**Gastrointestinal agents (Acidifiers)**

Acidifiers are inorganic chemicals that either produce or become acid.

These chemicals increase the level of gastric acid in the stomach when ingested, thus decreasing the stomach pH.

These are many types of acidifiers but the main types are:

* Gastric acidifiers: used in controlling pH in stomach in patients suffering from achlorhydria or hypochlorhydria.
* Urinary acidifiers: used in controlling pH in urine to treat some urinary tract disorders.
* Systemic acidifiers: used in controlling pH in body fluid, particularly blood, in patient suffering from systemic alkalosis.

Achlorhydria: refer to states where the production of hydrochloric acid in gastric secretions of the stomach and other digestive organs is absent or low.

The major causes of achlorhydria include the following:

* **Pernicious Anemia:**In this condition, antibodies are directed against the parietal cells of the lining of the stomach, which secrete hydrochloric acid and intrinsic factor. Binding of the antibodies to intrinsic factor results in malabsorption of vitamin B12, giving rise to pernicious anemia.
* **Hypothyroidism:**This condition results in sluggish metabolism, which slows-down the functioning of the digestive glands, resulting in achlorhydria.
* **Medications:** Medicines that act on the gastric glands such as antacids, H2-receptor antagonists and proton pump inhibitors (PPI) can cause achlorhydria.
* ***Helicobacter pylori* Infection:**This is a bacterium that attacks the lining of the stomach, causing inflammation (gastritis). This results in strong suppression of gastric acid secretion.
* **Atrophic Gastritis:**In this condition the gastric glands become atrophied and can result in achlorhydria.
* **Stomach Cancer:**This type of cancer can give rise to achlorhydria, which can be further aggravated by radiation therapy.
* **Sjögren’s Syndrome:** It is a chronic (long-lasting) autoimmune disorder that happens when the immune system attacks the glands that make moisture in the eyes, mouth, and other parts of the body.
* **Gastric bypass surgery:** such as a duodenal switch, where the largest acid producing parts of the stomach are either removed, or blinded.

Treatment

Treatment focuses on addressing the underlying cause.

* ***Helicobacter pylori* Infection:**Achlorhydria arising from *H. pylori* infection responds well to eradication therapy.
* **Pernicious Anemia:**This anemia is associated with vitamin B12 deficiency. It is caused by an inability to absorb the vitamin B12 needed to make enough healthy red blood cells. Pernicious anemia is treated by injections of vitamin B12, which has been found to reverse the hematological abnormalities.
* **Bacterial Overgrowth:** Antimicrobial agents, including metronidazole, amoxicillin/clavulanate potassium, ciprofloxacin, and rifaximin, can be used to treat bacterial overgrowth.
* **Excessive Use of PPI:**Achlorhydria resulting from long-term proton-pump inhibitor (PPI) use may be treated by dose reduction or withdrawal of the PPI.
* **Improving the complications of achlorhydria:**  These include the replacement of iron, and vitamin B12
* Diluted HCl solution

**Laxatives**

Laxative are substances that loose stools and increase bowel movements. They are used to treat and/or prevent constipation.

Constipation is the infrequent or difficult stool passage, or seemingly incomplete defaecation.

Laxatives are used to:

* Relieve acute constipation.
* Remove solid material from intestinal tract prior to X-ray.
* Ease defecation in patients with painful haemorrhoids or other rectal disorders.
* Avoid excessive straining and concurrent increase in abdominal pressure in patients with hernias.
* Avoid potentially hazardous rise in B.P. during defecation in patients with hypertension.

Laxative should only be used for short term therapy as prolonged use may lead to loss of spontaneous bowel rhythm upon which normal evacuation depends, causing patient to become dependent on laxatives, the so called laxative effect.

Classification:

* Bulk forming laxative: Dietary fibre, Ispaghula husk , Methylcellulose.

They increase faecal mass which stimulate parastalsis. They do not work until after a few days of consumption and patients need to take plenty of fluids.

* Stimulant laxative: Senna, biscodyl, Castor oil, sodium picosulfate, glycerol.

They speed up the bowel movement by stimulating the contraction of intestinal muscles. They have a more rapid onset of action (about 6 to 12 hours) than bulk laxatives, and are usually given at night to help produce a bowel movement the following morning.

Glycerol suppositories are normally used when a bowel movement is needed quickly, with onset of action of about 15 to 30 minutes.

* Stool softener: Docusates, Liquid paraffin.

They add moisture to stools, and make them softer and easier to pass out of the body. They are used for patients with haemorrhoids or anal fissures.

* Osmotic laxative (Saline laxative): Magnesium salts: sulfate, hydroxide; Sodium salts: sulfate, phosphate; Lactulose ; polyethylene glycol.

They draw fluid into the bowel, and facilitate bowel movement with bulky and softer stools.

**Antimicrobials:**

An antimicrobial is an agent that kills microorganisms or stops their growth.

* Disinfectants: (non selective agents) are antimicrobial agents that are applied to the surface of non-living objects to destroy microorganisms that are living on the objects.
* Antiseptics: (non selective agents) are antimicrobial substances that are applied to living tissue/skin to reduce the possibility of infection, sepsis, or putrefaction.
* Chemotherapeutics (antibiotics): (selective agents) are chemical agents which are used to treat infectious disease.

Antimicrobial chemotherapy is a broad term that includes all medications used to target bacteria, viruses, parasites and funguses

Classification of Antiseptics and Disinfectants (according chemical structure):

1. Inorganic substances
2. Organic substances

1. Inorganic substances

(i) Halogens:

1. Iodine (2%, 3%, 5% alcohol solution)
2. Povidon-Iodine
3. Lugol’s solution
4. Chlorhexidine

(ii) Oxidizing agents

1. Hydrogen peroxide
2. Potassium permanganate

(iii) Acids and alkalis:

1. Boric acid
2. Salicylic acid
3. Solution of ammonia

(iv) Metallic salts:

1. Silver nitrate
2. Copper sulfate
3. Zinc sulfate
4. Zinc oxide
5. Organic substances
6. Aldehydes
7. Formaldehyde
8. Glutaraldehyde
9. Hexamethylentetraminum
10. Alcohols
11. Ethyl alcohol
12. Phenol derivatives
13. Phenol
14. Cresol
15. Resorcinol
16. Thymol
17. Dyes
18. Methylene blue
19. Brilliant green

Boric acid

Boric acid is weak acid with many uses:

* Boric acid can be used as an antiseptic and astringents for minor burns or cuts.
* Boric acid is applied in a very dilute solution as an eye wash.
* Dilute boric acid can be used as a vaginal douche to treat bacterial vaginosis due to excessive alkalinity.
* It is used in the manufacture of glass, pottery, enamels, glazes, cosmetics, cements, porcelain, leather, carpets, hats, soaps, artificial gems, and in tanning, printing, dyeing, painting, and photography.

Hydrogen peroxide (H2O2)

It is an oxidizing agent used for:

Medical uses:

* Hydrogen peroxide solution (6%) used as an antiseptic and deodorizing for skin wound and ulcer. It is also used as cream for superficial bacterial skin infection.
* Mouthwash( 6%): used for the treatment of acute ulcerative gingivitis.
* Hydrogen peroxide can be used for the sterilization of various surfaces, including surgical tools and may be deployed as a vapour for room sterilization.

Cosmetic applications

* H2O2 mixed with ammonium hydroxide is used to bleach human hair.
* Hydrogen peroxide is also used for tooth whitening. It can be found in most whitening toothpastes.
* Hydrogen peroxide may be used to treat acne.

Chlorhexidine

Uses:

* Chlorhexidine solution as bladder irrigation for the management of common bladder infections as it as broad spectrum activity against G+ve and G-ve bacteria.
* Chlorhexidine mouthwash, gargles and toothpast for the management of gingivitis, aphthous ulcer and oral candidiasis.
* Chlorhexidine lotion and skin wash for acne.
* Chlorhexidine solution for preoperative skin and hand disinfectant.