

CONTENTS

- ❑ Introduction
- ❑ Dentifrices or Cleaning agents
- ❑ Anti-caries agents
- ❑ Role of Fluoride in treatment of dental caries
- ❑ Desensitizing agents
- ❑ Cements and Fillers



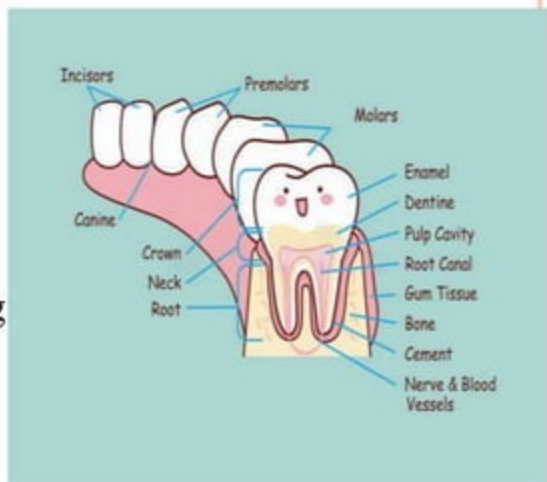
shutterstock.com · 1927987931

INTRODUCTION

- Oral hygiene is the practice of keeping one's mouth clean & diseases free by regular brushing & cleaning teeth
- Clean teeth keeps good health & cannot decay early.
- Various factors contribute to dental decay & problems of oral hygiene.
- A large no. of Inorganic substance and their preparation are used in practice of dental & oral disorders e.g- anti-caries agents, dentifrices, polishing agents, desensitizing agents ,oral antiseptics and astringents mouthwashes

ANATOMY OF TOOTH

- Tooth consist of three layers of calcified tissue-
 1. Dentine- it surrounds the pulp cavity and extends throughout the entire portion of tooth. 75% mineral
 2. Cementum- it is the layer covering the portion of the lying buried in the gem.
 3. Enamel- white, hard material covering the portion of tooth projecting above the gem. 98% mineral-hardest part of the body



- Vitamin A, C and D are necessary for proper tooth formation.
- Vitamin A deficiency causes hypoplastic enamel (imperfectly calcified)
- Vitamin C deficiency affects calcification of dentine
- Vitamin D is important for absorption of calcium from gut and proper deposition of calcium and phosphorus in tooth
- Other ions like Magnesium, citrate, carbonate, chromium is also present in tooth like bones

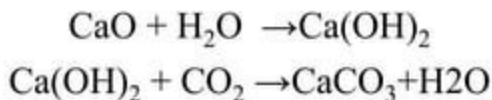
DENTIFRICES OR CLEANSING AGENTS



- Dentifrices are the preparations used to clean the teeth & other parts of oral cavity (gums) using a finger or toothbrush. (e.g.- tooth powder, toothpaste, gels & creams)
- Used to enhance personnel appearance of teeth by maintaining cleaner teeth, reduction of bad odour, make gums healthy.
- Good Cleansing agent must remove stain from teeth and its action depends upon abrasive property & rubbing force is applied
- Some useful substances included in dentifrices for providing better oral hygiene and Supply of trace materials(e.g., fluoride, antiseptic, deodorants)

CALCIUM CARBONATE

- **Molecular formula:** CaCO_3 **Synonym:** Precipitated chalk
- **Preparation :**
- Water is added to give calcium hydroxide then carbon dioxide is passed through this solution to precipitate the desired calcium carbonate, referred to in the industry as precipitated calcium carbonate (PCC).



- **Physical properties :** It is odourless and tasteless fine white crystalline powder. It is soluble in alcohol and soluble in dilute acids. This preparation is used externally as a dentifrices, because it is having a mild abrasive quality because of its micro crystalline structure.

- Identification tests :
- About 5 g of calcium carbonate is dissolved in 1 M acetic acid, resulting in formation of effervescence. Once the effervescence ceases, the solution is boiled for 2 minutes, allowed to cool and diluted to 100 ml with 2 M acetic acid and filtered. The filtrate is tested for the presence of calcium, carbonates and presence of substance insoluble in acetic acid.
- Assay:
- About 0.1 g of sample is dissolved in 3 ml of dilute HCl and 10 ml of water. It is boiled for 10 minutes and the sample is cooled to room temperature. It is then diluted to 50 ml with water. The sample solution is titrated with 0.05 M EDTA solution. After few ml of titrations, 8 ml of NaOH and 0.1 g of calcon mixture is added, and the titration is continued until the colour of solution changes from pink to full blue.

- Uses :
- Calcium carbonate is traditionally used as a dental cleaning-polishing agent for most tooth pastes and tooth powders. It furnishes both abrasive and antacid effect in mouth.
- It is incompatible with fluoride salts because even though calcium carbonate is a water insoluble salt, it is soluble enough to provide enough free calcium cation to bring about formation of even more insoluble calcium fluoride (CaF_2)

ANTI-CARIES AGENTS

- Dental caries or tooth decay is a disease of teeth caused by acids produced by the action of microorganisms on carbohydrates. This is characterized by decalcification of tooth accompanied by foul mouth odour.
 1. Dental caries starts on the surface of the teeth
 2. Acids produced by bacterial metabolism of fermenting carbohydrates act on teeth and produce lesions where bacteria get localised.
- To prevent dental caries-
- Maintaining dental hygiene with the help of dentifrices
- Dentifrices enhance removal of dental plaque and strains.
- Flossing and brushing regularly administration of fluoride (anti-caries agents – sodium fluoride, stannous fluoride)
- Dental caries if not treated, then microorganism may invade the pulp causing inflammation and infection.



ROLE OF FLUORIDE IN TREATMENT OF DENTALCARIES:

- Fluoride ion is a trace material which occurs in our body, generally adequately obtained from food and water.
- In some parts of the world, ground water is totally lacking fluoride. In such places occurrence of dental caries has been becoming in alarming proportions Addition of fluoride to the municipal water supply known as fluoridation.
- Those who receive slow continued ingestion of fluoride may suffer from mottling of teeth, increased density of bones, gastric disturbances, muscular weakness, convulsions and even heart failure.
- When a fluoride having salt or solution is taken internally, it is readily absorbed, transported and deposited in the bone or developing teeth and remain gets excreted by the kidneys.
- The deposited fluoride on the surface of teeth does not allow the action of acids or enzymes in producing lesions.

- A small quantity (1 ppm) of fluoride is essential 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 mottled enamel known as dental fluorosis.
- Fluoride can be administered orally and topically
- The use of fluoridation of public water supply has been the most common and effective way of oral administration.
- Water supply should contain about 0.5 to 1 ppm of fluoride.
- Sodium fluoride tablets or solution of sodium fluoride in a dose of 2.2 mg per day are used. For topical application 2 percent solution is generally used on teeth.
- Inorganic phosphate salts can also be useful in the prevention of dental caries. Soluble salts of phosphate such as sodium monohydrogen phosphate, sodium dihydrogen phosphate can cause caries reduction and also used as cleansing agent.

SODIUM FLUORIDE

Molecular formula : (NaF)

- It is having not less than 98.0 percent of NaF.
- **Preparation :**

It may be prepared by neutralizing hydrofluoric acid with sodium carbonate.



- Another method involves the double decomposition of calcium fluoride with sodium carbonate



Physical Properties :

- It forms colourless, odourless crystals or as white powder
- It is soluble in water but insoluble in alcohol
- Its aqueous solutions corrode ordinary glass bottles and hence be prepared in distilled water and stored in dark, pyrex bottles.

- Identification test:
- 1 g of sodium fluoride is placed in a platinum crucible in a well ventilated hood. To this, 15 ml of sulphuric acid is added and covered with a piece of clear polished glass. The crucible is heated on water bath for 1 hr. The glass cover is removed and rinsed with water and wiped dry. It will be observed that the surface of glass have been etched.
- Assay :
- It is assayed by complexometric titration method using disodium edetate.
- A weighed quantity is dissolved in water. To it a small amount of sodium chloride an alcohol is added. Now contents are heated to boiling and drop wise excess lead nitrate is added with stirring. On cooling, coagulated precipitate is filtered, residue washed with dilute alcohol and the combined filtrate and washings are made to titrate with disodium edetate using xylenol orange as indicator

- Uses :
- Important agent for retarding or preventing dental caries
- Sodium fluoride in 2 per cent aqueous solution is widely used topically, Fluoride ion enters enamel of teeth and becomes part of enamel structure and thus becomes effective
- Sodium fluoride can be administered as solution, tablet, oral gel or as mouth wash for local use in the mouth.
- A 2% solution of sodium fluoride in water may be applied to children's teeth after preliminary cleansing.
- Dose :
- 2.2 mg (equivalent to 1 mg of fluoride) once a day.

STANNOUS FLUORIDE

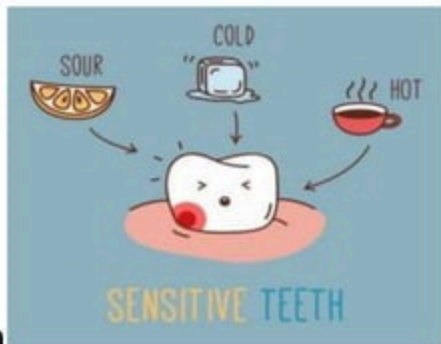
- Molecular formula : (SnF₂)
- Synonym: Tin Fluoride
- Preparation:
- It may be prepared by neutralizing hydrofluoric acid with stannous oxide.



- Properties:
- It is white crystalline powder having bitter saline unpleasant taste.
- It is freely soluble in water and insoluble in alcohol, chloroform, ether.
- Aqueous solution decomposes within hours with formation of white ppt., they slowly attack glass.
- Uses:
- It is used as a preventive for dental caries.

DESENSITIZING AGENTS

- Teeth are sensitive to heat or cold.
- During the teeth decay or in toothache the perception to heat and cold feels strongly.
- Therefore, some desensitizing agents are use in dental preparation to reduce sensitivity of teeth to heat and cold.
- They act probably like local anaesthetics. Examples:
Strontiumchloride and zinc chloride.



STRONTIUM CHLORIDE :

- Molecular formula : $\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$
- Preparation :
- Add strontium carbonate to hydrochloric acid until the effervescence of carbon dioxide is not stopped.



- Properties :
- White crystals or granules.
- It effervesces in dry air and is soluble in water and alcohol,

- Identification test:

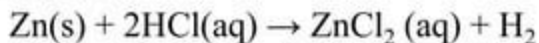
- To 1 g of strontium chloride add 5 drops of ethanol. Then add 3 M (6 N) H_2SO_4 drop wise until precipitation is complete, Heat the sample in a water bath for a few minutes. Test again for complete precipitation by adding 1 more drop of sulphuric acid. Centrifuge and decant the supernatant. The white precipitate of strontium sulphate confirms the test.

- Uses :

- It is added in tooth paste to reduce the pain in sensitive teeth.
- It is also added in the dietary supplement for building bones.
- Strontium 89 is used in prostate cancer and also found to be effective in osteoporosis.

ZINC CHLORIDE :

- Molecular formula : ZnCl_2
- Molecular weight : 136.28
- Synonym : Butter of zinc
- Preparation :
- It is prepared by heating granulated zinc with hydrochloric acid. When evolution of hydrogen ceases, the solution is filtered and evaporated to dryness.



- Properties :
- It occurs as a white, odourless, deliquescent crystalline powder or granules or opaque white masses or sticks.
- Soluble in water ,alcohol, glycerol and freely soluble in acetone.
- Water solution or alcoholic solution is turbid, due to formation of zinc oxychloride, turbidity disappears after small addition of HCl.

- Uses :
- It is use as an antiseptic, astringent to the skin and mucous membrane as a 0.5 to 2.0% solution.
- It is used as an active ingredient in preparation of magnesia cement in dental fillings and certain mouth washes.

CEMENT AND FILLERS :

- Dental cements are used to temporary cover or protect areas that have undergone operation as in dental surgery.
- The cementing material is applied as a paste which gets hardened forming a protective layer. After healing of operated tissue, the hardened cement can be removed.
- The temporary cement can also be medicated, usually with eugenol which is antiseptic and local anesthetic.
- A cement of suitable consistency is used as a temporary filler for the cavity. Gold and silver are used as a permanent filling materials.



ZINC EUGENOL CEMENT

- There are four types of Zinc eugenol cement
- Type I (For temporary cementation)
- Type II (For permanent cementation)
- Type III (For temporary filling and thermal base)
- Type IV (Cavity liner).
- **Preparation** :ZOE is the material formed by combination of zinc oxide and eugenol contained in oil of cloves. An acid base reaction takes place with the formation of zinc eugenolate chelate.
- The reaction is catalysed by water and is accelerated by the presence of metal salts.
- **Composition** :
- Liquid :Eugenol Olive Oil
- Powder :Zinc oxide (active ingredient)
- Zinc stearate (accelerator, plasticizer)
- Zinc acetate (accelerator, improves strength)
- White rosin (to reduce brittleness of set cement)

- Properties :
- It is the cement of low strength, low abrasive resistance and low flow after setting, so it is used for temporary filling not be more then few days.
- It has adhesive effect on exposed dentin.
- It is least irritating than other dental cements.
- Uses : It is used as an impression material during construction of complete dentures and is used in the mucostatic technique of taking impressions.