DIY Science – Enzymes in Action

Sweet experiments exploring enzymes.

Safety
An adult must assist with using the chopping board and knife. An adult must carry out the steps that use boiling water. Check the food packaging for allergy warnings.

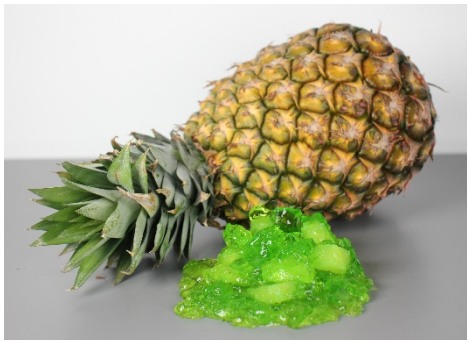
What you need
Plain cracker, small can of pineapple pieces, fresh pineapple, chopping board and knife, small jelly cup moulds or teacups, packet of jelly crystals, heat-resistant jug, kettle, measuring cup, metal spoon for stirring

What to do

Part A: Sweet cracker

1. Break off a piece of the plain cracker, place the piece on your tongue, and close your mouth without chewing. What does the cracker taste like? Is it salty or sweet?
2. Swish your tongue around to cover the cracker in lots of saliva. Let the cracker sit on your tongue for 1 minute and notice the taste. Is there any change?
3. Don't swallow anything yet but chew up the cracker and let it sit on your tongue again. Is there any change to the taste this time?

Part B: Pineapple jelly



1. Open the can of pineapple pieces.
2. Cut the fresh pineapple into pieces using the chopping board and knife, making the pieces similar in size to the pieces in the can.
3. Add 4 pieces of fresh pineapple to one jelly cup or teacup and add 4 pieces of canned pineapple to a second cup. You might like to label the cups.
4. Empty the jelly crystals into the heat-resistant jug.
5. Boil water in the kettle and follow the instructions on the jelly crystals packet to make a jelly mixture in the heat-resistant jug.
6. Pour the jelly mixture into the cups with the fresh and canned pineapple pieces until the cups are about ¾ full. Pour the remaining jelly mixture into empty cups.
7. Place all of the cups of jelly in the refrigerator for a few hours to set.
   Does all of the jelly set? Record your results in the table on the next page.
   Try this! If you have some other fruits available, try adding them to cups of jelly to see if the jelly will set, or try cooking fresh pineapple before adding it to jelly.

What's happening?

An enzyme is a type of chemical found in living things, including humans. Enzymes are catalysts which means they can speed up a chemical reaction without being used up in the reaction. In the digestive system, enzymes break up chemicals in the food we eat so nutrients can be absorbed by the body.

The first stage of digestion happens in the mouth where food is chewed and mixed with saliva. Saliva contains an enzyme called 'amylase' which breaks starch molecules into sweet-tasting sugar molecules. The longer the cracker was in your mouth, the more time the amylase in your saliva had to break down the starch molecules into sugar, and the sweeter the cracker tasted.

Gelatine is made from a protein called 'collagen' which comes from the bones and skin of animals. When mixed with hot water and then cooled, the collagen molecules form a three-dimensional structure, with water molecules trapped inside, creating a semi-solid. This is the jiggly dessert we know as jelly. Fresh pineapple contains an enzyme mixture called 'bromelain' which digests proteins. When added to jelly, bromelain breaks apart the collagen molecules, so the jelly does not set. In canned pineapple, bromelain has been destroyed by high temperatures used in the canning process, so the gelatine is intact, and the jelly will set.

Results

Fruit	Description of how well the jelly sets
No fruit	
Fresh pineapple	
Canned pineapple	

Did you know?

The bromelain in fresh pineapple can be used to tenderise meat and it can also eat away at your mouth! When you chew fresh pineapple, the bromelain can break down some of the protein that makes up the slippery lining of your mouth. This can cause a tingling sensation but is harmless. An enzyme that breaks down protein is called a 'protease'. Other fruits that contain proteases include pawpaw, kiwi, fig, and mango.

Find out more

- See the *Elephant's toothpaste* demonstration for an explosive enzyme-driven reaction: https://bit.ly/41ah3CW
- Explore how enzymes break down proteins and fats to clean your clothes: https://www.canr.msu.edu/news/trending-laundry-detergent-enzymes
- Discover how enzymes breaking down plastic might help with the problem of plastic waste: https://www.publish.csiro.au/ma/pdf/MA23013