

Topic 2 – Practical 6

Observing digestion under a microscope

Safety

- Eye protection should be worn when applying stains and using enzyme solutions.
- Some students may be allergic to eggs, so an alternative may be preferred.

Apparatus and materials

- six microscope slides
- coverslips
- microscope
- boiled water
- 1% diastase solution
- food samples, including:
 - potato, yam or other starchy food
 - egg white (soft boiled) or soft cheese
 - full fat milk or cream
- dropping pipette
- iodine solution
- Biuret reagent
- Sudan III solution
- access to a heated plate

Introduction

The process of digestion is enhanced in the body by the presence of enzymes, which work as catalysts. Each enzyme has a specific substrate and a typical enzyme only works on one substrate.

In this experiment the enzyme diastase is used. Diastase was the first enzyme discovered and was extracted from malt solution in a sugar factory by two French scientists, Anselme Payen and Jen-Francois Persoz, in 1833. Diastase catalyses the breakdown of starch to maltose and was found in germinating barley seeds.

You should recall the indicator tests used to identify:

- starch (iodine solution turns blue–black if starch is present)
- protein (Biuret solution turns from blue to purple if protein is present)
- fat (Sudan III stains fat cells red).

The experiment enables you to observe the action of diastase under the microscope using smears of foods as the test substrates.

Procedure

- 1 Cut a fresh potato or yam and scrape the surface to remove some cells. Wipe these across the surface of two of the microscope slides so that starch is left on the slide.
- 2 Take the white of a soft-boiled egg and smear this over two further slides.
- 3 Place a small drop of full cream milk or dairy cream on each of the two final slides.
- 4 Heat the slides on a heated plate for a few minutes, and then cool them.
- 5 For each pair of slides, place one drop of boiled water on one sample and one drop of diastase on the other. Place a coverslip over each food sample and leave overnight.
- 6 Next day, add one drop of iodine indicator to the two slides containing yam or potato, add one drop of Biuret reagent to the two slides containing egg white and one drop of Sudan III to the two slides containing milk or cream.
- 7 Examine each slide carefully under a microscope.
- 8 Compare pairs of slides and look for evidence that the foods have been digested by the enzyme diastase.

Questions and further work

- 1 Which foods were still visible in their original condition?

- 2 Which foods had been digested by diastase?

- 3 What was the purpose of the indicator solution in each case?

- 4 State the main purpose of digestion in the digestive system.