**National 4 Biology**

Cell Biology – Cheese Making





**Teacher/Technical Guide**

This activity consists of, a simple base practical which establishes clotting time for milk when rennet is added, an investigation where some of the factors which control the milk/rennet reaction can be altered and a discussion activity which encourages discussion about the use of the various forms of rennet.

It supports the National 4 and National 5 Biology courses:

*National 4: Cell Biology: 4. Properties of enzymes and use in industries; Carry out experiments with rennet. Make cheese/visit cheese factory. Investigate the history and ethics of rennet production.*

*National 5: This topic might be useful as a starter for an assignment.*

The practical activities are based an activity from NCBE (National Centre for Biotechnology Education) <http://www.ncbe.reading.ac.uk/ncbe/protocols/pracbiotech/PDF/rennet.pdf>

The purpose of this practical activity is to demonstrate a vital step in the production of cheese - the effect which rennet has on milk. Some classes could then develop this technique and investigate the various factors which control this reaction.

Three different forms of rennet are suggested in the activity two of which are available from NCBE: Chymosin - Maxiren® and Fungal ‘rennin’ - Fromase® <http://www.ncbe.reading.ac.uk/NCBE/MATERIALS/PDF/NCBEpricelist.pdf>

Calf rennet can be ordered from Cheese-Yogurt-Making.com

<http://cheese-yogurt-making.com/Rennet/50ml-Animal-Rennet>

**Base Practical**

**Materials required for each group of pupils:**

* 20 cm³ of whole pasteurised milk
* 2 cm³ of 0.02% calcium chloride
* Stirring rod
* pH paper and chart or pH probe
* 20 clean glass slides
* Access to a water bath at 30 °C
* 0.2 cm³of one of the rennet enzymes
* A timer

(as the pupils may need to repeat this experiment a few times it would be advisable to provide each group with approximately three times these quantities)

**Investigation**

 A variety of investigations may be attempted:

Investigating the effects of altering pH on clotting time – solutions can be made as follows:

1. 1 cm³ of 1 mol dm-3 hydrochloric acid added to 10 cm³of milk plus enzyme results in a pH of about pH 1
2. 1 cm³of 1 mol dm-3 citric acid added to 10 cm³of milk plus enzyme results in a pH of about pH 5
3. 1 mol dm-3 sodium hydrogen carbonate added to 10 cm³ of milk plus enzyme results in a pH of about pH 8
4. 1 mol dm-3 sodium hydroxide added to 10 cm³of milk plus enzyme results in a pH of about pH 14
5. Distilled water added to 10 cm³ of milk plus enzyme results in a pH of about pH 7

Investigating the effect of altering calcium chloride concentration - solutions can be made:

0.02% calcium chloride; 0.05% calcium chloride; 0.1% calcium chloride; 0.5% calcium chloride.

A discussion activity ‘Which Rennet?’ is also available.