

●●○ MEDIUM

👩👧 7-12

🕒 1 HR  
plus 4 hours for  
observations



1 Learn about the work  
of Elsie Widdowson

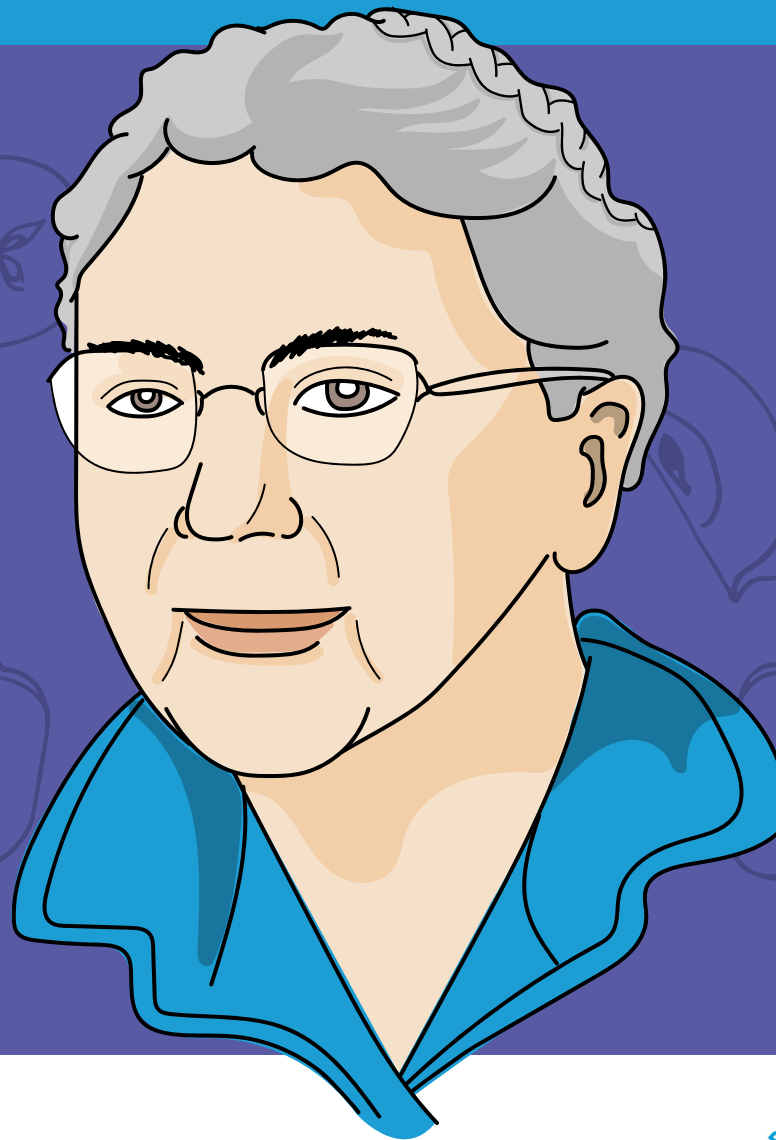
2 Investigate the  
effect of Vitamin C  
on preserving fruit

3 Discover whether the  
fruit browning reaction  
requires oxygen

STORIES IN CHEMISTRY

# FUNKY FRUIT AND VITAL VITAMIN C

Illustration: Elsie Widdowson



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# INTRODUCTION

**Elsie Widdowson was a British chemist, dietitian and nutritionist.**

She was born in 1906. During this time, professional opportunities for educated women were usually limited to nursing and teaching, but instead Elsie decided to train as a chemist.

Elsie's first job developed methods for measuring the different sugars in fruit. Once a fortnight, she took a train to a Kentish orchard and picked apples. She measured the changes in the sugars from the time apples appeared on the tree to when they ripened.

During WWII, many foods such as meat, butter and eggs were rationed. Elsie became concerned about the health effects from the limited wartime diet, so she developed a special diet which was healthy and nutritious but also achievable from rations.

Elsie also developed nutritional standards for a baby milk formulas, and used her knowledge to help victims of starvation during the war and in developing countries.



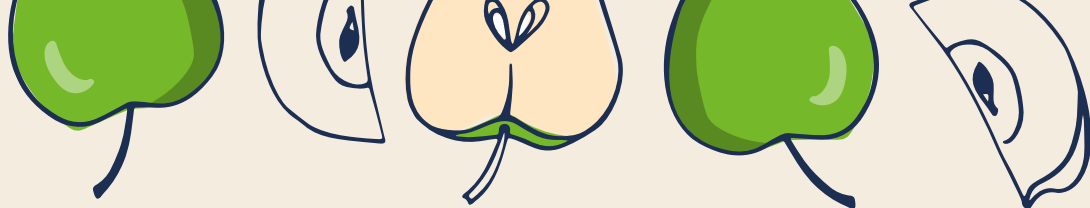
# DID YOU KNOW?

Human bodies cannot make their own Vitamin C and instead we get it from our food. Lemons and limes are naturally very high in Vitamin C. In the olden days these fruits were taken on long sea voyages to prevent sailors getting a disease called scurvy, which is caused by lack of Vitamin C.



# SAFETY

- Ask an adult for help with sharp knives.
- This activity should be supervised at all times.



# ACTIVITY

## INVESTIGATING THE BROWNING REACTION IN APPLES

To commemorate the work of Elsie Widdowson, the experiment below explores how fruit can be preserved using the Vitamin C in lemon juice.

### INSTRUCTIONS

1. Make labels for the 4 saucers – they should read “Vitamin C in 200ml”, “Vitamin C in 100ml”, “lemon juice” and “water”.
2. Dissolve one effervescent **Vitamin C** tablet in 200ml of cold tap water in a measuring jug. In another measuring jug, dissolve one effervescent **Vitamin C** tablet in 100ml of cold tap water. Fill a shallow bowl with lemon juice and another bowl with water.
3. Ask an adult to cut an apple in half vertically from stalk to base, and then cut each piece again vertically from stalk to base to make quarters. Cut each quarter lengthways again to make 8 identical slices with the pips in the centre.
4. Dip two apple pieces into lemon juice and hold in the liquid for 20 seconds. Remove and place them on the correctly labelled saucer. Repeat with the remaining 3 liquids.
5. Leave all four saucers at room temperature, checking every hour for evidence of browning. The results should be visible after 4 hours. Which apple pieces brown fastest and which brown the slowest?

### CHALLENGE

Using the second apple, try wrapping some cut apple pieces in cling film to make them airtight, and leaving others open to the air. Which are slower to turn brown? Why do you think this may be happening?

## YOU WILL NEED

- Effervescent **Vitamin C** tablets – any flavour (usually 1000mg per tablet)
- 2 apples (any variety)
- Lemon juice
- 2 measuring jugs
- 2 shallow bowls
- 4 saucers or plates
- Scissors, pen and paper for labels
- Fruit or small knife
- Chopping board
- Timer
- Cling film



## WHAT'S HAPPENING?

Inside apple cells are two different chemicals called **polyphenol oxidase** and **phenols**. These are normally stored in different parts of the cell. When the apple is cut open, the two different chemicals start to mix, together with oxygen from the air. The polyphenol oxidase reacts with phenols to produce melanin – the same substance as makes human skin darken on contact with the sun, and this makes apples turn brown. This chemical reaction requires oxygen to work.

**Vitamin C** is an antioxidant – which means it reacts with oxygen before the oxygen can react with the chemicals in the apple – thus preventing the browning reaction. **Vitamin C** tablets contain very large amounts of Vitamin C compared to lemon juice. Using cling film slows down browning reactions by stopping oxygen from the air coming into contact with the cut apple.