

Centre of the Cell's 'Gut Feeling' Challenge



Time to digest some facts

Your digestive system is made up of many different specialized enzymes that break down different parts of what you eat. Some enzymes specialize in breaking down sugars, some break down the oils and fats, and others break down proteins. Your body uses **protease** to break down proteins into shorter chains and eventually **amino acids**. Fresh pineapples also contain a protease called **bromelain**, which we can use to investigate digestion in the kitchen!

What you will need

- Fresh pineapple
- Gelatin-based jelly
- Some containers for the jelly
- A cutting board and a knife

Prepare the jelly as the instructions say. It doesn't matter if it is sugar free or not; all that matters is it is **gelatin**-based jelly, which you can see if it is in the ingredients.

You will need at least 2 containers, but you can set some **experimental controls** if you have three or four.

Pour the jelly mix into several equal sized containers. These can be cups, bowls, beakers, or whatever you have on hand. Refrigerate until set.



Cut two equal-sized pieces of fresh pineapple. Put one on top of one of the set jellies, and carefully chop the other into smaller pieces. Put the small pieces onto one of the remaining jellies and stir it all up so it's mixed together.

If you have any jellies spare you can mix one up without any pineapple and leave another completely alone. These controls will show you what happens to jelly if there is no digestion happening.

Leave the jellies at room-temperature for **a few hours** and observe any changes.

You should see the pineapple on the top of the jelly has started to sink into it, with a small pool of liquid around it. The jelly with the chopped pineapple mixed in should be mostly liquid by now. If you had any controls they should be unchanged.



Now you've done the experiment, it's over to you to use your results to form some conclusions!

Why do you think the chopped-up pineapple in the mixed-up jelly worked so much faster than the single block of pineapple?

Do you think there is a connection to us needing to chew our food and our stomach muscles mixing up its content for us to properly digest our food?

What specifically is it about the chopping and mixing that makes the experiment faster?

*Can you think of a **new** experimental setup to test your hypothesis?*

In this experiment, why can't we use canned pineapple? (hint: the canning process involves heating the contents, what does heating do to enzymes?)

Glossary:

Amino Acid

Amino acids are the basic building blocks of proteins, they join together with peptide-bonds.

Bromelain

Bromelain is a group of enzymes found in fresh pineapple with a range of uses, including meat tenderization and cosmetics. They are all proteolytic, so cleave peptide bonds, breaking proteins into smaller pieces. The highest concentration is in the stems but also found in the fruit.

Experimental Controls

An experimental, or scientific control is a part of an experimental setup or design to measure how the scenario occurs *without* the experimental setup. This can be used to measure how different the sample being experimented on has behaved.

Gelatin

Gelatin-based jellies are mostly derived from an animal protein called collagen – these are long protein chains that, when set, tangle up together and trap water molecules between them. If those protein strands get chopped up, the water is freed from the strands.

Hypothesis

A hypothesis is a proposed explanation for a phenomenon.

Protease

A protease is an enzyme which breaks down proteins and peptides. They typically cleave peptide bonds between amino acids.

Let us know how your challenge goes on social media @CentreoftheCell!