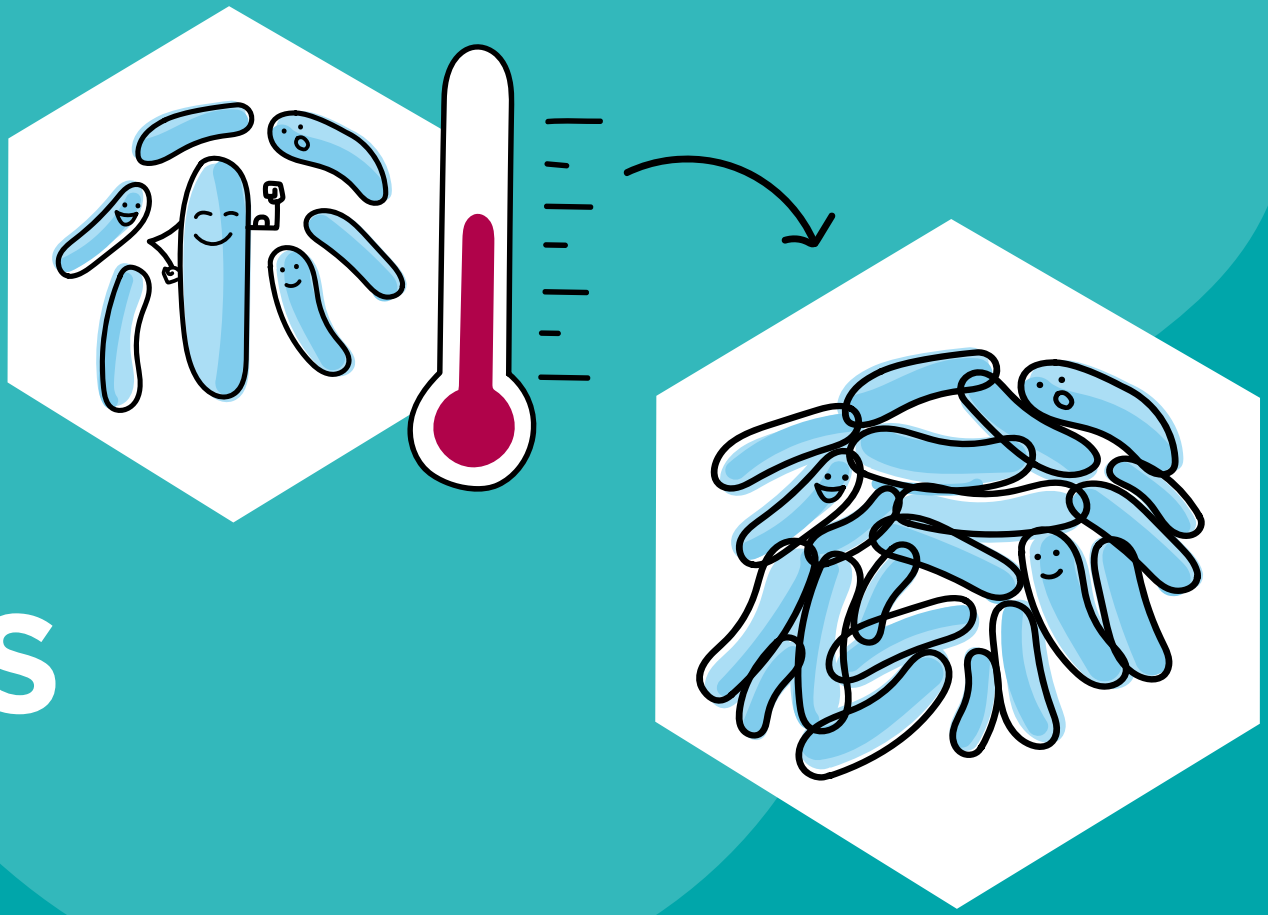
ACTIVITY 11



CHEMISTRY AT HOME

MIGHTY MICROBES

MEDIUM | 7-12 | 30 MINS PREP *plus overnight incubation*

1. Learn about how bacteria can be used in making food
2. Try making your own yoghurt
3. Understand how bacteria grow and reproduce

ENCOURAGING TOMORROW'S CHEMISTS TODAY

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MIGHTY MICROBES

The world around us includes billions of tiny living things called microbes which includes bacteria, viruses and yeasts. Bacteria are so small you can only see them using a microscope. 100 or more bacteria could live on a full stop.

Most people think of bacteria as things that make you ill, such as those that cause food poisoning. Not all bacteria are bad; some are helpful and biochemists can use them to make foods, medicines and fuels.

You will need

- 400g pot of "natural" or "bio" yoghurt containing Lactobacillus
- 2 400g cans of full fat evaporated milk
- 200ml oat milk or soya milk
- Measuring jug
- Small pan
- Wooden spoon
- 4 clean jam jars with lids
- Large piece of bubble wrap or kitchen foil
- Towel
- Hot water bottle
- Access to cooker, kettle, fridge and a warm place

Safety

Do not eat home-made yoghurt unless an adult has sterilised all equipment/utensils before starting.

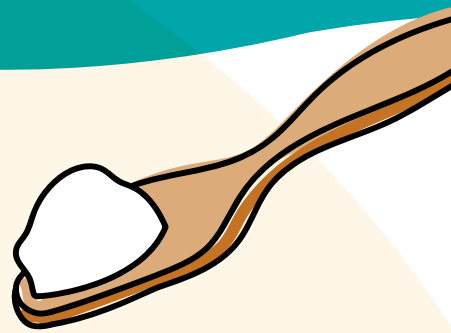
Ask an adult to handle hot liquids and open cans.

Check the food packaging for allergens.

This activity should be supervised at all times.

Instructions

Activity 1
Making Yoghurt



- Ask an adult to prepare a warm hot water bottle.
- Measure 150ml of evaporated milk into a measuring jug and top up to 200ml with water. Pour into a pan and ask an adult to heat this on a low heat, stirring constantly, until bubbles start to form around the edges.
- Pour the hot milk into a jam jar and leave to cool to room temperature.
- Add 2 tablespoons of the live yoghurt to the jam jar with the milk. Stir gently and secure the lid.
- Nestle the jam jar next to the hot water bottle and wrap them together first in bubble wrap and then in a towel to keep warm. Place the package in a warm place and leave overnight.
- Unwrap and examine the contents of the jam jar – has the milk thickened into yoghurt? The thicker the yoghurt, the more bacteria are present.

Challenge 1

What is the best temperature for bacteria to grow?

- Repeat steps 2 to 4 of activity 1, but instead of wrapping up the jam jar with a hot water bottle, keep it cold overnight by placing in the fridge.
- Repeat activity 1, but this time add the live yoghurt starter culture to the milk before heating the milk in the pan. Bring the milk/yoghurt mixture to the boil (it will curdle) before pouring into the jam jar, leaving to cool and wrapping up with the hot water bottle as before.

Looking at your experiments, which temperature made the best yoghurt?

Challenge 2

Do bacteria need lactose to make yoghurt?

Dorothy wants to test whether the bacteria really need lactose to make yoghurt.

She knows that milk substitutes such as oat milk and soya milk do not contain lactose.

Design an experiment, based on activity 1, to see whether lactose is required for bacteria to make yoghurt.

What's happening?

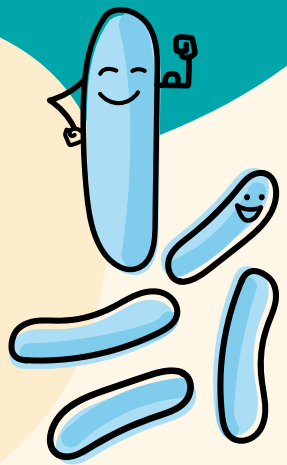
Yoghurt is made from milk using a special bacteria called Lactobacillus.

The milk is heated first to kill any bad bacteria and ensure the milk is hygenic before starting, this is called pasteurisation. A few Lactobacillus from the natural yoghurt is then added to warm milk at the right temperature and the bacteria start to divide and multiply. The bacteria "eat" a sweet tasing chemical in milk called lactose and release an acid. This acid makes milk thicken into yoghurt.

The Lactobacillus cannot grow to make yoghurt if the temperature is too low or too high. Most bacteria grow best around 37°C (human body temperature). Bacteria can grow in cold temperatures, but very slowly. At high temperatures, bacteria will die. Lactobacillus cannot make yoghurt without lactose, eg: using oat or soya milk.

Did you know?

A single bacterium can divide itself to create two new bacteria. Just one bacterium can grow and multiply into eight after 1 hour, and after 8 hours this would result in a total of 16,777,216 bacteria!



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