


TOOTH PASTES





A toothpaste or dentifrice is a substance used with a toothbrush for the purpose of cleaning the accessible surfaces of the teeth.

Purposes:

- **Cleaning**
- **Polishing**
- **Removal of stains**
- **Reduce incidence of tooth decay**
- **Reduction of oral malodors**

ADVANTAGES

- Delivers active ingredients such as fluoride or xylitol to help prevent tooth and gum disease.
- Recent advances in toothpaste enable high efficacy of oral health delivery:
 - Special toothpaste for kids with fluoride and relatively low abrasion value
 - Desensitizing toothpaste
 - Whitening toothpaste
- Easy to use, available in collapsible tubes.
- Combination of various contents available as to combat different oral healthcare needs at once.

DISADVANTAGES

- Extended consumption of large volumes of fluoridated toothpaste can result in fluorosis.
- Fluoridated toothpaste can be either acutely toxic if swallowed in large amounts or chronically toxic if swallowed in any amount consistently.
- Triclosan, an active ingredient in many toothpastes can combine with chlorine in tap water to form chloroform which is a human carcinogen. According to some scientists it can leave unborn babies brain damaged.
- Although in several studies whitening toothpaste show the ability to improve tooth color they have side effects.
- The most significant one is enamel and dentin abrasion which in turn leads to increased tooth sensitivity.

TOOTHPASTE FORMULATION

General toothpaste formulation composition contains:

1. Abrasives
2. Detergents
3. Water
4. Humectants
5. Thickening Agents
6. Flavor
7. Sweeteners
8. Preservatives
9. Corrosion Inhibitors
10. Colorants
11. Bleaches
12. Anticaries Actives
13. Anticalculus Agents
14. Desensitizing Agents
15. Antimicrobials /antiplaque/ antigingivitis agents



1. Abrasives:

- The main component responsible for cleaning the teeth.
- Should be abrasive enough to clean the tooth & avoid damage to tooth surface
- Ability depends on particles size, shape, & brittleness of the material.

EXAMPLES :

- hydrated silica
- calcium carbonate,
- calcium pyrophosphate
- dicalcium phosphate dihydrate



2. Detergents:

- major contributor to teeth cleaning process
- Should be tasteless, nontoxic, nonirritant, producing large volume of foam.

Examples:

- Sodium lauryl sulfate (SLS),
- Sodium lauryl sarcosinate



3. Humectants :


- Prevents toothpaste from drying out
- Glycerin (50% aq. solution)

EXAMPLES :

- Sorbitol
- hydrogenated starch hydrolysate
- Propylene glycol, PEG :

Disadvantage: *bitter taste*

Advantage : *1. sweet & coolness feeling*
2. anticaries



4. Thickening Agents:

- Needed to maintain the stability of high-solid dispersion
- Affect the dispersibility, foam character, and mouth feel

Examples:

- Sodium carboxymethylcellulose (interacts with cationic antimicrobials),
- Hydroxypropyl methyl cellulose (HPMC)
- hydroxyethyl cellulose (nonionic),
- Xanthan gum,
- carbomer



5. Flavour

- Influence consumer acceptance
- Leaves a fresh clean feeling after brushing
- Considered **highest cost** ingredient in the toothpaste formulation

Examples : Peppermint, spearmint, menthol, wintergreen, cinnamon,...



6. Sweeteners :

- Most flavor oils have bitter taste leaving the toothpaste formulation unpalatable without sweeteners
- Artificial sweeteners are used (non cariogenic effect like natural sugar)

Examples :

- Saccharin, sodium saccharin
- potassium acesulfame



7. Preservatives :

- Rarely used nowadays due to safety concerns
- Proper formulation ingredient selection can result in **preservative free** toothpaste

8. Corrosion inhibitors: :

- Used to avoid corrosion of the aluminum tubes (e.g. sodium silicate)
- Not needed nowadays due to the use of plastic tubes


9. Anticaries Actives :

- ➔ Fluoride ions reduce the incidence of carious lesion by **reducing** the acid solubility of tooth enamel

Examples :

- ➔ Sodium fluoride
- ➔ sodium monofluorophosphate
- ➔ stannous fluoride

- ➔ **FDA recommends levels of soluble fluoride ion between 850-1150ppm**



10. Anticalculus Agents :

Examples:

→ zinc chloride,

→ zinc citrate (Crest)

→ tetra sodium pyrophosphate,

→ disodium pyrophosphate (used more than zinc salts, and it has antiplaque activity)



11. Desensitizing Agent :

- Potassium Nitrate(5%)
- Compatible with fluoride, and has salty taste
- Ex. Sensodyne toothpastes

12. Antibacterial/Antiplaque/antigingivitis:

- Triclosan, Chlorhexidine, Zinc citrate.

GENERAL METHOD OF PREPARATION

- The preparations are preferably **made in stainless steel mixer container for large scale manufacture filled with slowly rotating blades .**
- It can be done for in **planetary mixer or similar mixer used for semisolid preparations. Small scale batch can be made in glass container.**
- The **gum is mixed with suitable quantity of humectant without any water** proper dispersion.
- Chloroform and talc. Can also be used for dispersion of binding agent. Other colloid may be disperse in water.
- Methyl cellulose should be mixed with cold water, but ethyl cellulose should be disperse in warm water.
- Other powder ingredient are sifted together and added gradually to mucilaginous mixture with continue Gentle stirring.


- Then aq. Media is mixed and stirred to get a product.
- Flavour and detergent added at the last.

Formula 1

Calcium carbonate	56.0 g
Na.lauryl sulphate	1.0 g
Glycerin	22.0 g
Gum tragacanth	1.5 g
Water	19.4 g
Saccharine	0.1 g
Flavour	q.s.
Preservative	q.s.



Anti-cavity Agents:

- (a) Sodium Monofluorophosphate ($\text{Na}_2\text{PO}_3\text{F}$)
 - (b) Sodium Fluoride (NaF)
 - (c) Organo (amine) Fluorides
 - (d) Stannous Fluoride (SnF_2)
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EVALUATION OF TOOTHPASTE

1. Test for abrasive character
2. Determination of particle size
3. Determination of cleansing property
4. Consistency
5. pH determination
6. Foaming power
7. Determination of fluoride ion
8. Stability
9. Determination of moisture and volatile matter
10. Limit test for heavy metal.