

Spectacular Starch

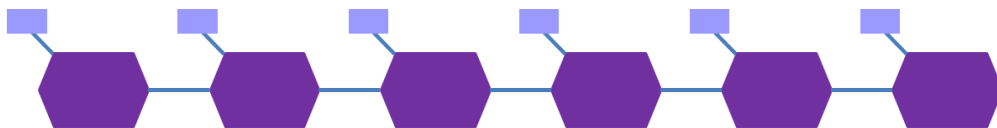
Aim: This hands-on workshop is designed to teach students about which foods contain starch and the properties of starch

Curriculum Links:

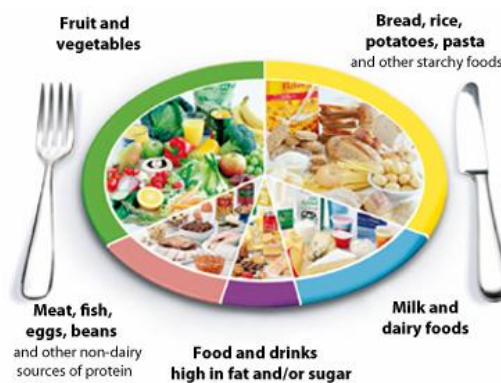
By contributing to investigations into familiar changes in substances to produce other substances, I can describe how their characteristics have changed. SCN 2-15a

Background Information

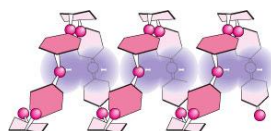
Starch is a carbohydrate consisting of a large amount of sugar (glucose) molecules joined together.



Starch is produced by green plants as an energy store and is the most important carbohydrate in the human diet.



The experiment we will do now investigates how we can detect starch in everyday foods using iodine. Iodine will change from an orange/brown colour to blue/black if starch is present. This happens when the starch molecules form a spiral and help the iodine molecules to line up.



Equipment Required

- Iodine solution (Please wear protective gloves when handling this)
NB If using iodine solution from scientific supplier this will be diluted for you. If using iodine tincture, dilute one part iodine with 10 parts water.
- Apple slices (1 per group)
- Milk (a small amount per group)
- Bread (a small amount per group)
- Uncooked pasta (a small amount per group)
- Cooked pasta (a small amount per group)
- Potato slices (1 per group)
- Cheese (a small amount per group)
- Dropper
- Disposable plates

Setting up the workspace for the experiment

Because this experiment involves liquids, spillages may occur so consider covering the tables or conducting the experiment on trays.

Although none of the substances being used are very harmful, participants should wear personal protective equipment of some sort to protect clothes and skin. For example, disposable aprons or lab coats, gloves (if available) and eye protection (if available). Students with long hair should tie it back.

What to do

1. Place one of each food sample on disposable plate. Each group will need one piece of each food.
2. For each food sample, record in the results table whether you think it contains starch or not.
3. Using the dropper, place a few drops of iodine onto each food (one at a time) and watch for the colour change.
4. Record your results in the table.

Results

Food Sample	Do you think it contains starch? (Yes or No)	Did the iodine change colour? (Yes or No)	Did the food contain starch? (Yes or No)
Apple slice		No	No
Milk		No	No
Bread		Yes	Yes
Uncooked Pasta		Yes	Yes
Cooked Pasta		Yes	Yes
Potato slice		Yes	Yes
Cheese		No	No

Conclusions

1. Which foods contained;

a) The most starch (i.e. the iodine turned darkest)?

Potato, bread, pasta.

b) No starch (i.e the iodine didn't change colour)?

Apple, milk, cheese.

2. Take a piece of uncooked pasta and a piece of cooked pasta. Drop iodine onto each at the same time - which changes colour quickest?

The cooked pasta.

3. So which contained more starch – the cooked pasta or the uncooked pasta?

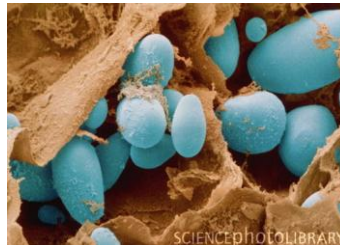
The cooked pasta.

4. Why do you think there was a difference between the cooked pasta and the uncooked pasta?

Cooking helps to release the starch.

Exploring the Science

Grains of starch are stored in plant cells. The picture below shows starch grains in potato.



When we eat plants or seeds, our bodies break down this starch into glucose which we can use for energy.

Cooking helps to break cell walls and release the starch. This explains why the iodine became darker on the cooked pasta than on the uncooked pasta.



Slippery, slimy starch

Starch is a polymer and if we mix it with another polymer, we can see some interesting results!

Equipment Required

- Borax solution
- PVA glue
- Water
- Cornflour
- Tablespoon
- Teaspoon
- Plastic cups (one per student)
- Food colouring (optional)

What to do

BEFORE CLASS

1. Prepare the borax solution (as directed on the packaging).

WITH THE CLASS

2. In each cup, mix one tablespoon of PVA glue with 2 teaspoons of cornflour.
3. Add one teaspoon of the borax solution to the mixture and stir well.
4. The mixture will become stiff – tip it out of the cup and knead well with your hands.
5. Play with your slime, see if you can make it into a bouncy ball!

Exploring the Science

In this experiment, the starch involved is in the cornflour. As we have already discovered, starch is a polymer and so is PVA. When we mix these polymers and add borax, cross-links form between the 2 polymers joining them together – this is what makes the mixture go stiff. It is important to get the amount of borax just right – too many cross-links and the mixture is too stiff but too few and it will flow too much.

If you get it right you should be able to roll it into a ball.

Risk Assessment

Although this experiment is very safe, it is worth keeping in mind the possible hazards and trying to prevent them. This risk assessment should help you to identify the risks and ways to minimise them.

Brief Description of Experiment

Using iodine, test various foods for the presence of starch. Prepare starch slime from borax, glue and cornflour.

Risks	Action to be taken to minimise risks	Action to be taken in the event of an accident
Borax irritant to eyes and skin and harmful if ingested.	<ul style="list-style-type: none"> – Use small amounts of the chemicals. – Use minimum strength of the chemicals. 	<ul style="list-style-type: none"> – Flush affected eye under running water.
PVA glue irritant to eyes and skin and harmful if ingested.	<ul style="list-style-type: none"> – Make sure all spills are cleaned up immediately. – Make sure all participants wear appropriate PPE. 	<ul style="list-style-type: none"> – Wash affected skin with soap and water. – Seek medical attention if irritation persists.
Iodine solution irritant to eyes and skin and harmful if ingested.	<ul style="list-style-type: none"> – Supervise students at all times. – Make sure participants wash hands after the experiment. 	<ul style="list-style-type: none"> – If ingested, do not induce vomiting. Seek medical attention.
Borax irritant if inhaled.	<ul style="list-style-type: none"> – Use small amounts of the chemicals. 	<ul style="list-style-type: none"> – Remove to fresh air.
PVA glue irritant if inhaled.	<ul style="list-style-type: none"> – Use minimum strength of the chemicals. – Supervise students at all times. 	<ul style="list-style-type: none"> – If not breathing or breathing is difficult seek medical attention.