# DENTAL MATERIAL

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## Zinc Oxide and Eugenol cements

They are characterized by their sedative effect on the pulp due to presence of eugenol and their neutral pH.

- There are three main types under this classification:
- I. Conventional
- **II. Resin modified**

III. Orthoesxy benzoic acid modified zinc oxide and eugenol cements.

## I. Conventional ZnOE



**Powder:** 

A.Pure zinc oxide (69%): This is the main reactant with eugenol.

- **B. Rosin (30%):**
- **1. Reduced brittleness.**
- 2. Produces cohesive mass.
- **3. Reduces solubility**
- **C. Zinc acetate: It acts as accelerator.**



A. Purified eugenol (85%): The main reactant with ZnO.B. Olive oil (15%): It improves plasticity of the cement.

#### **Setting reaction:**

 $ZnO + H2O \rightarrow Zn (OH)2$  $Zn (OH)_2 + 2Eugenol \rightarrow Zn Eugenolate + H2O$  1) Trace amount of water is essential to initiate the reaction, but once started, it is a by-product of the setting reaction.

Without H2O, i.e. if eugenol is completely dehydrated before mixing with ZnO powder, the resulting will not harden.

2) The set material is a cored structure formed form an amorphous matrix of Zn eugenolate or Zn carboxylate holding together the unreacted powder

# 4) The resulting Zn eugenolate is highly stable & poorly dissociated.



**A. Working time:** The material is available in as slow setting and fast setting.

The slow setting takes 24 hours, while the fast one takes 5 minutes.

the working time is controlled by moisture availability, accelerators, and P/L ratio.

#### **B. Interaction with other dental materials:**

It inhabits the polymerization of the composite resin. Therefore, it should not be used under composites resin or as temporary cement for restoration that will be cemented by resin cements. **C. Biocompatibility:** it is the reference to other cements in biocompatibility due to:

1) The presence of eugenol that have anodyne and obtunding effect on the pulp in deep cavities.

2) When exposed directly to oral conditions, the material maintains good sealing characteristics.

**3)** The antibacterial action appears to facilitate pulpal healing; however, when in direct contact with connective tissue the material is an irritant.

**Eugenol is potential allergen.** 

#### Uses:

- 1) Mainly as temporary filling and cavity liner.
- 2) Temporary cementation of cast restoration.
- 3) Root canal sealer.
- 4) Surgical and periodontal dressings.

## II. Resin-modified zinc oxide eugenol

The aim behind modification is to overcome some shortcomings of conventional ZnOE, e.g., low strength, low abrasion resistance, and high solubility in oral fluids.

Ingredients	The role
<b>1. Powder</b> :	
ZnO	The main reactant
Natural or synthetic	Filler for reinforcement
resin	Accelerator
Zinc acetate	
2. Liquid	Main reactant
Eugenol	Accelerator
Acetic acid	Antimicrobial
Thymol	Strengthener

**Properties:** Because of the reinforcement by resin, it has higher compressive strength and film thickness and lower solubility than conventional ZnOE.

#### Uses:

1) Base under metallic restoration.

2) Permanent luting for cast restorations.

3) Temporary filling.

III. Modified zinc oxide-eugenol/ ethoxybenzoic acid (EBA) cements Incorporation of ethoxybenzoic acid (**EBA**) increases strength of ZOE cements. It has higher physical properties than conventional ZnOE cement and it has the same application like modified ZnOE cement.

#### **Composition:**

Mixtures 62.5% EBA and 37.5% eugenol, powder contains up to 30% of A 1 to increase strength.

#### **Properties:**

It has the thickest film thickness (40-70 $\mu$ m) among other cements, but still seems adequate for permanent cementation of restorations.

#### Uses:

1) Base under metallic restoration.

2) Permanent looting for cast restorations.

3) Temporary filling.

# **Cavity varnish**

It is a solution of resin in an organic solvent.

#### Uses:

- \* Seal the dentinal tubules.
- \* Reduce leakage around a restoration, e.g. under amalgam restorations to reduce leakage around margins and to prevent penetration of corrosion products to tooth structure.
- \* Act as a barrier to protect the tooth from highly acidic cements such as zinc phosphate.

#### **Contraindications:**

should not be used under:

1) Restorative resins (e.g. composite), because it will be disrupted by the monomers (organic solvent) present in these resins.

2) Therapeutic bases as will deprive the pulp form it.



**Uses:** protection the pulp tissue against chemical insults from restorative materials and providing therapeutic benefit to the pulp.

#### **Composition:**

Ca  $(OH)_2$  which could be supplied in three forms:-

1) Suspension of Ca  $(OH)_2$  powder in water.

2) Chemically cured Ca  $(OH)_2$ : supplied as two pastes.

3) light-cured Ca  $(OH)_2$  which is supplied as one past system containing Ca  $(OH)_2$  and Bus GMA, HEMA (hydrophilic polymer which can absorb water and so help in the release of Ca  $(OH)_2$ .

### **Properties:**

- a) Alkaline pH (11-12)
- b) It has bactericidal effect.
- c) It has low mechanical properties.
- d) It has high solubility in oral fluid.

