom of the pool as well as the top as creatures such as mosquito larvae sink rapidly to the bottom as a form of defence when water is disturbed. Petri dishes and test tubes can be held towards the light or placed on a piece of white paper to highlight aquatic organisms.

When using the hand lens students may need to be reminded that the glass is held close to the eye and the object to be viewed is moved towards the glass and eye until in focus. Moving the glass between the eye and object can result in nausea.

Growing bacterial and fungal colonies in nutrient gel in Petri dishes

Although filtration methods will remove most solids from the dirty water, dissolved materials and microbes will pass through the paper and could cause illness if swallowed. Bacteria and fungal spores are too small to be seen under a school microscope. If you provide them with nutrition they will multiply into visible colonies. Bacteria multiply at a rate of 2^{n-1} where n is the time it takes for them to double. Students may wish to calculate how long it would take for one bacterium to become 64 bacteria if it only takes 15 seconds to reproduce asexually (one parent cell becomes two). 15s-2, 30s-4, 45s-8, 60s-16, 1min 15s-32, 1min 30s-64



Petri dishes are named after Julius Rickard Petri the famous German bacteriologist (1853 – 1921). The dishes with gel should be prepared the day before the activity. Materials required for 6 Petri dishes:

- Six Petri dishes
- Agar powder (about one and a half tablespoonsful)
- Stock cube or sugar
- Five cotton buds.
- Sticky tape



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A nutrient gel can be made by dissolving about a quarter of a stock cube in warm water. Add half a level tablespoon of agar to 100mL of warm water and pour into the smaller bottom dish. Close with the larger upper lid and seal with sticky tape. Dishes with nutrient gel should not be left uncovered as they will quickly be contaminated. Dishes can be prepared a day earlier if they are kept upside in the fridge. This minimises drying out. Commercial fruit jelly usually has too much food acid which delays, but does not prevent, microorganisms growing. (Soft fresh bread can be substituted but the results are not always successful)

One Petri dish with gel should be sealed immediately and returned to the refrigerator. This is the **CONTROL** dish. It is the dish against which any change will be measured. The other dishes are the **EXPERIMENTAL** models.

Moisten the cotton bud with filtered dirty water and smear it over the top of the gel with a few strokes. Replace the upper lid. Seal round the edges with sticky tape. Do not open again. Leave these in a warm (not hot) place and colonies should become visible over a couple of days. They are most easily seen by holding the sealed dish up to a light or window and letting the light shine through.

DO NOT CONSIDER OPENING THE PETRI DISHES. The few original microorganisms will have multiplied rapidly making them more virulent.

Bacterial colonies tend to be slimy whereas fungal colonies tend to be furry. I rather enjoy watching "real estate wars" when colonies compete for nutrient.

Unless you have an autoclave, do not attempt to clean these dishes. Dispose of rapidly.

Availability of food and warmth are major factors limiting in bacterial reproduction. Where sewage has mixed with drinking water in a warm climate, conditions for disease outbreak are present. Where the residents are poorly fed and have low medical aid, deaths of babies and the elderly follow floods and war.

Viruses need a living host to multiply.