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RESEARCH ARTICLE!!!

**COMPARATIVE STUDIES ON NEUTRALISING POWER OF VARIOUS
ANTACID TABLETS****M.KALAIMATHI, K.SOUTHAMANI, R.ANITHA, Y. YESUTHANGAM**PG & Research Center of Chemistry, Jayaraj Annapackiam College for Women (Autonomous)
Periyakulam-625 601, India.**KEYWORDS:***Heart burn, HCl, proton pump, minerals.***For Correspondence:****M.KALAIMATHI *****Address:**Assistant Professor in
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India.**ABSTRACT**

Today, there are different types of medicines available to treat stomach acidity. They are categorized as antacids are highly alkaline and simply neutralize the acid in our stomach and H₂ blockers reduce the amount of acid and Proton pump inhibitors stop our body's production of acid. The acidic environment of the stomach makes it possible for inactive forms of digestive enzymes to be converted into active forms (i.e. pepsinogen into pepsin), and acid is also needed to dissolve minerals and kill bacteria that may enter the stomach along with food. Antacids are very common over the counter acids, which combat "acid indigestion" and "heart burn". Typically, these states occur during stress, which causes the release of HCl in greater amounts than usual into the stomach. The purpose of this experiment is to determine which antacid is better to neutralize the stomach acid. We became interested in this idea when we saw some experiments on medicines and wanted to find out some scientific facts about medicines. The information gained from this experiment will help the people to know which antacid they should look for in the stores. It will also let them to know which antacid will give them the most comfort. This could also save consumers money and provide better health.

INTRODUCTION:

Digestion in the stomach results from the action of gastric fluid which includes secretions of digestive enzymes, mucous and hydrochloric acid. However excessive acid production (hyperacidity) results in the unpleasant symptoms of heartburn and may contribute to ulcer formation in the stomach lining. Antacids are weak bases (most commonly bicarbonates, hydroxides and carbonates)* that neutralize excess stomach acid and thus alleviate symptoms of heartburn. The general neutralization reaction is



The hydrochloric acid solution used in this experiment approximates the acid conditions of the human stomach, which is typically 0.4 to 0.5 % HCl by mass (pH≈1). Antacids help people who have or get heartburn. The following information will help people understand how stomach acid works and what antacid will help those most.

Acids are a group of chemicals, usually in liquid form. They can be recognized by their sour taste and their ability to react with other substances. Acids are confirmed as an acid by their pH. The pH of acids ranges from 0 – 6.9 (below 7). The two main acids are mineral acid and organic acid. The three well known acids that are sulphuric acid (H₂SO₄), nitric acid (HNO₃) and hydrochloric acid (HCl).

Stomach acid is very dangerous. If a person was to have an ulcer and the stomach acid was to escape it would irritate their other organs. Stomach acids is highly acidic and has a pH of 1.6. Stomach acid is hydrochloric acid produced by the stomach. If there is too much stomach acid it can cause heartburn. Heartburn is when stomach acid is produced in abnormal amounts or location. One of the symptoms of heartburn is a burning feeling in the chest or abdomen. Antacids help people who have or get heartburn. The following information will help people understand how stomach acid works and what antacid will help those most.

Almost all foods and drinks and even medicines have ingredients that are different acids. Here are some examples Aspirin (acetylsalicylic acid), orange juice (ascorbic acid/ vitamin C), sour milk (lactic acid), soda water (carbonic acid), vinegar (acetic acid), Apples (malic acid) and spinach (oxalic acid).

Hyperacidity or acid dyspepsia simply means increase of acidity in the stomach. The term “dyspepsia”, derived from the Greek words dys (bad) and Pepsis (digestion), refers to symptoms thought to originate in the upper gastrointestinal tract [1-2]. Dyspepsia often used to refer to upper abdominal pain or discomfort but may also encompass symptoms of early satiety, nausea, vomiting [3]. The human stomach secretes hydrochloric acid which is necessary for the digestion of food.

When the stomach contains an excessive amount of hydrochloric acid, then the condition is called as hyperacidity or acid dyspepsia[4].

Sometimes hyperacidity is confused for a simple bellyache. This is because people with hyperacidity usually generally get pains in their stomachs with similar symptoms as bellyaches. This confusion is more rampant in children who cannot differentiate kinds of stomach ailments. However hyperacidity can be found out with the sour belching and aftertaste of the already eaten food in the mouth.

The prime medical factors of hyperacidity or acid dyspepsia are as follows:

i) Stomach Ulcers:

Ulcers in the stomach are one of the prime causes of hyperacidity. Once this is diagnosed, the treatment will be done by the surgical removal of the stomach ulcers.

ii) Acid Reflux Diseases:

Some people have a gastric disorder called as the acid reflux disease. In this condition, the acids of the stomach i.e. gastric acids or hydrochloric acid get refluxed up to the food pipe, which is biologically called as the esophagus. When this happens, it builds up the level of acidity in the stomach.

iii) Stomach Cancers:

Stomach cancers can also cause hyperacidity as one of their symptoms. This is very rare case, but the mortality rate is quite high. Hence, a hyperacidity that lasts more than two weeks must be immediately shown to the doctor and got checked for any cancer. A timely diagnosis can enable complete treatment of the disease.[5]

Hyperacidity symptoms are observed a couple of hours after eating, when the food has been digested and still excess acids are left with in the stomach. At this stage, the following symptoms are seen

1. A typical feeling of restlessness.
2. Feeling of nausea (wanting to throw up) and actual vomiting.
3. Sour belching with an aftertaste of the already eaten food.
4. Stiffness in the stomach, which is called as atonics dyspepsia.
5. Lack of desire for any other type of food.
6. Indigestion.
7. Constipation.

Reduced stomach acidity may result in an impaired ability to digest and absorb certain nutrients, such as iron and the B vitamins. Since the low pH of the stomach normally kills ingested bacteria,

antacids increase the vulnerability to infection. It could also result in reduced bioavailability of ketoconazole (antifungal) is reduced at high intragastric pH (low acid content).[6]

(The usual rate of HCl production is about "1-22 mmol of HCl per hour 'excess' production is about 10mmol of HCl per hour greater than that of normal HCl production". Occasionally, the acidic stomach contents make their way partially back up the esophagus (reflux) and cause discomfort by eroding that tissue. People with hyperacidity are quite vulnerable to ulcers. Antacids are bases, i.e. they react with the [excess] HCl in the stomach on neutralization.[7]

Reaction of one of the more common antacid is Tums (CaCO_3) which reacts with HCl as follows:



The idea is that if we change the ingredients of formulation we will increase the neutralizing power of tablets. Here some antacids used in the tablets are given [8-9]

Aluminium Hydroxide:

$\text{Al}(\text{OH})_3$ Alum is the most stable form of aluminium in normal conditions. It is found in nature as the mineral gibbsite (also known as hydrargillite) and its three, much more rare, polymorphs: bayerite, doyleite and nordstrandite closely related are aluminium oxide hydroxide ($\text{AlO}(\text{OH})$) and aluminium oxide Al_2O_3 , differing only by loss of water. These compounds together are the major components of the aluminium ore bauxite. Freshly precipitated aluminium hydroxide forms gels, which is the basis for application of aluminium salts as flocculants in water purification. This gel crystallizes with time. Aluminium hydroxide gels can be dehydrated (e.g. with the utility of water-miscible non-aqueous solvents like ethanol) to form an amorphous aluminium hydroxide powder, which is readily soluble in acids. Heat dried aluminium hydroxide powder is known as activated alumina and is used in gas purification, as a catalyst support and an abrasive.

Magnesium Hydroxide:

Magnesium hydroxide is an inorganic compound with the chemical formula $\text{Mg}(\text{OH})_2$. As a suspension in water, it is often called milk of magnesia because of its milk like appearance. The solid mineral form of magnesium hydroxide is known as brucite.

Magnesium hydroxide is common component of antacids and iron. Magnesium hydroxide has low solubility in water with a K_{sp} of 1.5×10^{-11} all of magnesium hydroxide that does not dissolve does dissociate. Since the dissociation of this small amount of dissolved magnesium hydroxide is complete, magnesium hydroxide is considered as a strong base.

Calcium Carbonate:

Calcium carbonate is a chemical compound with the chemical formula CaCO_3 . It is a common substance found in rock in all parts of the world and is the main component of shells of marine

organisms, snails, pearls and egg shells. Calcium carbonate is the active ingredient in agricultural lime and is usually the principal cause of hard water. It is commonly used medicinally as calcium can be hazardous [10-13]

MATERIALS AND METHODS:

Materials required:

- 0.1N HCl
- 0.1N Na_2CO_3
- 0.1N NaOH
- Phenolphthalein indicator and
- 9 different Antacid tablets.

Method:

500ml of 0.1N HCl solution, 0.1N NaOH solution were prepared and standardized. The HCl solution was standardized using standard Na_2CO_3 . 20ml of standardized HCl was taken in the conical flask and 0.1g of an antacid tablet was added. After 10 minutes the solution in conical flask was titrated against NaOH using phenolphthalein as an indicator. The end point is the appearance of permanent pale pink colour. The above experiment is repeated for each brand. From the above experiment, we obtained the volume of NaOH required to neutralize the unused HCl.

RESULTS AND DISCUSSION:

Now a day the problem of acidity is very common and the main causes behind this is over strenuous life style, smoking and dependence on junk food. Antacids are agent that neutralizes the stomach acid responsible for dysfunction of stomach. But they are meant to be used only occasionally. They should not be taken continuously for more than two weeks unless under a physician's directions as they produce serious side effects such as Milk alkali syndrome, loss of appetite, mood changes, muscular pain, nervousness, weakness, constipation, stones in kidney etc. antacids are classified on the basis of how quickly they work and how long they provide relief. An ideal antacid should have adequate duration of action. This is related to gastric residence time i.e. how long a drug can maintain the pH of stomach above 3.

Table.1 Tablets Names and Volume of NaOH Required and Cost

| S.No | Brand Name | Volume of NaOH | Cost per Tablet |
|------|--------------------------|----------------|-----------------|
| 1. | Antioxidant complete TD* | 14.5 | 7.00 |
| 2. | Antoxy-2 | 17 | 3.50 |
| 3. | Axovit | 16.8 | 3.50 |
| 4. | Becovit | 10.5 | 3.50 |
| 5. | Digene | 17.1 | 1.00 |
| 6. | Healvit | 12.1 | 3.50 |
| 7. | Lantac-150 | 13.8 | 0.50 |
| 8. | Orvit | 17.6 | 3.00 |
| 9. | Plex forte | 14.8 | 3.00 |

CONCLUSION:

When we compared the 9 brands, Even though LanTac150 is the best one to use, it also causes some side effects. Top foods to decrease heartburn are fibers, banana, ice cream, milk etc. The volume of NaOH required to neutralize the unused HCl of each brand and the cost of the tablets were shown in table 1. From the above table the effectiveness of a tablet is inversely related to volume of NaOH. So, from table.1, Becovit is most effective and Orvit is least effective. When we compared the cost and effectiveness, LanTac 150 is better to use.

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