

Review Article

A review on pharmacology and therapeutic uses of Antacids

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ABSTRACT

Antacids have been used since the last more than hundred years for the symptomatic relief by raising the pH of the stomach and without hampering the gastric condition of the body namely killing of bacteria. Sodium bicarbonate, aluminium hydroxide, magnesium hydroxide besides ranitidine and the prazoles react with the HCL present in the stomach and have become the ready choice of physicians to treat all kinds of gastric disorders. This study sheds a light on the pharmacokinetics of various antacids, their advantages, disadvantages and the chemical conditions which they help to subside. Present paper specifically focuses on the study of clinical uses and side effects of long run use of antacids

KEYWORDS

Antacids | Gastric pH | GERD | Ulcer

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Introduction

Drugs: The term drug is derived from the french word "DROGUE" which means herbs. Natural products extracted from plants, fungi, algae, sponges, animals and worms have been used for the treatment of diseases since time immemorial. A drug is a natural or synthetic substance which when administered affects the functioning and structure of a living body. These drugs can be used for the diagnosis, treatment or prevention of a disease and at the same time relieving of the discomfort. . As a number of herbs are being used since ancient times for the treatment of various ailments therefore compounds and herbs for treatment of various diseases are known as drugs in modern age also.

Drugs are the chemical compounds which are either synthesized in the laboratory or of plant animal or marine origin and intends to bring change in normal physiological function of the body. Medicinal or therapeutic drugs are the substances or preparations which are used in the treatment of diseases. Thus in short we can say that all medicines are essentially drugs but all drugs are not medicines.

Monitoring of therapeutic drugs is a branch of clinical chemistry and clinical pharmacology that deals with the measurement of medication concentration in the blood. Drugs are basically chemicals which affect the course of conditions, diseases, syndrome or pathology to benefit the health of an individual.

Antacids and their medical uses

A common class of medicines that neutralize the acid present in the stomach, heartburn, indigestion and upset stomach are termed as

antacids. They are usually the hydroxides of aluminium, magnesium, calcium or sodium bicarbonate which are alkaline in nature and counteract the acid in the stomach to make the pH more neutral. The normal gastric pH range of the stomach is 1.5 to 3.5.

Antacids were used in the treatment of gastric problems since a long time. They give relief from the condition of hyperacidity and other gastrointestinal problems by neutralizing the gastric acid and thereby increasing the pH of gastric contents, balancing acid-base ratio, lowering the pepsin activity and raising bicarbonate and prostaglandin secretion. The antacids quickly relieve occasional heartburn which happens to be the major symptom of gastroesophageal reflux disease (GERD). They do not kill bacteria or inhibit other actions of body and hence are distinct from the reducing drugs.

Gastroesophageal reflux (GERD) is a normal physiological process short duration, often remain asymptomatic, and limited to the distal part of esophagus. According to the American College of Gastroenterology GERD is defined as the "mucosal damage that produce chronic symptoms by the abnormal presence of gastric juices in the esophagus produced by hyperacidity".

Types of Antacids

Drugs are classified mainly into two categories on the basis of digestive absorption

1. Absorbable

- Sodium carbonate (baking soda)
- Magnesium oxide (magnesia)
- Magnesium carbonates
- Calcium carbonates
- Bourget mixture (sodium bicarbonates, sulphate, phosphate)

- Rennie mixture (calcium carbonates, magnesium carbonates)
- Tums mixture (calcium carbonates, magnesium oxide).
- Magnesium hydroxide
- Aluminum-magnesium combination
- Aluminum-magnesium combination with other Active ingredients (anesthetics, antiflatulents, alginates, *etc.*) Table 1

2. Non-absorbable

- Aluminum phosphate
- Aluminum hydroxide
- Magnesium silicate

S. No.	Antacid	Advantages	disadvantages	Clinical conditions
1.	Calcium carbonate	Potent and rapidly acting	GI distress Nausea/vomiting Hypercalcemia Hypo-phosphatemia, milk-alkali syndrome	Heartburn Acid indigestion Upset stomach
2	Magnesium trisilicate	Slow but prolonged action laxative (at larger doses)	Low solubility and reactivity, Absorbed systemically (problem in renal compromised function patients)	Dyspepsia Heart burn Hyperacidity Constipation
3	Magnesium carbonate		GI distress, Electrolyte imbalances Hypotension Neuromuscular blockade hypotension	Hyperacidity and peptic ulcer dyspepsia heartburn GERD Constipation
4	Magnesium hydroxide	Reacts with HCl Promptly and is an efficacious antacid, low systemic absorption	Low water solubility, no systemic alkalosis (mg is poorly absorbed from gut)	Constipation, digitalis toxicity Gastric acidity Hypomagnesaemia Peptic ulcer Pre-eclampsia, Magaldrate
5	Magaldrate	Good oral antacid with prompt and sustained neutralizing action	Diarrhea Constipation Intestinal pain	Gastritis Hyperacidity Reflux esophagitis
6	Aluminium hydroxide	Raises the pH of the gastric juice, Adsorbs pepsin	Efficient, low systemic absorption, Decreases phosphate excretion via kidney	Chronic diarrhea, hyper parathyroidism Hyperphosphatemia (in renal failure), nephrolithiasis, peptic ulcer, reflux esophagitis, stress ulcers
7	Sodium bicarbonate	Most rapidly acting antacid	Metabolic alkalosis with urine alkalisation, Intake of large doses	Heartburn Alkalinisation of urine Acidosis

Table 1: Important Antacids and their features

Conventional antacids offer less symptomatic relief from gastric problems and therefore their use has been declined with the availability of more efficacious anti-acid secretory medications (H₂ blockers and PPIs).

An important type of antacid usually given after the administration of Anaesthesia or to reduce post operational acidity is a

combination of simethicone and loperamide (Imodium Advanced) and is effective in relieving abdominal bloating however, it has not been studied in nondiarrhoea-associated flatulence.

Pharmacokinetics

Absorbable antacids are rapidly dissolving substances that immediately react with hydrochloric acid in the stomach forming

carbon dioxide and water. Carbon dioxide causes gastric distention which provokes gastroesophageal reflux and stimulates gastric secretion enhancement.

Most of the antacids used are non adsorbable but Sodium carbonate acts differently as it is absorbed into the blood affecting the organisms pH in whole. Patients with absolute renal failure excrete the excess of bicarbonate rapidly while some of this bicarbonate is accumulated causing systemic alkalosis in cases of patients with parafunction of the kidneys. Most antacids used in medical practice are non-absorbable, without systemic pharmacokinetics.

Indications and Principles of Clinical Use

Clinical chemistry is the branch of chemistry that deals in the therapeutic management of drugs and specializes in the measurement of the concentration of medicines in the blood. High security Antacid are supposed to be the drugs of choice for the self treatment because of the quick symptomatic effect, pleasant organoleptic properties and, convenient presentation (suspensions, chewable tablets). Therapeutic indications of antacids for the treatment of acid related disorders of proven effectiveness belongs to the class H₂ antagonists, proton pump inhibitors and eradication therapy of infection *Helicobacter pylori*

1. Gastroesophageal reflux disease (GERD): The main function of antacids in this disorder is to neutralize hydrochloric acid, absorb bile acids, inactivate pepsin, , stimulate the synthesis of bicarbonates and raise the tone of the lower esophageal sphincter thereby affecting on the majority of

units in the GERD pathogenesis. In case of erosive GERD antacids are given as a co-drug to the PPIs main course.

- 2. Acute gastritis:** In this case antacids are used in addition to proton pump inhibitor therapy, H₂-blockers in the treatment of acute gastritis especially with severe pain and dyspeptic syndromes. They play an important role in the prevention and/or treatment of acid reflux. The presence of bile acids and lysolecithin(responsible for fat breakage)poses a hinderance in their action.
- 3. Chronic Gastritis / Gastroduodenitis:** To prevent recurrences, antacids are either used alone or in combination with antisecretory agents. These drugs supposed to be of choice for preventing and treating eflux gastritis, where the main disturbing factor are found to be bile acids and lysolecithin.
- 4. Gastropathy caused by nonsteroidal anti-inflammatory drugs (NSAIDs - gastropathy):** In order to prevent duodenopathies and gastropathies affected by the administration of nonsteroidal antiinflammatory drugs (NSAIDs) antacids can either be taken alone or can be taken in addition to antisecretory drugs.
- 5. Gastric and duodenal ulcer:** Here In this case antacids are mainly used for severe pain treatment during the screening phase and within first day of PPIs administration before the acid production blockade (after 1-3 days).
- 6. For dyspeptic syndromes and pains:** For the healthy people with discomfort or dyspeptic symptoms (heartburn,

belching, meteorism) and epigastric pain antacids are recommended. Non-absorbable antacids are used as the essential drug to relieve heartburn in pregnancy, which occurs in approximately (50-80 %).

7. **Prevention of (stress) Ulcers:** Antacids are used in the intensive care units to prevent so-called (stress) ulcers (in patients after a major operation, with craniocerebral traumas - Cushing's ulcers or with severe burns – Curling's ulcers, *etc.*).

Side effects of long term use of antacids

- Antacids may cause hyperacidity and milk-alkali syndrome which depends on its dose.
- Antacids that contain aluminum hydroxide [$\text{Al}(\text{OH})_3$] may cause hypophosphatemia, aluminum-intoxication, constipation and osteomalacia.
- Antacids that contain magnesium are found to have a laxative effect that may cause diarrhea. Patients with renal failure are unable to eliminate magnesium from the body with urine thus leading to increased magnesium levels in the blood.
- Sodium containing antacids are harmful for the patients on sodium restricted diet while calcium containing antacids may cause kidney stone formation..

With which drugs do antacids interact?

- When antacids are taken with acidic drugs (e.g digoxin [Digitek], [isoniazid], phenytoin [Dilantin], chlorpromazine [Thorazine],), they cause the absorption of the acidic drugs to be decreased, which reduces the concentrations of the

drugs in the blood which ultimately results in lowering the effects of the drugs.

- Antacids taken with drugs such as pseudoephedrine (Sudafed, Semprex D, Clarinex-D 12hr, Clarinex-D 24hr, Deconsal, Entex PSE, Claritin D, and more), and levodopa (Dopar), increase absorption of the drugs and this may result in adverse events or toxicity due to increased concentration of the drugs in the blood levels.
- Antacids that consists of magnesium hydroxide [$\text{Mg}(\text{OH})_2$] and magnesium trisilicate when taken with some other medications (like tetracycline) will bind to the drugs, and reduce their absorption and effects.
- Sodium bicarbonate(Na_2CO_3) has a very strong effect on the acidity of the urine, and this can affect the elimination (excretion) of some drugs by the kidney. Thus the presence of sodium bicarbonate inhibits the excretion of some basic drugs like quinidine (Quinidex, Quinidine Sulfate Quinidine Gluconate, Quinidine Injection) and amphetamines, and thereby results in the increases of excretion of some acidic drugs like aspirin.

Conclusion

Antacids have gained considerable confidence for the treatment of gastric disorders due to the prolonged relief and quick action with the administration of low doses. Anaesthetic antacid which are mainly a combination of aluminium and magnesium hydroxides with an Anaesthetic (oxethazine) is recently becoming a choice for the

treatment of GERD, ulcers and other conditions relating to acidity. These anaesthetic antacids remain non iodised in hyper acidic conditions causing numbness of the duodenum thus reducing the pain besides neutralizing acids normally.

The therapeutic efficacy of this group of antacids in the light of low dosage, side effects and the faster and long duration of the relief of symptoms is better and needs to be looked further into

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