

MAKING YOGHURT:

TEACHERS NOTES

The microbiology of yogurt



Yogurt is a fermented milk product meaning it is produced when certain microbes grow in milk and change the properties. In this case, two bacterial species are largely responsible for yogurt production and they are *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. Both of these bacteria are alive and present in the yogurt that you can buy in the supermarket. This is the reason that we add yogurt at the beginning, we need to make sure that there are enough bacteria present to convert the milk.

These two bacterial species are required by law to be in yogurt. They work by fermenting the sugar lactose which is present in milk. The lactose is converted to lactic acid by the fermentation which gives the yogurt its tangy flavour. The longer you leave the yogurt to ferment, the more lactic acid will be produced and the more tart the yogurt will taste.

Many yogurts contain other bacteria too which can affect the properties of the yogurt. In the education pack, the initial exercise calls for 2 different yogurts to be used. If possible, it is good to find yogurts with different types of bacteria listed on their ingredients, then your students can see the difference that the different microbes make.

THINGS TO CONSIDER

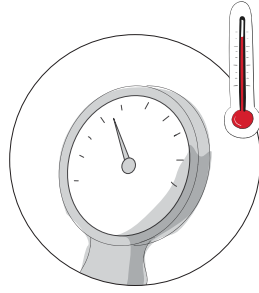
Cleanliness

When making yogurt, we're actually creating the perfect environment for bacteria and yeast to grow. It is important to make sure that we only grow the bacteria that we want to be there, and nothing else. The yogurt that we add at the start contains all of the good bacteria that we need, we just need to make sure that no contamination can find its way into our starter from other sources. To do this, make sure all the containers and utensils that come into contact with the yogurt are clean. Where the instructions call for sterilisation, pour boiling water onto any surfaces that need to be sterilised. Some of the exercises require that the children smell the yogurt. During this step, try and encourage them to sniff from the edge of the container without putting their noses in. yogurt and milk should smell pleasant, and slightly sour if it has been fermenting. If there are any off smells or signs of mould, throw the yogurt away and start again.



Temperature

The bacteria in yogurt work best at temperatures of around 40°C and grow faster where it is warm. Try to find a place that has a consistent warm temperature, such as close to a heat source like a radiator, an oven or



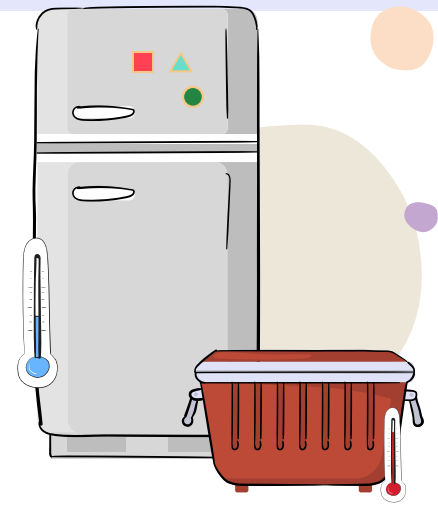
a boiler. If the temperature is slightly colder, then the yogurt will still form, just a little more slowly. If the temperature is cooler, it might just take a little longer for the yogurt to form.

EXPERIMENTING FURTHER

There are lots of ways to adjust the yogurt recipe to change the results. The nice thing about making yogurt is that it is very fast and that gives a lot of scope for experimenting and making small changes.

There are too many combinations to list out all the possible experiments that you could do, but here are some questions to help you guide your students.

To make yogurt you need bacteria, a source of lactose and a warm place. This is a slight over simplification as other compounds in milk are also important, but it is the lactose that is the fuel for the bacteria to create yogurt. So you could ask your students what happens if you take any of these away? In the lesson, you already have a pot that contained milk and no bacteria, so this can be answered directly but how about lactose free yogurt? What happens if the milk is stored in the fridge instead of a warm place?



The bacteria in yogurts are normally always the same. However probiotic yogurts or drinks often boast many more species of bacteria that could be fun to try out in your yogurt. Try adding some probiotic drink or yogurt to your starter and see how it affects the process and the properties of the finished product.

These are the simplest forms of yogurt but you could also experiment with different additives and styles. For example, most yogurts contain some flavourings such as fruit, does it make a difference to the yogurt when the fruit is added? Also, could you process the yogurt in some way to change the style eg. thicken it to make a Greek style yogurt?