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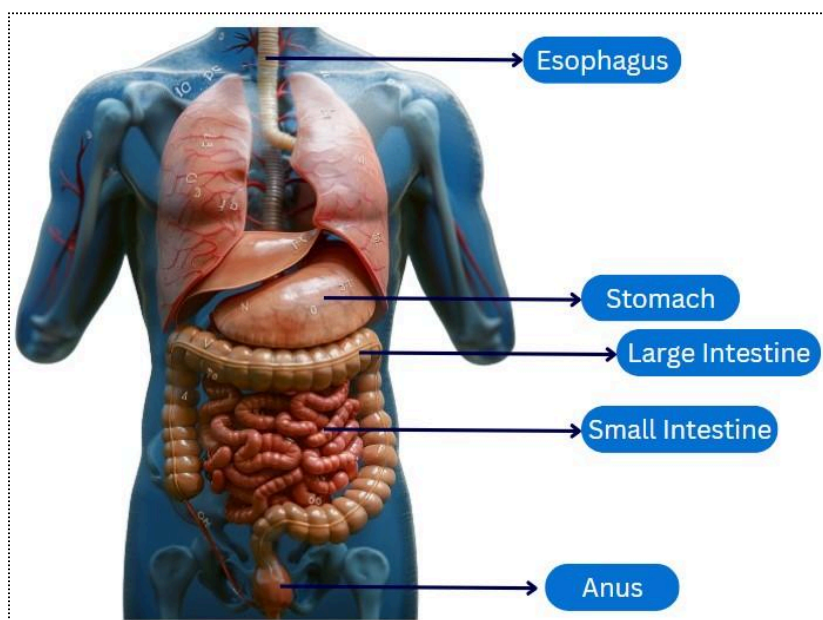


Gastrointestinal Tract:

- The gastrointestinal tract is the pathway of the digestive system, which helps in the digestion of food and its excretion.
- It starts from the mouth and ends at the anus.
- The main portions of the GIT include the stomach, small intestine, large intestine, rectum, and anus.
- When the function of the GIT goes wrong, diseases occur.

Diagram:

- Oral Cavity
- Esophagus
- Stomach
- Small Intestine
- Large Intestine
- Rectum
- Anus



Diseases of GIT:

- Insufficient secretion of acid in the stomach can cause Achlorhydria or Hypochlorhydria.
- Too much secretion of acid in the stomach can cause Hyperacidity.

- Insufficient bowel movement in the intestine can lead to Constipation.
- The growth of microbes/bacteria can affect the gastrointestinal tract.

Gastrointestinal Agents:

- Gastrointestinal Agents are used to treat gastrointestinal disturbances or diseases.
- These agents include:
 1. Acidifiers (for Hypochlorhydria)
 2. Antacids (for Hyperacidity)
 3. Cathartics (for Constipation)
 4. Antimicrobials (for Microbial Growth)

1. Acidifiers:

- Acidifiers are inorganic substances that are used to increase the level of gastric acid in the stomach.
- They are also known as Acidifying Agents.
- They either produce acid or increase the level of acid.
- They work by decreasing the pH of the stomach.
- They are used in the treatment of Achlorhydria or Hypochlorhydria.

Why Acid is Important in the Stomach?

- It breaks down food and helps in digestion.
- Kills microbes present in the food.
- Provides an acidic environment needed for effective digestion.

Types of Acidifiers:

There are mainly three types of Acidifiers:

1. Gastric Acidifiers
2. Urinary Acidifiers
3. Systemic Acidifiers

Gastric Acidifiers:

- They are mainly used to control the pH of the stomach.
- These are the drugs used to increase the acidity of the stomach.
- These agents are mainly used in patients suffering from Achlorhydria or Hypochlorhydria.

Urinary Acidifiers:

- They are mainly used in controlling the pH of urine.
- These are the drugs used to remove acidic urine from the body.
- These acidifiers are widely used to cure some types of Urinary Tract Infections (UTIs).

Systemic Acidifiers:

- They are used to control the pH of all parts of the body.
- These are the drugs that can neutralize the alkaline body fluid.
- They are used to treat patients suffering from Alkalosis.

Ammonium Chloride:

- Molecular Formula: NH_4Cl
- Molecular Weight: 53.49 g/mol

- Synonym: Sal Ammoniac

Method of Preparation:

- It is prepared by the reaction of HCl with NH₃ (Ammonia):



Physical Properties:

- It is a white crystalline powder.
- It is odorless.
- It has a cool saline taste.
- It is hygroscopic in nature.

Chemical Properties:

- On decomposition, ammonium chloride produces ammonia gas and hydrogen chloride:



Uses of Ammonium Chloride:

- It is used as an acidifier.
- It is used as fertilizer.
- It is used in Glue.
- It is also used in Buffer Solutions.

Dilute HCl (Hydrochloric Acid):

- Molecular Formula: HCl
- Molecular Weight: 36.46 g/mol
- Synonym: Spirit of Salt

Preparation:

- It can be prepared by the action of concentrated H_2SO_4 with NaCl :



Properties:

- It is a colorless liquid.
- It is strongly acidic.
- It is soluble in water and alcohol.
- It has a pungent odor.
- On reacting with NaOH , it gives salt and water:



Uses:

- It is used as an acidifier.
- It is mainly used as a Pharmaceutical Aid.
- It is used in many Solvents.

2. Antacids:

- Antacids are drugs that are used to decrease the level of gastric acid in the stomach.
- They are used in cases of hyperacidity.
- They also prevent heartburn and ulcers.
- Antacids are generally weak bases that react with the excessive acid in the stomach and convert it into salt.
- They work by increasing gastric pH.
- Example: CaCO_3 , NaHCO_3

Classification of Antacids:

Antacids are commonly classified into two groups:

1. Systemic Antacids
2. Non-Systemic Antacids

Systemic Antacids:

- Antacids that are absorbed into the systemic circulation (blood circulation) are called systemic antacids.
- They are not very suitable as antacids because they can cause metabolic alkalosis (a disturbance in acid-base balance).

Non-Systemic Antacids:

- Antacids that are not absorbed into the systemic circulation and do not affect the acid-base balance of the body are called non-systemic antacids.

Ideal Properties of Antacids:

- It should be insoluble in water and have a fine particle form.
- It should not cause metabolic alkalosis.
- It must have its effect over a long period of time.
- It should not cause constipation.
- It should not cause any side effects.
- It should be stable and readily available.
- It should not be too expensive.

Combination of Antacids:

- Systemic antacids are not used regularly as they can cause metabolic alkalosis and congestive heart failure.

- Non-systemic antacids are more effective compared to systemic alkalosis, but they also have some other side effects.
- To avoid these side effects and to increase the effect and duration of action, antacids are generally given in combination.
- Generally, in the combination of antacids, one has a rapid action and the other has a longer duration of action.

Example: Combination of Magnesium and Aluminum as Antacid

1. Magnesium - Fast-acting
2. Aluminum - Longer duration of action

Sodium Bicarbonate:

- Chemical Formula: NaHCO_3
- Molecular Weight: 84.01 g/mol
- Synonym: Baking Soda

Preparation:

- It is prepared by the Solvay ammonia process.
$$\text{Na}_2\text{CO}_3 + \text{CO}_2 + \text{H}_2\text{O} \rightarrow 2\text{NaHCO}_3$$

Properties:

- It is a white crystalline powder.
- It is insoluble in ethanol but soluble in methanol.
- It has a saline taste.
- It is alkaline in nature.
- It is also soluble in water.

Uses:

- It is mainly used as an antacid.
- It is used as an electrolyte replenisher.
- It is also used as a disinfectant.

Aluminum Hydroxide Gel:

- Chemical Formula: Al(OH)_3
- Molecular Weight: 78.00 g/mol
- Synonym: Aluminum Hydrated Powder

Preparation:

- It is prepared when Aluminum Chloride is treated with Ammonium Hydroxide.



Properties:

- It is a white viscous suspension.
- It is tasteless.
- It is odorless.
- It is soluble in mineral acid solution but insoluble in water and alcohol.

Uses:

- It is used as an antacid.
- It is used to treat heartburn.

3. Cathartics:

- Cathartics are drugs that are used to get relief from constipation.



- These are drugs that accelerate defecation.
- Cathartics act by increasing the fluid content of feces, making them softer and easier to pass.
- Cathartics increase the mobility of the intestine.

Types of Cathartics:

Cathartics are mainly classified into two categories:

1. Laxative
2. Purgative

1. Laxative:

- Laxatives are mild-acting cathartics.
- They work by either:
 - Increasing intestinal movement.
 - Increasing stool bulk.
 - Making stool softer.
- Prolonged use of laxatives may cause habit or dependency.

2. Purgative:

- They are strong cathartics.
- They are given in very serious conditions.
- They are generally given to completely remove solid materials from the intestine before surgery.

Classification (Based on mechanism):

1. Stimulant Cathartics:

- They act by producing local irritation in the intestinal tract.

2. Lubricants:

- Provide a lubricant effect so that stool easily passes through the rectum, also known as stool softeners.

3. Bulk Forming:

- These agents increase the amount of stool production.

4. Saline Cathartics:

- They increase the osmotic load of the gastrointestinal tract (GIT), consumed with a large amount of water.

Uses of Cathartics:

- For easy defecation and other rectal diseases.
- To relieve acute constipation.
- To remove solid material from the intestinal tract before surgery.
- To avoid a rise in blood pressure due to constipation.

Magnesium Sulphate:

- Chemical Formula: $MgSO_4 \cdot 7H_2O$
- Molecular Weight: 246.47 g/mol
- Synonym: Epsom Salt

Method of Preparation:

Magnesium sulphate is obtained by the action of dilute sulphuric acid (H_2SO_4) on magnesium carbonate ($MgCO_3$).

Chemical Reaction:

**Properties:**

- Occurs as white crystals
- Odourless
- Has a cool, saline, bitter taste
- Soluble in water and sparingly soluble in alcohol

Uses:

- Used as a cathartic (laxative)
- Used in agriculture
- Used to control seizures in pregnancy

Sodium Orthophosphate:

- Chemical Formula: $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$
- Molecular Weight: 358.14 g/mol

Preparation:

Sodium orthophosphate is obtained by adding sodium carbonate to a hot solution of phosphoric acid.

Chemical Reaction:**Properties:**

- Occurs as colourless crystals

- Odourless
- Has a saline taste
- Soluble in water
- Insoluble in alcohol

Uses:

- Used as a cathartic (laxative)
- Also used as a buffer

Kaolin:

- Molecular/Chemical Formula: $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$
- Molecular Weight: 258.16 g/mol
- Synonym: China Clay

Preparation:

Kaolin is simply prepared from natural clay by powdering, separating, and purifying processes.

Properties:

- Light, white powder
- Odourless
- Tasteless

Uses:

- Used as a cathartic (laxative)
- Used in food poisoning
- Used in dusting powders

Bentonite:

- Chemical Formula: $\text{Al}_2\text{O}_3 \cdot 4\text{SiO}_2 \cdot \text{H}_2\text{O}$
- Molecular Weight: 360.31 g/mol
- Synonym: Clay

Preparation:

Bentonite occurs naturally or can be prepared from natural clay.

Properties:

- Very fine, cream-colored powder
- Odourless
- Insoluble in water

Uses:

- Used as a cathartic (laxative)
- Used as an emulsifier
- Also used as a protective agent

4. Antimicrobial Agents:

Definition:

- Antimicrobial agents are chemical compounds or drugs that inhibit or destroy the growth of microorganisms.
- They can either kill or prevent the growth of bacteria.

Classification of Antimicrobials:

1. Antiseptics
2. Disinfectants

3. Germicides
4. Bacteriostatic
5. Sanitizers
6. Sterilization

1. Antiseptic:

- Antiseptics are antimicrobial agents that are mainly used on living cells.
- They either kill or inhibit the growth of bacteria.
- An ideal antiseptic agent should destroy bacteria, viruses, etc., and should not cause any harm to the applied area.
- Examples: Hydrogen Peroxide, Silver Nitrate, etc.

2. Disinfectant:

- Disinfectants are antimicrobial agents mainly used on non-living surfaces.
- They can either kill or destroy bacteria.
- They are mainly used in home and hospital cleaning.
- Example: Sulphur dioxide

3. Germicides:

- Germicides are agents used to kill microorganisms.
- They can be used on living or non-living surfaces.
- Germicides can also be divided into the following types:
 - Bactericides: To kill bacteria
 - Virucides: To kill viruses
 - Fungicides: To kill fungi



4. Bacteriostatic:

- Bacteriostatics are agents used to prevent the growth of bacteria.
- They do not kill bacteria.
- Can be used on living or non-living surfaces.
- Example: Chloramphenicol

5. Sanitizers:

- Sanitizers are agents mainly used in cleaning and washing.
- They are generally used to maintain general public health.
- Examples: Soap, Alcohol, etc.

6. Sterilization:

- It is a process by which all the microorganisms are either killed or removed.
- In this process, the products, surface, or area will be free from all types of microorganisms.

Mechanism of Action of Antimicrobials:

- Microorganisms mainly contain proteins (enzymes) to survive.
- Anti-microbial acts by changing their protein structure, which results in the death of microorganisms.
- Antimicrobials mainly act by three mechanisms:

a. Oxidation

b. Halogenation

c. Precipitation

a. Oxidation:

- This MOA (Mechanism of Action) is shown by oxygen-releasing compounds.
- They cause oxidation of active functional groups present in proteins and inactivate them.

b. Halogenation:

- This MOA is shown by halogen (Br, Cl, etc.) releasing compounds.
- These agents add halide atoms to nitrogen present at the peptide linkage of protein and inactivate them.

c. Precipitation:

- This MOA is shown by metal-containing compounds.
- Metal binds with important groups present in proteins, changes their structure, and inactivates them.

Potassium Permanganate:

- Chemical Formula: KMnO_4
- Molecular Weight: 158 g/mol
- Synonym: *Condy's Crystals*

Preparation:

- It can be easily prepared from potassium manganate under acidic conditions.

**Properties:**

- It is a purple crystalline solid.
- It is odorless.
- It is soluble in both water and alcohol.

Uses:

- It is used as an antimicrobial agent.
- It is used in the treatment of various skin conditions.
- It is used as an antiseptic.
- It is used as a strong oxidizing agent.

Boric Acid:

- Chemical Formula: H_3BO_3
- Molecular Weight: 61.83 g/mol
- Synonym: Hydrogen Borate

Preparation:

- It is prepared by the action of HCl on borax ($Na_2B_4O_7$).



Properties:

- It is a white crystalline solid.
- It is odorless.
- It has a sweet taste.
- It is soluble in water and slightly soluble in alcohol.

Uses:

- It is used as an anti-microbial agent.
- It is used as a preservative.

- It is also used in cosmetics.

Hydrogen Peroxide:

- Chemical Formula: H_2O_2
- Molecular Weight: 34.01 g/mol
- Synonyms: Hydrogen Oxide, Peroxide

Preparation:

- It can be prepared by the reaction of sodium peroxide with dilute sulfuric acid.



Properties:

- It is a clear, colorless liquid.
- It is odorless.
- It has a bitter taste.
- It is miscible with water.

Uses:

- It is used as an antimicrobial agent.
- It is used as an antiseptic.
- It is used as a bleaching agent.
- Also used in tooth whitening.

Chlorinated Lime:

- Chemical Formula: $CaOCl_2$

- Molecular Weight: 136.98 g/mol
- Synonym: Bleaching Powder

Preparation:

- It is prepared by reacting chlorine with calcium hydroxide.



Properties:

- It is a white or grey powder.
- It has an odor of chlorine.
- It is partially soluble in water and alcohol.

Uses:

- It is used as an antimicrobial agent.
- It is used as a powerful bleaching agent.

Iodine:

- Chemical Formula: I_2
- Molecular Weight: 253.8 g/mol
- Synonym: Halogens

Preparation:

- In the laboratory, it is prepared by heating the mixture of KI, MnO_2 , and concentrated H_2SO_4 .



Properties:

- It occurs as greyish-violet or bluish-black crystals.
- It has a strong harsh odor.
- It is volatile in nature.
- It is insoluble in water.
- It is soluble in alcohol.

Uses:

- It is used as an antimicrobial agent.
- It is used in iodine deficiency.
- It is used in thyroid cancer.

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