# **PURPOSES:**

- 1. Disinfection
- 2. Debridement
- 3. Demineralization
- 4. Lubrication
- 5. Stimulation of Repair



# **DISINFECTION:**

## **Requirements for root canal disinfection**

- 1. Effective as an antimicrobial agent
- 2. Non-Irritating
- 3. Stable in solution
- 4. Prolonged antimicrobial action
- 5. Active in the presence of blood, tissue and organic debris



# **DISINFECTION: (cont.)**

## **Requirements for root canal disinfection**

- 6. Not interfere with repair of periapical tissue
- 7. Not stain tooth structure
- 8. Easily introduced into root canals
- 9. Not toxic or carcinogenic
- 10. Not sensitizing

# **DISINFECTION: (cont.)**

## Solutions

- 1. Formocresol
- 2. Camphorated monochlorophenol (CMCP)
- 3. Cresatin
- 4. Eugenol
- 5. Chloramine T



# **DISINFECTION: (cont.)**

# Solutions (cont.)

- 6. Chlorhexidine Gluconate
- 7. Sodium Hypochlorite (Chlorinated Soda, Dakin's Solution)
- 8. Calcium Hydroxide
- 9. Iodine/ Potassium Iodide
- **10. Polyantibiotic Paste (PBSC)**
- 11. MTAD



## Formocresol (Buckley's Solution)



## Formocresol (Buckley's Solution) -cont.

## 2- Mode of Action:

#### Alkylation; Coagulation

MECHANISM OF ALKYLATION:

Phenols (cresol) causes coagulation proteins.



$$R-SH + H_{H} = 0 \longrightarrow R-S-H_{H} = 0$$

## Formocresol (Buckley's Solution) -cont.

## 3- Advantages:

**Highly bactericidal** 

4X more potent than phenol (phenol coefficient=4)

Does not require contact for antibacterial action (vapors are effective)



# Formocresol (Buckley's Solution) -cont.

#### 4- Disadvantages :

Highly cytotoxic Causes severe inflammatory tissue reactions Highly volatile – lost from root canal over time Possibly carcinogenic

#### **5- Method of Application:**

saturated/ blotted cotton pellets sealed into pulp chamber

#### **#2 Camphorated Monochlorophenol (CMCP)**

#### **1- Composition :**

#### 2- Mode of Action: coagulative antiseptic

Looks similar to the cresols but has a chloride attached to it.

It's a derivative of phenol and works similar again causing COAGULATION



## **Camphorated Monochlorophenol (CMCP)**

- 3- Advantages : Highly bacteriocidal
- 4- Disadvantages :

Highly toxic and irritating to tissue Most be in direct contact to be effective (vapors not effective)

5- Method of Application : Saturated/ blotted cotton pellets sealed in pulp chamber

## #3 Cresatin

#### 1- Composition : acetic acid ester of metacresol



#### 2- Mode of Action: coagulative antiseptic

# Cresatin

#### **3- Advantages :**

Less irritating than other phenolic antiseptics

#### 4- Disadvantages :

Only weakly bacteriocidal Requires direct contact for bacteriocidal effect

## **5- Method of Application :**

Saturated/ blotted cotton pellets sealed in

pulp chamber



## Eugenol

- **1- Composition :**
- 2- Mode of Action: coagulative antiseptic
- 3- Advantages: moderately antiseptic



# #4 Eugenol (cont.)

4- Disadvantages :

Highly irritating and inflammatory (on direct contact) Requires direct contact (vapors not effective)

5- Method of Application : Saturated/ blotted cotton pellets sealed in pulp chamber



# #5 Chloramine T

- **1- Composition :**
- 2- Mode of Action: Released Chlorine acts as oxidizing agent
- 3- Advantages: Non-irritating



# Chloramine T (cont.)

#### 4- Disadvantages :

Does not have solvent action on necrotic pulp as does Sodium Hypochlorite

#### **5- Method of Application :**

Used to irrigate root canal

## #6 Chlorhexidine Gluconate (Peridex)

#### **1- Composition :**



## Chlorhexidine Gluconate (Peridex)- cont.

#### **2- Mode of Action:**

- Positively charged portions of chlorhexidine bind to negatively charged groups on cell surfaces (Phosphates on lipids and carboxyl groups on proteins)

- Lipophilic group of molecule react with lipoproteins to cause disorganization of cell membrane
- Increases permeability of cell membrane
- Causes leakage of low molecular weight substances from cells

# Chlorhexidine Gluconate (Peridex)- cont.

#### **3- Advantages:**

- Non-Irritating
- High Substantivity

#### 4- Disadvantages

- Only moderate aseptic action
- Possible emergence of resistant strains
- Not active against bacterial endospores, some fungal spores or viruses

-Forms precipitates with either NaOCI or EDTA

-Breakdown product (parachoroaniline) may be carcinogenic

## Chlorhexidine Gluconate (Peridex)- cont.

#### 5- Method of Application: - Used to Irrigate root canal



# **#7 Sodium Hypochlorite**

- 1- Composition : NaOCI (Used in 5.25%-6.0% solution)
- 2- Mode of Action: Liberates free Chlorine

Most commonly used

- 3- Advantages:
  - Has solvent action on necrotic pulp tissue and organic debris
  - Highly antiseptic



# Sodium Hypochlorite (cont.)

#### 4- Disadvantages :

- Extremely irritating and caustic (must not come into contact with periapical tissue)
- Does not inactivate or degrade LPS

#### **5- Method of Application:**

- Used as irrigant (gently/ passively)

Use as gently as possible to prevent exposure to the patient (forcing it down thru the root canal, can cause severe burns to patient.

# **#8 Calcium Hydroxide**

1- Composition : Ca(OH)<sub>2</sub>

## **2- Mode of Action:**

pH 12.2 – high pH kills almost all organisms it comes in contact with! Itroduced and packed down as a thick paste so it fills the Root Canal space

# 3- Advantages:

- "Fills space"
- Remains in canal a long time

# **Calcium Hydroxide**

#### 4- Disadvantages : -Not effective against some endodontic microorganisms such as *E. faecalis*

# -Requires at least 1 week intracanal application to be effective in eliminating bacteria.

#### Ca(OH)<sub>2</sub>

#### **5-Mode of Application**

Ca (OH) 2



1-High pH may favor calcification
2-Calcium proteinate precipitate formed
3-Induction of hard tissue-producing cells may be due to mild irritation to pulp from calcium-protein preciptate

# **#9 Iodine/ Potassium Iodide**

#### 1- Composition : lodine 2% Potassium lodide 4%



#### 2- Mode of Action: Oxidizing antiseptic, attacks sulfhydryl groups of proteins

# Iodine/ Potassium Iodide (cont.)

- 3- Advantages:
  - High antimicrobial
  - Much less (100X) irritating than phenolic antiseptics
  - Vapors have antimicrobial activity (does not require direct contact)
  - -Effective against E. faecalis & Candida albicans

## 4- Disadvantages

- Solution loose activity with age
- Stains

# Iodine/ Potassium Iodide (cont.)

# 5- Method of Application:

Used to irrigate canals



# **#10 Polyantibiotic Paste (PBSC)**

1- Composition :

Penicillin, Bacitracin, Streptomycin, Sodium Caprylate

2- Mode of Action: Penicillin and Bacitracin – inhibit bacterial cell wall synthesis Streptomycin - inhibit bacterial protein synthesis Sodium Caprylate – disrupts fungal cell membranes

# Polyantibiotic Paste (PBSC)- cont.

#### 3- Advantages:

- Highly antimicrobial
- Highly specific in action

#### 4- Disadvantages

- Mildly irritating
- Can sensitize the patient to the drug
- Can result in emergence of resistant organisms

# Polyantibiotic Paste (PBSC)- cont.

#### 5- Method of Application:

#### PBSC made into a paste with a silicone vehicle is packed into the canal



# #11 MTAD

- 1- Composition:
  - Doxycycline
  - -Citric Acid
  - -Tween 80 (detergent)
- 2-Mode of Action:

Doxycycline-Inhibits bacterial protein synthesis Citric Acid-Chelating agent

**Tween 80-Solubilizing agent/surfactant** 

# MTAD

#### 3-Advantages:

Less irritating than many other disinfectants

#### -Claimed to be more effective than other disinfectants in rendering root canals bacteria-free

- 4-Disadvantages:
  - -Claims of superior disinfection capabilities are controversial [JOE, 33(1):48-51, 2007] -Must be used for a 5 minute irrigation

# MTAD

#### **5-Method of Application:**

- Used as an irrigant (in combination with NaOCI)
- -Applied for 5 minutes



# DEBRIDEMENT

- 1. Calcium Hydroxide + Sodium Hypochlorite
- 2. Hydrogen Peroxide + Sodium Hypochlorite
  - **1. Allows Effervescence to occur**
- 3. Urea Peroxide + EDTA (RC Prep) +

**Sodium Hypochlorite** 

# DEMINERALIZATION

#### EDTA – Ethylenediamine tetraacetic acid

#### **RC Prep contains EDTA**





 EDTA (RC Prep) + Urea Peroxide in carbowax vehicle





#### EDTA (RC Prep)

# LUBRICATION

**Intracanal Medicaments and Irrigants** 

# **STIMULATION OF REPAIR**

## **Calcium Hydroxide**

- 1. High pH may favor calcification
- 2. Calcium proteinate precipitate formed
- 3. Induction of hard tissue-producing cells may be due to mild irritation to pulp from calcium-protein precipitate