Pharmaceutical chemistry
Chapter—3 Inorganic pharmaceutical
Unit-4 — Dental products.

Dental products are those substances which prevent the dental caries, dental decay and give the freshness and cleanness to the mouth and teeth. In market it is mainly available in the form of toothpaste, tooth powder, mouthwash, tooth gel, dentifrice etc.
Dental caries— it is defined as, demineralization or destruction of inorganic and organic matrix from the calcified tissue of the tooth by the activity of microbes. In this process of tooth destruction of the mineral phase, consisting primarily of hydroxyl apatite crystals by organic acids produced by bacterial growth.

Dental plaque—plaque is defined as whitish or pale yellowish soft accumulations of bacterial colony (mainly Streptococci) and their substrate which deposits on the teeth while not cleaned adequately.

Gingivitis—Gingivitis is a form of gum disease that happens when plaque, a naturally occurring sticky film containing bacteria, builds up on teeth and causes the inflammation of the surrounding gum tissue.

- In dental products many abrasive is used for abrading, granding or polishing. Abrasive are most often found as crystals, small and small particles that are preferred to avoid tooth wear. Hydrated silica is a common abrasive in dentifrice, alumina and calcium carbonate may also be used.

Dental products Classification.

On the basis of their activity it is divided into five parts-

1. **Antiplaque agent—** Example: - Triclosan, delmiopinol, phenolic compounds
2. **Anticaries agent—**Example: - Sodium fluoride, stannous fluoride.
3. **Cleaning/dentifrice agent** —Example: - Calcium carbonate, calcium phosphate, sodium metaphosphate.
4. **Desensitizing agent**—Example: - Strontium chloride, zinc chloride.
5. **Mouth washes—**Example:- Chlorhexidine gluconate, potassium nitrate.

Calcium carbonate.

Chemical formula— $CaCO_3$ **Molar mass—**100.0869g/mol

Introduction—.It is also known as aragonite, calcite, and limestone, marble. Calcium carbonate shows wide range of activity in our body by providing the calcium ion in our body. Teeth enamel is mainly made by calcium salts so calcium carbonate plays a major role in tooth development and provides the strength of tissues. Calcium ions are also used in the water treatment and agricultural aspects. Overdose of calcium cause the hypocalcaemia and digestive problems.

- Calcium carbonate is prepared by the reaction of calcium oxide with water and carbon dioxide. Initially water is added to calcium oxide then it forms calcium hydroxide the carbon dioxide is passed through this solution to precipitate the desired calcium carbonate.

Reaction- $CaO + H_2O \rightarrow Ca(OH)_2$

$Ca(OH)_2 + CO_2 \rightarrow CaCO_3\downarrow + H_2O$

Properties—

- **Color and state**—it is the whitish or milky crystalline powder.
- **Odor and taste**—it is odorless with bitter taste.
- **Solubility**—it is practically insoluble in water and ethanol.

Pharmaceutical preparation—Tablet, syrup, capsule, pills, Tooth paste, tooth powder, oral drop.

Brand/Market Name— Coolwhite, Emoform, denti fresh etc.

Storage condition—It is stored in well closed air resistance unopened container and keep away from incompatible materials at room temperature and also away from the light and moisture.

Uses/Application—

- It is used for water treatment. In water treatment it forms the complexes with other harmful metals.
- Calcium plays a vital role for the growth and maturation of the body like muscles, bones, teeth, and organs.

- Calcium carbonates acts as antacid and neutralizes the acidic PH and prevents the indigestion, heartburn, and gastric problems.

Sodium fluoride

Chemical formula— NaF **Molar mass—** 41.99g/mol
Introduction— Sodium fluoride is an inorganic chemical which is widely used for fluoride ion in dental products preparations. It protects the teeth from acid demineralization during bacterial growth. It provides the strength for tooth enamel and prevents the tooth decay. Minor quantity of sodium fluoride is used in drinking water.

- It is prepared by reaction of hydrofluoric acid with sodium carbonate and finally obtained a insoluble precipitation.

Reaction- $2HF + Na_2CO_3 \rightarrow 2NaF + H_2O + CO_2\uparrow$

Properties—

- **Color and state—**it is colorless crystalline powder.
- **Odor and taste—**it is odorless with salty taste.
- **Solubility—**it is readily soluble in water but insoluble in alcohol.

Pharmaceutical preparation—Tablet, solution, drops, toothpaste.
Brand/Market Name—Optifresh, NuNof, D Flour, Vinaflour.
Storage condition— It is stored in well closed air resistance unopened container and keeps away from incompatible materials at room temperature and also away from the light and moisture.

Uses/Application—

- Sodium fluoride is an ingredient of various dental preparations used to support tooth mineralization and the prevention of dental caries.
- It is also used in water treatment.

Denture cleaners

The word **denture** referred as, a removable plate or frame holding one or more artificial teeth or false teeth. It replaces our missing teeth by adding the false teeth and it is surrounded by soft and hard tissue of oral cavity.

Denture cleaners are those substances or equipments which are designed to safety removal of stains, deposits, debris from the denture or mouth caused by diet, tobacco, coffee and tea drinking etc. The main use is to control the growth of microorganism (Candida albicans a yeast) on the dentures thereby preventing dentures related stomatitis.

In our personal hygiene, denture cleaners play an important role to maintain the hygienic conditions of our mouth. It also helps in removing the mouth odor and keep freshness as long time. Now a day, many spray denture cleaners are widely used.

The process by which denture accumulate plaque (Biofilm), stain and calculus is approximately similar to the process which takes place on natural teeth. On the basis of using process it is divided mainly into two categories.

- **Chemical method**
  - Alkaline peroxide and alkaline hypochlorite
  - Disinfectants- Chlorhexidine
  - Dilute organic and inorganic acid- Hydrochloric acid, acetic acid.
  - Enzymes- Glycoprotein, muco-polysaccarides

- **Mechanical method**
  - Brushing
  - Tooth paste & tooth powder
  - Ultrasonic agitation

Pharmaceutical preparation— Paste, powder, liquid, and cleaning Brush.

Market/ Brand Name—Dentural, Polident, steradent(Peroxide).

Denture adhesives

Denture adhesive are those substances which are act as adhesive materials between the gum and denture. It allows for a sticky layer between the tissue and

the denture surface that helps to keep the denture in place while function and helps stops any movements.
The absorption of saliva or mouth liquids expands the adhesive which results in 'filling the empty space' that aids in more adhesion. In market denture adhesive is present in the form of paste, powder, strip made from a non-toxic, non-irritant water soluble material that are place between the denture and gum line.

Before wear of denture proper cleaning and hygiene are required. Denture adhesive should only be used to improve function of denture that are properly fitted and give a natural confidence. On the basis of physical state it divide into three categories—

1. **Denture adhesive cream**— Cream or paste typically comes in a tube and, is applied in small amounts on wet dentures directly to the part of the denture that connect with the bone tissue. Denture cream has a higher adhesive strength than adhesive powder.

2. **Denture adhesive powder—** Adhesive powder is applied by sprinkling the powder directly on wet dentures, specifically to the part of the denture that connects with the bone tissue. Unlike denture adhesive cream, powder covers the entirety of the surface that connects with tissue.

3. **Denture adhesive strip—** These strips either one whole piece or multiple smaller strips, depending on the brand are applied to dry dentures before being placed in the mouth.

Composition of denture include as—

Zinc—this mineral helps the adhesive create that grip you need. (**Zinc can be toxic if you ingest too much of it**)
Mineral oil—this ingredient delivers the right denture cream consistency.
Petroleum—like mineral oil this help with consistency.
Cellulose gum—this ingredient help the denture stick in place.
Silica—it also works to help create the right consistency.

Pharmaceutical preparation— Cream or paste, powder, strip.
Market/brand Name—Fixodent, poligrip (zinc free), Fittydent, Seabond
Storage condition— It is stored in well closed air resistance unopened container and keeps away from incompatible materials at room temperature and also away from the light and moisture.

Mouth washes.

Mouth washes is the liquid preparation meant for preventing the dental caries and oral contamination. It removes the bad breath and keeps freshness at long time. Mouth washes are the antiseptic solution intended to reduce the microbial activity and reduces the mouth infections healing the wound rapidly.

Mouth washes is held in mouth directly or diluting form passively and swilled around the mouth by contraction of the perioral muscles and may be gargled.

Mouth washes contains the antibacterial agents, alcohol, glycerin, sweetening agent, flavoring agents and coloring agents. Normally we use the home made mouth wash by adding the NaCl salts in hot water or normal saline. On the basis of mouth washes activity it is divide into many parts: -

1. Antiseptic— Chlorhexidine, Listerine mouth wash.
2. Anti allergic—Benadryl mouth washes.
3. Anti haemostatic—Traneximic acid mouth washes.
4. Analgesic—Lidocaine mouth wash.
5. Steroid mouth wash—Triamcinolone Acetonide.

Pharmaceutical preparation—Solution, sprays.
Market/brand Name—Listerine, Hexadine, Gargilin, Unifresh.
Storage condition— it is stored in well closed air resistance unopened container and keeps away from incompatible materials at room temperature and also away from the light and moisture.