

Subject
Pharmaceutical Inorganic
Chemistry

Subject Code
BP104TP

Dental Products

Prepared By:
Dr. Navneet F. Chauhan
Professor
Ph.D



Dental Products

Dental products:

The agents that can be used for the treatment of dental and oral disorders are known as dental products.

Classification:

They can be classified as:

1) Anticaries agents:

- Microorganisms act on carbohydrate in mouth and produce acid. This acid carry out decalcification of teeth. This cause dental caries or tooth decay. The agents which are used to prevent or treat dental caries or tooth decay are known as anticaries agents.
- Ex. Sodium fluoride, sodium monofluorophosphate, stannous fluoride.

2) Dentrifrices:

- The agents that can be used for cleaning of teeth and adjacent gums are known as dentrifrices.

- They can be applied with use of finger or tooth brush.
- Ex. Calcium carbonate, Dibasic calcium phosphate, calcium phosphate, sodium metaphosphate, strontium chloride, pumice.

3) Desensitizing agents:

Teeth are sensitive to heat and cold. In case of tooth decay, they become more sensitive.

The agents which reduce sensitivity of teeth towards heat and cold are known as desensitizing agents.

Ex. strontium chloride, zinc chloride.

4) Oral antiseptics and astringents:

Few inorganic chemicals can be used for oral hygiene are known as oral antiseptics and astringents.

Ex. Hydrogen peroxide, Magnesium peroxide, sodium perborate.

5) Mouth wash:

They are employed for various purpose like mild antiseptic, astringent, deodorant, desensitizing action.

Ex. Zinc sulphate, zinc chloride, potassium permanganate etc.

6) Cements and fillers:

They are temporarily used to cover and protect areas on which dental surgery has been performed.

Ex. Zinc oxide.

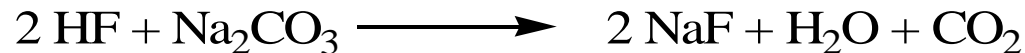
Sodium fluoride

Mol. Formula: NaF **Mol. Wt.:** 41.99 gm/mol

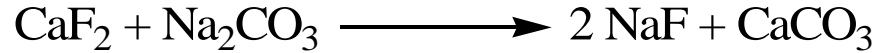
Contains not less than 98% of NaF.

Preparation:

1). Prepared by treatment between hydrofluoric acid and sodium carbonate.



2) By treatment between calcium fluoride and sodium carbonate.



Properties:

- Colorless, odorless crystals.
- Soluble in water, insoluble in alcohol.
- On acidification, it produces hydrofluoric acid that is poisonous.

Uses:

- Retards or prevents dental caries.

Application:

- 2% solution of 1.5 to 3 ppm NaF in drinking water can be used topically for teeth.

Dental products:

The agents that can be used for the treatment of dental and oral disorders are known as dental products.

Calcium carbonate

Synonym: Precipitated chalk

Mol. Formula: CaCO_3 **Mol. Wt.:** 100 gm/mol

It is having not less than 98% and not more than 100% of CaCO_3 .

Preparation:

1) Commercially, it is prepared by mixing hot solution of calcium chloride with sodium carbonate.



Properties:

- Fine, white and micro-crystalline powder.
- Odorless

- Tasteless
- Insoluble in water and alcohol.
- It neutralizes acid with effervescence.

Uses:

Used externally as dentifrice.

Internally as an antacid.

It cause constipation when taken internally so taken along with magnesium salts.

Dose:

1-4 gm, approx six times per day.

Storage:

Stored in tightly closed container.

Dental Products

Role of fluoride in dental products.

- Fluoride ion is a **trace material** that occurs in our body.
- It is mainly **obtained** from **food** and **water** and in small amount, it is **obtained** from **fruits** and **vegetables**.
- Fluoride has **beneficial effects** in **treating dental caries** and **some types of osteoporosis**.
- In some parts of the world, **ground water** is **totally lacking fluoride**. In these places, **dental caries** occur most frequently.
- In such places, to **remove dental caries** and to **provide fluoride ion**, **fluoride** is added to the **municipal water supply**. This process is known as fluoridation.
- It is also observed that people who receive **slow and continuous ingestion of fluoride** may suffer from **mottling of teeth**, **increased density of bone**, **gastric disturbances**, **muscular weakness**, **convulsions** and even **heart failure**.

- When fluoride in **salt** or **solution form** is taken **internally**, it is readily **absorbed**, **transported** and **deposited** in the **bone** or **developing teeth** and remained fluoride gets **excreted** by the kidneys.
- The **deposited fluoride** on the **surface of teeth** does not allow the **action of acids** or **enzymes in producing injury**.
- A **small quantity (1 ppm)** of fluoride is necessary **to prevent caries**.
- If **more quantity of fluoride (more than 2-3 ppm)** is ingested it is carried to **bones** and **teeth** and gives rise to **mottling in enamel** and it is known as **fluorosis**.
- Fluoride can be **administered** by **two routes**:
 - A). Orally and
 - B). Topically.

- The use of **fluoridation in municipal water supply** is the common and effective way of oral administration.
- Water supply containing **0.5 to 1 ppm fluoride** is sufficient. It can also be given in **drinking water** or **fruit juice** in **1 ppm concentration per day**.
- Sodium fluoride tablets** or **solution of sodium fluoride** in a dose of **2.2 mg per day** are used.
- For **topical application**, **2% solution** is used on teeth.

As **fluoride ion** found to give **effective role** in **treatment of dental caries** and in **osteoporosis**, this ion plays a **chief role in dental products**.

Dental Products

- **Eugenol** is an **allyl benzene derivative**. It is aromatic liquid extracted from **oil of clove**, **nutmeg**, **cinnamon**, **basil**, etc. It is used topically to **treat toothache**.
- **Zinc oxide** is used as **bulking agent** and **filler**.
- **Zinc oxide eugenol (ZOE)** is a material created by the combination of **zinc oxide** and **eugenol** contained in oil of cloves.
- It was first introduced in **1980s**.
- When **zinc eugenolate chelate** forms, it will create an **acid-base reaction**.
- The reaction is **catalysed** by **water** and is **accelerated** by the **presence of metal salts**.
- **ZOE** can be used as a **dental filling material** or **dental cement** in **dentistry**.
- It is often used in **dentistry** when the **decay is very deep** or **very close to the nerve** or **pulp chamber**.

- **Tissue** inside the tooth, (**pulp**), reacts badly to the **stimulus** like **heat and vibration** and can cause **severe inflammation** and **precipitation**. This condition is known as **acute or chronic pulpitis**.
- This condition usually leads to **severe chronic tooth sensitivity** or **actual toothache**.
- **Pulpitis** can only be treated with the **removal of the nerve (pulp)** called **root canal therapy**.
- **ZOE cement** gives **anti-inflammatory action** in this condition.

The **chemical composition of ZOE**:

Sr. No.	Ingredient	Quantity	Role
1	Zinc oxide	69.0%	Bulking agent and filler
2	White rosin	29.3%	Increases fracture resistance
3	Zinc acetate	1.0%	improves strength
4	Zinc stearate	0.7%	acts as accelerator
5	Eugenol	85%	To treat toothache

- **ZOE pastes** are dispensed as **two separate pastes**. One tube contains **zinc oxide** and **vegetable** or **mineral oil**; the other contains **eugenol** and **rosin**. The **vegetable** or **mineral oil** acts as a **plasticizer** and helps in **removal of irritant action** of eugenol.
- Clove oil contains **70% to 85% eugenol** and it is used to feel **less burning sensation** for patients when it contacts the soft tissues.
- The addition of **rosin** to the paste in the second tube **increases the speed of the reaction** and yields a smoother, **more homogenous product**.
- **Canada balsam** and **Balsam of Peru** are often used to **increase flow** and **improve mixing properties**.
- If the **mixed paste** is **thin** then a **filler** (such as a **wax**) or an **inert powder** (such as **kaolin, talc, or diatomaceous earth**) may be added.

Mechanism:

The exact mechanism of **anesthetic effect** from **ZOE** is **unknown perfectly**, but it gives **anti-inflammatory effect** and **changes immune-cells** to **less inflamed status**.

- It is sometimes used in the **management of dental caries** as a "**temporary filling**".
- **Zinc oxide eugenol** is also used as an **impression material** during construction of complete **dentures** (**removable plate on the teeth**).
- **ZOE** is not usually used if the patient has **large undercuts**. In that condition, **silicone impression materials** would be better option.
- **Zinc oxide eugenol** is also used as an **antimicrobial additive** in **paint on the teeth**.