Claremont High School Academy Trust

The most effective indigestion tablet

Which indigestion tablet neutralises the largest volume of hydrochloric acid?

Hypothesis

The more expensive the indigestion tablet the more effective the tablet should be.

What is indigestion?

- Your stomach produces Hydrochloric acid in order to help digestion and kill bacteria on your food. The food in the stomach is broken down by digestive enzymes that need acidic conditions to work properly.

- Too much Hydrochloric acid in the stomach can cause stomach pain; this is indigestion. It is called heartburn when the acid escapes from the top of the stomach which causes pain into the tube leading to the mouth although it has nothing to do with the heart.

What is neutralisation?

- Neutralisation is when a metal hydroxides, metal oxides and metal carbonates is used to neutralise the acid to form salt and water.

- **Acid + Base → Salt + Water**

Background

Antacids:

- Most antacids contain either calcium or magnesium (a few may also contain aluminium hydroxide).
- These work by neutralising stomach acid.

Background

Indigestion Tablet	Main chemicals within tablet	Cost per tablet (p)
Rennie	Calcium carbonate and Magnesium carbonate	0.07
Gaviscon	Calcium carbonate	0.13
Tesco	Calcium carbonate	0.04
Asda	Calcium carbonate and Magnesium carbonate	0.12

Controls

- **Concentration of acid** – kept the same for each practical. A higher concentration than stomach acid is used in order to model the reaction that takes place in the stomach.
- **Dosage of tablet** – 2 tablet is used as that is the recommended dosage for each type of indigestion tablet.
- **Grind tablets and mix in 10cm^3 distilled water** – in order for titration to occur the tablet needs to be in powder form and in a solution.
- **Methyl orange indicator** – same indicator used for each experiment in order to determine neutralisation point.

Risks

- **Hydrochloric acid** - irritant to eyes. To prevent this we will wear safety goggles.

- **Glassware** - to avoid glassware breaking we will work away from the edge of the bench.

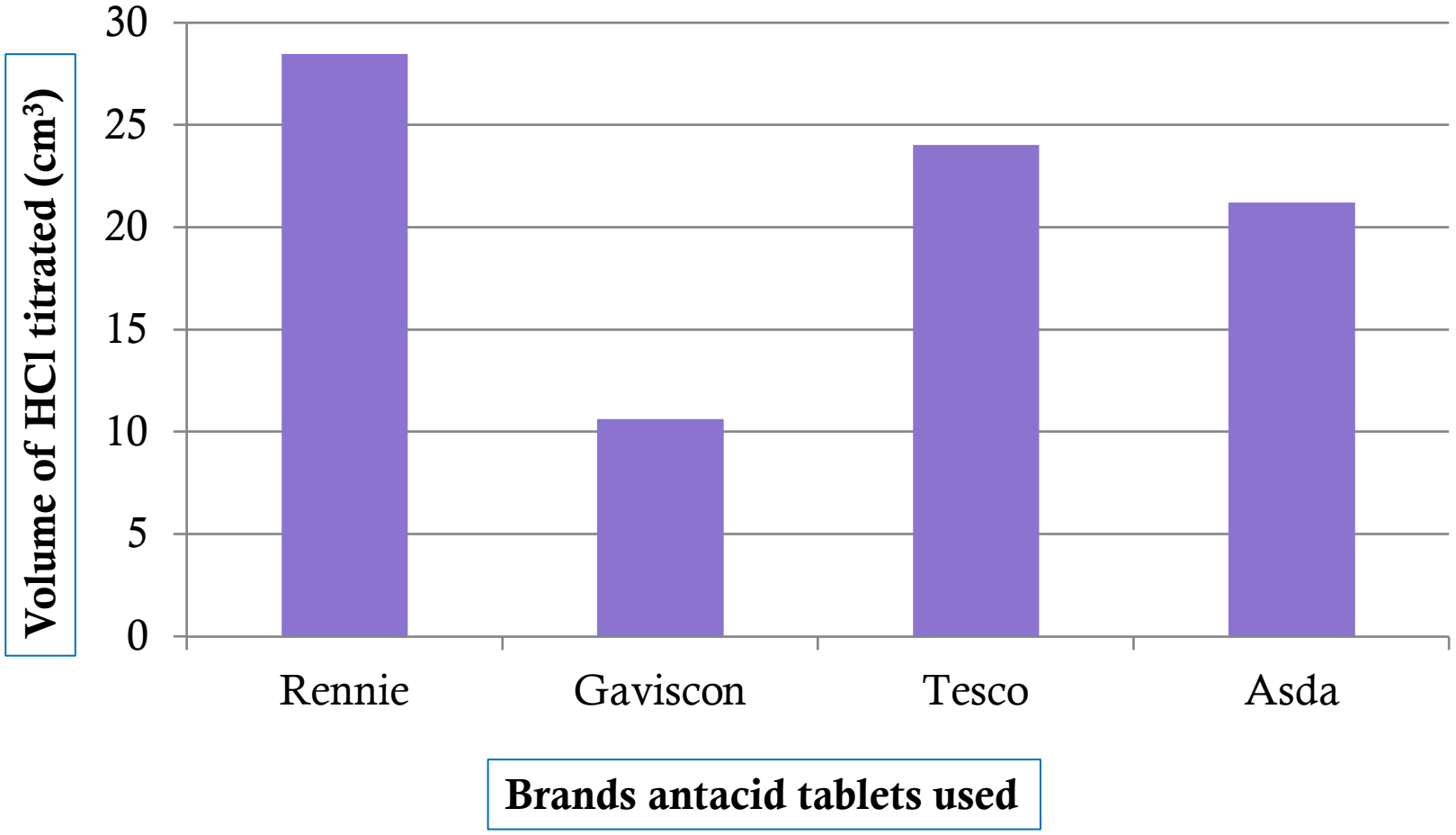
Method

1. Grind two indigestion tablet using a pestle and mortar.
2. Measure 10cm^3 distilled water and add to powdered indigestion tablet.
3. Add 2 drops methyl orange to solution.
4. Titrate the solution against HCl whilst swirling.
5. Stop titration when indicator turns from orange to red
6. Record volume of hydrochloric acid used
7. Repeat twice for each indigestion tablet
8. Calculate an average.

Results Table

Indigestion tablet	Volume of hydrochloric acid (cm^3)			
	Experiment 1	Experiment 2	Experiment 3	Average
Rennie	28.4	28.5	28.5	**28.47**
Gaviscon	10.6	9.6	11.7	**10.63**
Tesco	24.1	23.5	24.5	**24.03**
Asda	21.3	21.1	21.2	**21.20**

A graph to show the average volume of acid neutralised by different brands of antacids



Conclusion

- From this investigation we found out that the most effective indigestion tablet was **RENNIE** as it neutralised the largest volume of acid (28.47cm ^{3})
- **GAVISCON** was the most expensive but the least effective as it only neutralised 10.63cm ^{3} of acid
- **Our hypothesis stated that: 'The more expensive the indigestion tablet the more effective the tablet should be'**

Our hypothesis was incorrect as our results show that the most expensive tablet Gaviscon (0.13p) neutralised the lowest volume of acid

Indigestion tablet	Volume of hydrochloric acid (cm^3)	Cost per tablet (p)
Rennie	28.47	0.07
Tesco	24.03	0.04
Asda	21.20	0.12
Gaviscon	10.63	0.13

Conclusion

In conclusion we would recommend that you go for the Tesco indigestion tablets as it neutralised the second largest volume of acid and was the least expensive.

We wanted to research our results further to find out why Gaviscon was the most expensive brand.

We found out that it contained **ALGINATE.**

Alginate is added to protect the lining of the oesophagus from stomach acid .It works by forming a protective layer that floats on the surface of your stomach contents to reduce acid reflux.

Conclusion

We could also use our results to compare the average volume of acid neutralised to the cost of each tablet.

Indigestion tablet	Average volume of acid (cm^3)	Cost per tablet (p)
Rennie	28.47	0.07
Gaviscon	10.63	0.13
Tesco	24.03	0.04
Asda	21.2	0.12

Evaluation of our method

Advantages:

- Using a burette provided accuracy when measuring the volume of acid used. We were able to measure to 0.1cm^3.
- Using methyl orange instead of universal indicator makes it easier to observe the neutralisation point as only one colour change occurs rather than a range of colours.

Disadvantages:

- We could have used pipettes instead of measuring cylinders to measure out 10cm^3 of water to add to the powered indigestions tablets.
- We only tested tablets that contained either Calcium or Magnesium. Maybe with ones containing aluminum.

Improvements and Extensions

Improvement:

We could further our experiment by testing a larger range of indigestion tablets to see if they are more or less effective.

Extension:

We could extend our practical and test the rate at which the HCl neutralises each tablet.

We could also investigate other tablets that contain alginate as in Gaviscon.