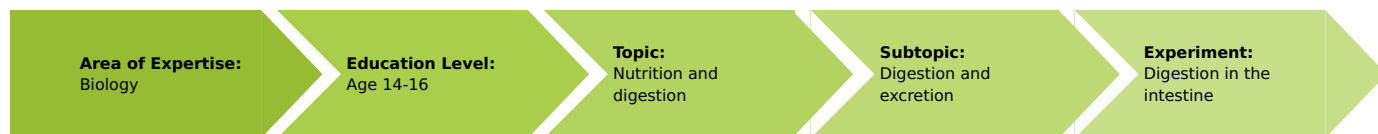


Digestion in the intestine (Item No.: P8013100)

Curricular Relevance



Difficulty



Intermediate

Preparation Time



10 Minutes

Execution Time



10 Minutes

Recommended Group Size



2 Students

Additional Requirements:

- Boiled lean beef or pork
- Boiled fish
- Cheese

Experiment Variations:

Keywords:

Pancreas, Pancreatic juice, Pancreatin

Task and equipment

Information for teachers

Additional Information

In the intestine, the already pre-digested food is further digested and finally the nutrients are absorbed through the intestinal wall. The enzymes, involved in the digestion of the food pulp in the intestine, are produced by the pancreas and released as pancreatic juice into the duodenum. The pancreatic juice contains lipases (fat splitting enzymes), amylases (starch splitting enzymes) as well as proteases (protein splitting enzymes).

The pancreatin used in this experiment is a mixture of these enzymes and is extracted out of the pancreas of pigs.

Hints on Set-up and Action

- Because of the waiting time, 2 days are required to carry out the experiment.

Hint

The result of the experiment depends highly on the size of the sample and the reaction time, i.e. the duration of heating to 40 °C and the subsequent waiting time.

Digestion in the intestine (Item No.: P8013100)

Task and equipment

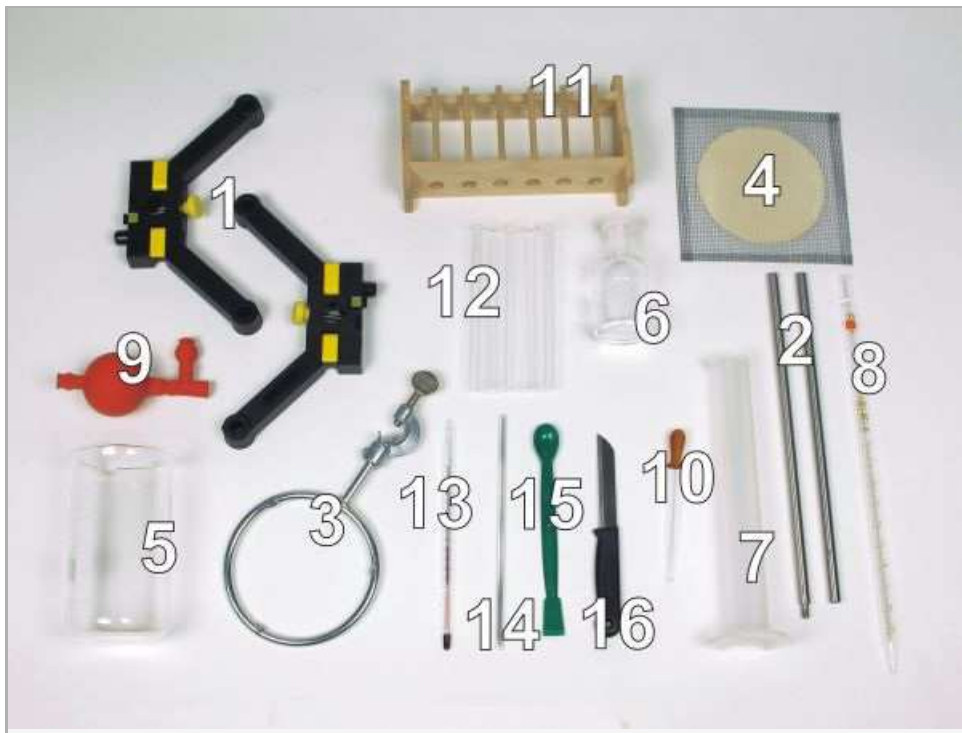
Task

What happens during the digestion in the intestine?

Examine the action of the enzymes of the pancreatic juice.



Equipment



Position No.	Material	Order No.	Quantity
1	Support base, variable	02001-00	1
2	Support rod, l = 600 mm, d = 10 mm, split in 2 rods with	02035-00	1
3	Support ring, i.d. 130mm,w.boss	37722-03	1
4	Wire gauze with ceramic, 160 x 160 mm	33287-01	1
5	Glass beaker DURAN®, tall, 600 ml	36006-00	1
6	Bottle,nar.mouth,100ml,clear,p.st	41101-01	1
7	Graduated cylinder 100 ml, PP transparent	36629-01	1
8	Graduated pipette 10 ml	36600-00	3
9	Pipettor,bulb,3 valves, 10ml max.	47127-01	1
10	Pipette with rubber bulb	64701-00	1
11	Test tube 160x16 mm, 10 pcs	37656-03	5
12	Test tube rack f. 6 tubes, wood	37685-10	1
13	Students thermometer,-10...+110°C, l = 180 mm	38005-02	1
14	Glass rod,boro 3.3,l=200mm, d=5mm	40485-03	1
15	Spoon,w.spatula end,18 cm,plastic	38833-00	1
16	Knife, stainless	33476-00	1
	Butane burner, Labogaz 206 type	32178-00	1
	Butane cartridge C206, without valve	47535-01	1
	Portable Balance, OHAUS JE120	48895-00	1
	Iodine potass.iodide sol., 250 ml	30094-25	1
	Starch,soluble 100 g	30227-10	1
	Water, distilled 5 l	31246-81	1
	Pancreatin 25 g	31699-04	1
Additional material			
	Boiled lean beef or pork		
	Boiled fish		
	Cheese		

Set-up and procedure

Experiment 1

Set up a support stand with the support base and the support rod (Fig. 1 and Fig. 2), fix the support ring to the support rod and lay the wire gauze on it (Fig. 3).



Fig. 1

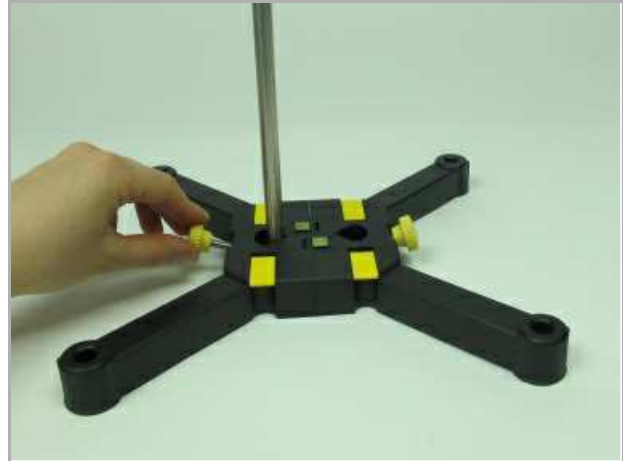


Fig. 2



Fig. 3

Attach the butane burner to the butane cartridge (Fig. 4-5).



Fig. 4



Fig. 5

Add 1 g starch and 99 g (99 ml) distilled water in a 600 ml beaker and place the beaker on the wire gauze. Using matches light up the butane burner place it underneath the wire gauze in order to heat the water so that the starch dissolves completely (Fig. 6). Regularly stir the mixture with a glass rod.



Fig. 6

Fill each of two test tubes with 5 ml of the prepared 1 % starch paste and add 2 drops of Lugol's solution to each, so that a clear blue-violet colouring occurs (starch test).



Fig. 7

Prepare a 1 % pancreatin suspension by giving 0.5 g pancreatin in a bottle and adding 49.5 g (49.5 ml) water. Shake the mixture until the pancreatin is evenly distributed. Pancreatin is a mixture of various pancreatic enzymes.

To one test tube add 5 ml water and to the other 5 ml 1 % pancreatin suspension.

Cover the tops of both test tubes with your thumb, turn them up and down a number of times to mix the contents, and put them in a test tube rack. Observe the changes in the next minutes closely and write down your observations in the report.



Fig. 8

Experiment 2

Fill each of the three test tubes with 10 ml of 1 % pancreatin suspension and in addition put a piece of fish the size of a cherry in one test tube, a piece of boiled lean beef or pork the same size in the second and a piece of cheese the same size in the third.



Fill a 600 ml beaker up to the half with water and place it on the wire gauze. Using matches light up the butane burner place it underneath the wire gauze and warm it to reproduce body temperature to 35-40 °C. Put in the three test tubes and keep on checking the temperature with a thermometer maintaining it at approximate body temperature.



Put out the burner at the end of the lesson and leave the test tubes at room temperature.

Examine the different samples after 24 hours and write down your observations in the report. Use a glass rod to check the texture of the samples.

Report: Digestion in the intestine

Result - Observations 1

Note down your observations on Experiment 1. What happens after pancreatin has been added?

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Result - Observations 2

Write down your observations on Experiment 2. How have the different samples – boiled fish, boiled lean beef or pork and cheese – changed by the next day? Which differences can you notice?

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Evaluation - Question 1

What can be noticed in the test tube to which pancreatin has been added? What does this change suggest?

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Evaluation - Question 2

How have the pieces of food in the test tubes changed by the next day? What nutrients are digested by the pancreatic enzymes? Consider also the result of the first experiment.

You can tell digestion is taking place by the fact that the pieces of food gradually disintegrate.

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