

Making cheese

Education in Chemistry

January 2020

rsc.li/34lq3BR

Enzymes are very important catalysts that are highly useful in our lives for making many products. This practical shows how enzymes are used for making cheese and yoghurt.

Activity 2 requires some patience while curdling takes place, so it is good idea to have something else for the students to do in the meantime.

Student sheet

In this activity, you will make the following:

- Activity 1: A cheese made without an enzyme
- Activity 2: A cheese using an enzyme in rennet
- Activity 3: A yoghurt

Apparatus per group

Per student, or student group (including filtration apparatus):

Activity 1

- 100 cm³ of whole milk
- 2x 100 cm³ beakers
- 5 cm³ of vinegar or lemon juice

Activity 2

- 100 cm³ of whole milk
- 1x 100 cm³ beaker
- Rennet – 0.5 g (either normal or vegetarian grade)

Activity 3

- 100 cm³ of whole milk
- 10cm³ of live yoghurt

Activity 1: Making a cheese without an enzyme

Some cheeses like ricotta, cottage cheese and paneer are made using natural acids like lemon juice or vinegar. These acids curdle the milk to form a solid.

Method

1. Measure out 100 cm³ of whole milk and add to a beaker.
2. Place the beaker onto a tripod and gauze, and heat the milk gently so it is close to boiling, but not boiling.
3. Remove the heat from the milk.
4. Add 5 cm³ of vinegar or lemon juice into the milk.
The milk should curdle and the curds and whey should separate.
5. Set up a filtration using a filter funnel, filter paper and another beaker.
6. Add the curdled milk to the filter funnel so that the curds separate from the whey.
7. Carefully squash the curds in the filter paper with a spatula.
8. Scrape out the curds onto a clean, dry piece of filter paper.
9. Leave and allow to dry.

You have now made a cheese very similar to cottage cheese or ricotta.

Activity 2: Making cheese with an enzyme

Most cheeses like cheddar use enzymes found in rennet to act on the proteins in milk, to curdle the cheese. Various bacterial cultures are also added to convert milk sugars into acids, and this also curdles the milk to form a solid (as above, in Activity 1).

Method

1. Place 100 cm³ of milk into a 250 cm³ beaker.
2. **Carefully** warm the beaker, until the temperature reaches 32°C – this is only lukewarm, so avoid over-heating.
3. Add half a spatula of the rennet into the milk, stir, and leave for **one hour**.
A solid curd will have set on top of the solution.
4. Using a spatula, carefully cut the curd into cubes.
5. Remove the cubes and carefully place onto a piece of filter paper.
6. Place another piece of filter paper on top, and carefully squash the cubes to remove any whey solution. You may need to repeat this process until all the whey solution is removed.
7. Remove the upper filter paper and allow the solid to air dry.

If the curds are now to be used to make, for example, a cheddar, they would be compressed into a mould, and left to mature. During this maturing process, many complex chemical reactions happen in which new substances form, and these will give the cheese a flavour, texture, smell and unique character.

However, as mentioned above, the addition of live bacterial cultures to the milk also adds an extra 'complexity' to this process, and together with the maturation phase, produces a cheese product that is more flavoursome and complex, compared to that produced using only acids (in Activity 1).

Activity 3: Making yoghurt

As this activity requires a thermos flask, it may be more conveniently carried out by the teacher.

It may seem strange, but the way yoghurt is made is using bacteria from another yoghurt!

This process is more straightforward than when making a cheese, and simply uses milk and a small amount of yoghurt.

Method

1. Add 2 heaped spatulas of live yoghurt into the thermos flask.
2. Warm 100 cm³ of whole full-fat milk in a 250 cm³ beaker, to 85°C, no higher.
3. Allow the milk to cool to 46°C, using a thermometer.
4. Add the milk to the yoghurt in the thermos flask and leave undisturbed for 7 hours.

Congratulations! You have now made yoghurt.