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Bacteria

Can we see bacteria?

Are all bacterium cells the same size and shape?

Is your mouthwash really the best?

Let's find out...

Equipment

Petri dishes, agar Petri dishes (pre-prepared), mouthwashes, toothpick, cotton buds, filter paper, hole-punch, microscope (must be able to magnify to at least $\times 400$), tape, permanent marker, sterile water.

Keeping us safe

If you are using a glass Petri dish, remember to be careful. Broken glass can cut you. **DO NOT touch the agar!** (wear gloves), do not fully seal the agar Petri dish, do not open the Petri dishes once sealed. At end of the practical, wash your hands.



Lactobacillus



Streptococcus

Bacteria in a pot

In this activity you will prepare a microscope slide containing bacteria from yogurt.

1. Using a cotton bud or toothpick, place a small blob of yogurt onto a microscope slide.
2. Pipette 1 drop of H_2O (water) onto the yogurt and carefully cover this with a coverslip.
3. Ensure that the stage of your microscope is completely lowered.
4. Secure the microscope slide onto the stage.
5. Use the objective lens with the highest magnification. This is normally $\times 40$. The eye piece magnification is normally $\times 10$ and so the image that you will see is magnified by $\times 400$ (bacteria are very small).

Slowly rack up the stage until you have a clear image. Sketch what you see and use a reference book or the Internet to try and identify the different types of bacteria present in your yogurt sample. Can you estimate the size of a bacterium?

Which mouthwash is best?

This activity investigates the effectiveness of different mouthwashes for killing bacteria that are commonly found in your mouth.

1. Using a hole-punch, cut out five small discs for each mouthwash that you intend to use.
2. Pour a small amount of mouthwash into a 100 ml beaker (or smaller). Soak five discs in the mouthwash so that they become saturated.
3. Label a pre-prepared agar Petri dish with the name of your intended mouthwash.
4. Take a sterile cotton bud and dampen it with sterilised water. Rub the cotton bud across your front and back teeth.
5. Very carefully, roll the cotton bud over as much of the agar in the labelled Petri dish as you can (try not to damage the surface of the agar).
6. Using tweezers, place the soaked discs onto the surface of the agar (evenly distributed across its surface).
7. Close the lid and partially seal the sides with tape at 2 points along the Petri dish. **Do not totally seal the dish.**
8. Repeat this procedure for each mouthwash that you intend to investigate.
9. If you have a camera, take a picture of each Petri dish.

Your teacher/technician will now place each Petri dish in an incubator, held at 37°C for 3 days (why do you think that the incubator is kept at this temperature?).

10. Examine your Petri dishes as often as you can and sketch what you see. **YOU MUST NOT OPEN THE PETRI DISHES.**
11. If you have a camera, take pictures so that you can compare your results over time.

Can you describe what you see? Can you explain your results? What conclusions can you draw? Is your mouthwash the most effective at killing bacteria? How might the experiment be improved?

So, what's the scientific explanation?

Bacteria in a pot

Bacteria are very small, ranging in size from 0.5×10^{-6} m (meaning that, if we put the smallest bacteria end-to-end, we could put around 1,000 in one millimetre!). You may also have noticed that bacteria are not all the same size or shape. Some are circular, some rod-like and others are irregular shapes. Bacteria that are round have the suffix '-coccus', rod-shaped bacteria are called '-bacillus' and a spiral-shaped bacterium has a name ending in '-spirillum'. If bacteria pair up, they have the prefix 'diploe-', if they form a chain, we say 'streptose-' and if they form clusters, we say 'staphyle-'. Streptococcus is a bacterium that has a round morphology (shape) and forms chains.

You should be able to see different types of bacteria in the yoghurt.

Which mouthwash is best?

The most effective mouthwashes will be those that have little or no bacterial growth around the discs. This means that bacteria have not been able to grow in these areas. An ineffective mouthwash will have bacterial growth around the discs, which shows that the bacteria have been able to reproduce and grow despite there being mouthwash present.

The Petri dish must not be totally sealed, as oxygen must be allowed to enter. Without oxygen (anaerobic), very harmful bacteria can grow.

The incubator is kept at about 37°C because this is the optimum temperature for bacteria found in the mouth to grow (check out how enzymes are de-natured by temperature). Our core temperature is 37°C and it therefore makes sense that anything that lives inside us should function best at this temperature.

Key words for your glossary

Bacterium (plural, bacteria), agar, agar Petri dish, magnification