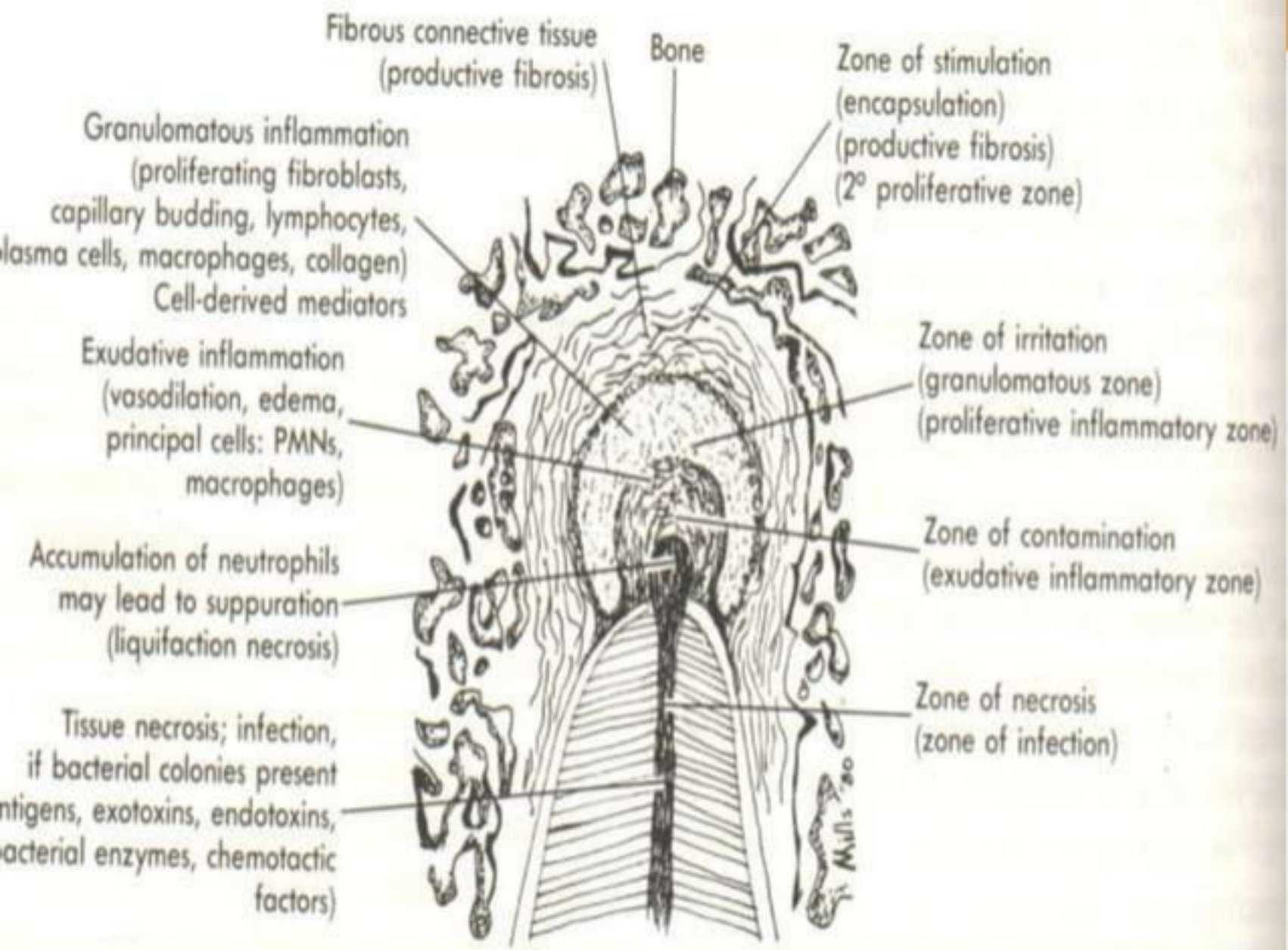
ENDODONTIC MICROBIOLOGY

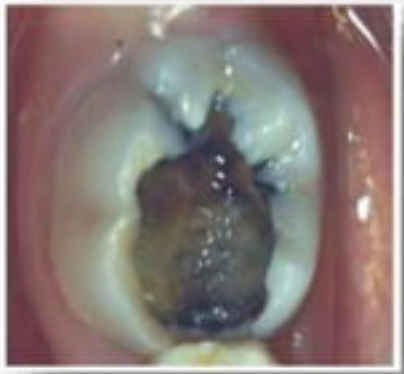
Why???

- Effective diagnosis
- Treatment of endodontic infection
- Knowledge of endodontic pathology


Fibrous connective tissue
(productive fibrosis)
Bone
Zone of stimulation
(encapsulation)
(productive fibrosis)
(2° proliferative zone)
Granulomatous inflammation
(proliferating fibroblasts,
capillary budding, lymphocytes,
lasma cells, macrophages, collagen)
Cell-derived mediators
Zone of irritation
(granulomatous zone)
(proliferative inflammatory zone)
Exudative inflammation
(vasodilation, edema,
principal cells: PMNs,
macrophages)
Zone of contamination
(exudative inflammatory zone)
Accumulation of neutrophils
may lead to suppuration
(liquifaction necrosis)
Zone of necrosis
(zone of infection)
Tissue necrosis; infection,
if bacterial colonies present
ntigens, exotoxins, endotoxins,
acterial enzymes, chemotactic
factors)

PORTALS ???

- Open Cavity
- Dentinal tubules
- PDL/Gingival sulcus
- Anachoresis
- Faulty restoration



classificaton

- Gram positive:
- Gram negative
- Obligate aerobes: requires oxygen
- Facultative anaerobes: presence/ absence oxygen
- Micro aerophillic: grow in oxygen environment but derive energy from fermentive pathway
- Obligate anaerobes

Pathogenicity ???

- Ability of micro organism to produce diseases.

virulence ???

- Degree of pathogenicity
- **Hobson equation** = no. of microorganism * virulence of

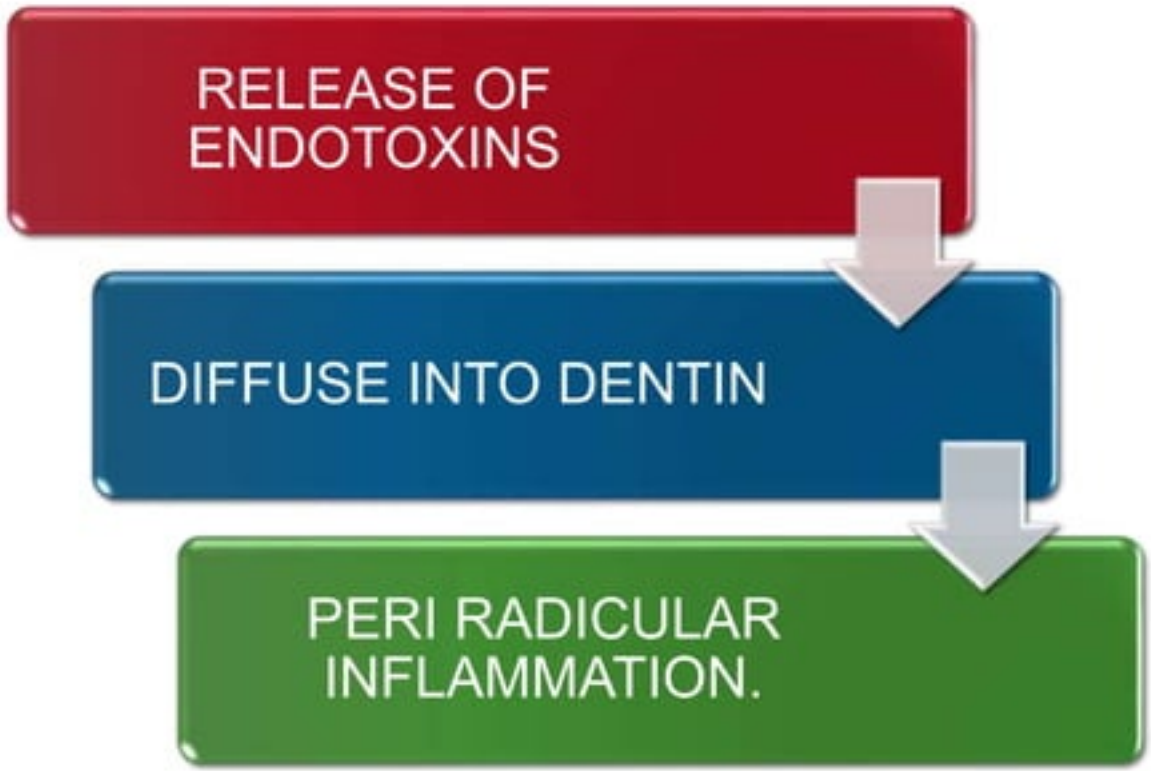
$$\frac{\text{microorganism}}{\text{Resistance of host}}$$

Virulent factor ???

- Lipo poly saccharides
- Extracellular vesicles
- Enzymes
- Fatty acid
- Polyamines

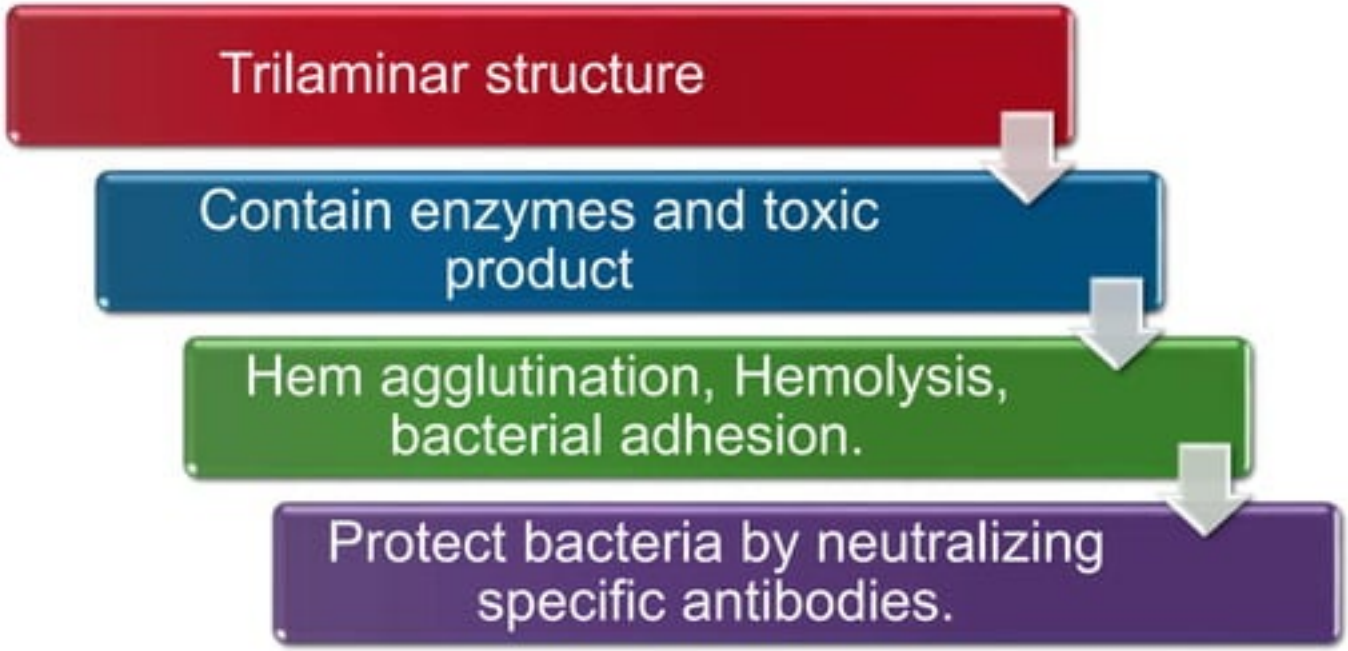
Lipo poly saccharides

- Protein on surface of GRAM NEGATIVE BACTERIA.



Extracellular vesicles

- Produce on surface of GRAM NEGATIVE BACTERIA. In the form of endotoxin.



Enzymes

- Produce on surface of BACTERIA.

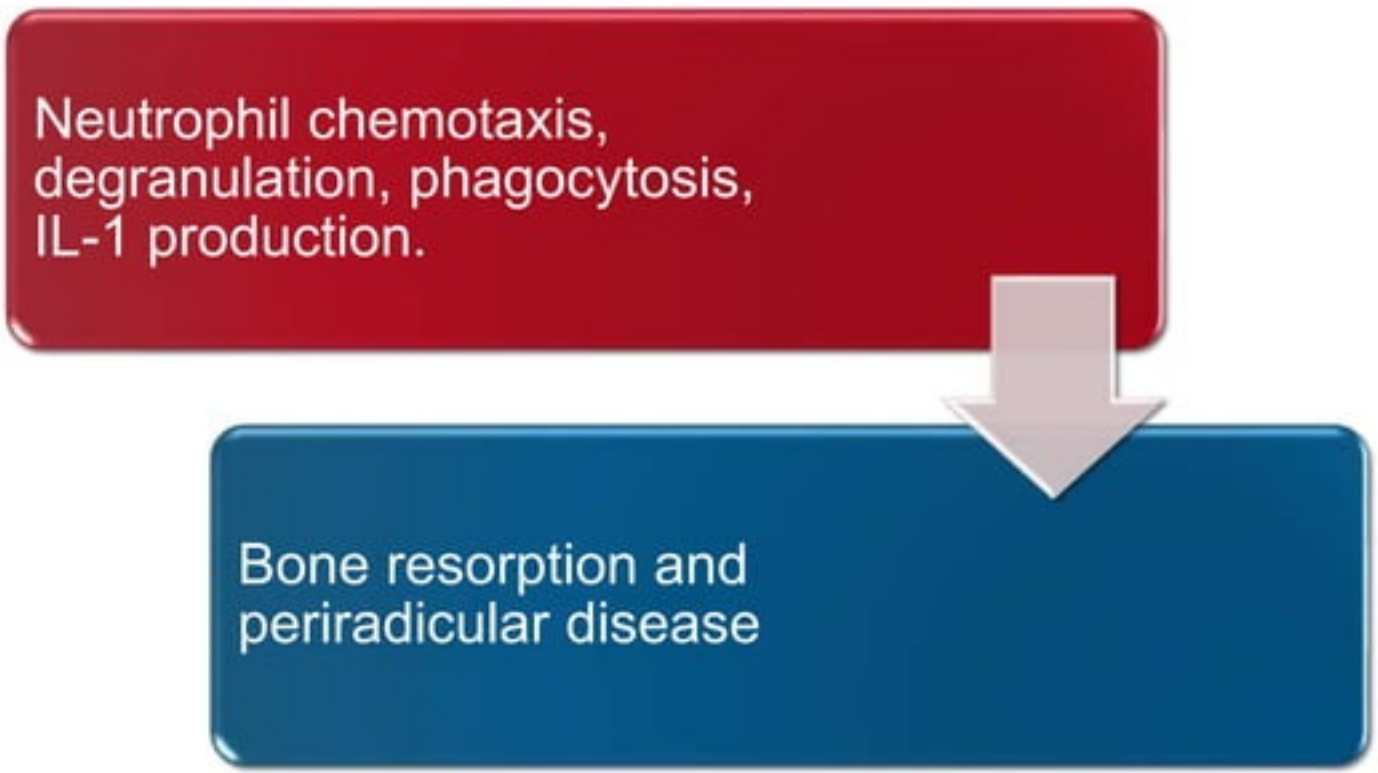
Help in spread of infection and neutralization of Ig & complement component.

Release hydrolytic enzymes

Degenerate and lyse to form purulent exudates and have adverse effect on surrounding tissues.

Fatty acid

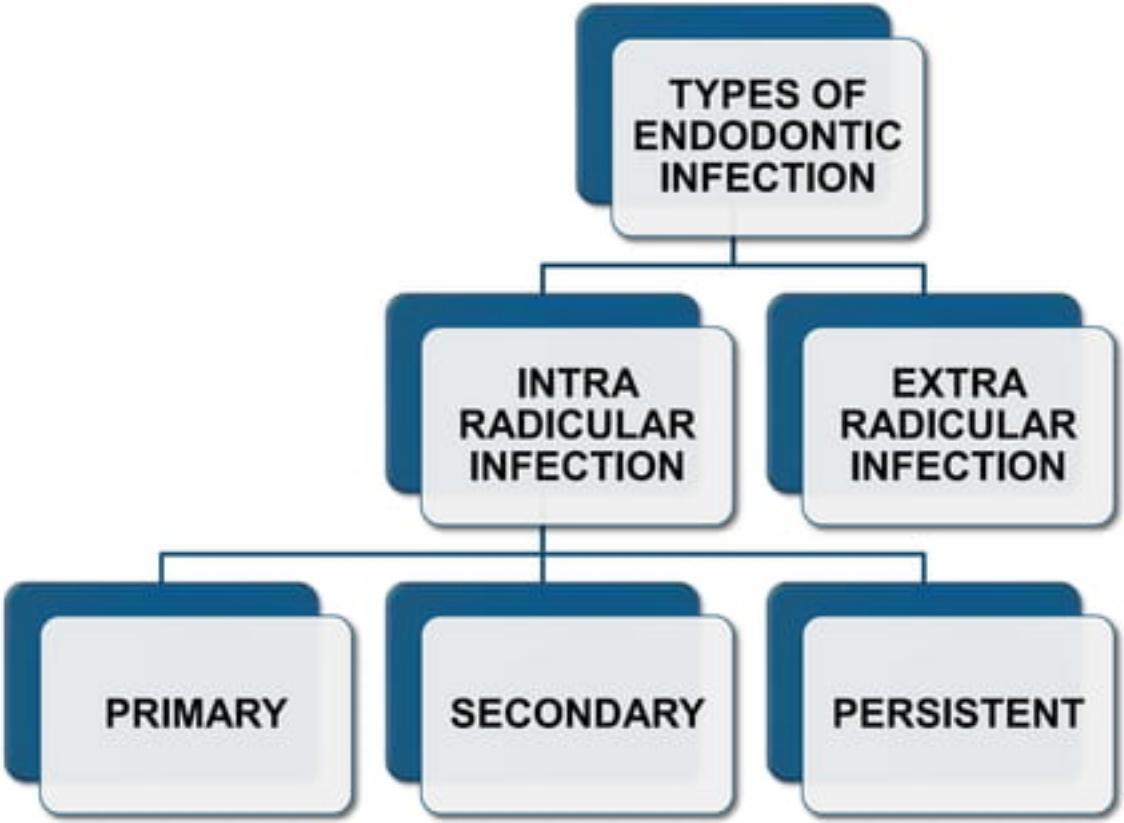
- Propionic acid , butyric acid produce by anaerobic bacteria.



Polyamines

- Biologically active chemical found in infected canal.

TYPES OF ENDODONTIC INFECTION:



INTRA RADICULAR INFECTION

Micro organism present within the Root Canal System

Primary INTRA RADICULAR INFECTION

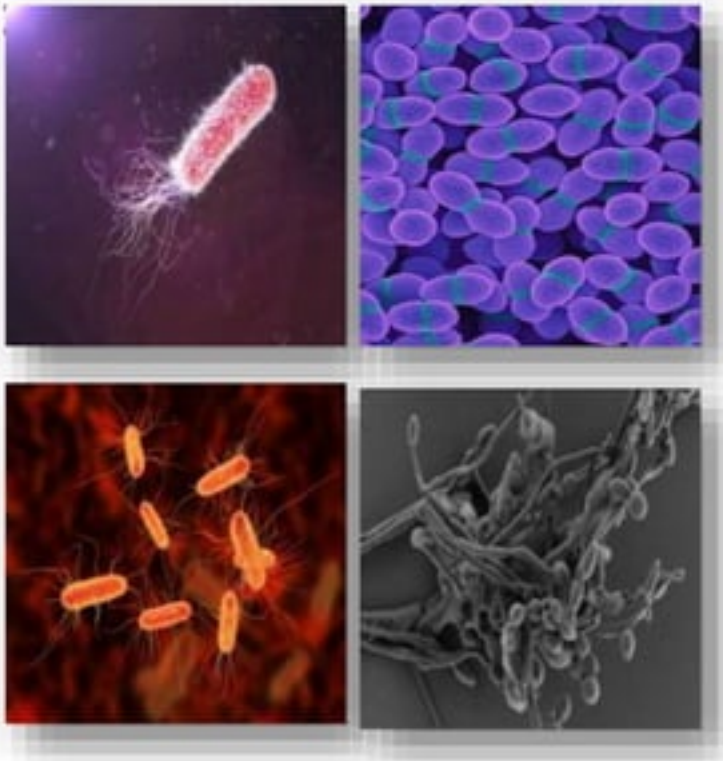
- Characterized by presence of mixed habitat

- Mainly dominated by:
  - Gram negative anaerobic bacteria
  - Prevotella
  - Fusobacterium
  - Treponemas
  - Campylobacter
  - porphyromonas

Secondary INTRA RADICULAR INFECTION

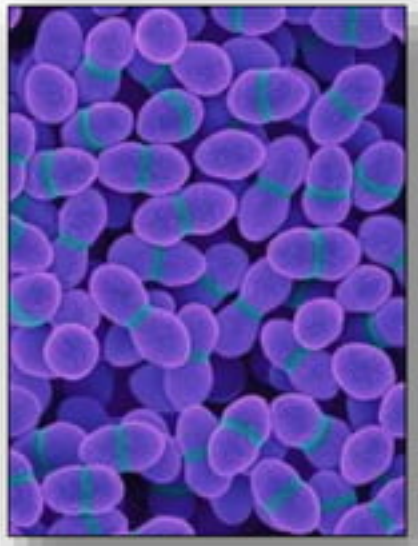
- Introduced during and after treatment.

- Commonly found micro-organism
  - Pseudomonas aeruginosa
  - Staphylococcus
  - E.coli
  - E.faecalis
  - Candida sp.



persistent INTRA RADICULAR INFECTION

- E .faecalis is most commonly found bacteria.
- Major role in etiology of persistent periapical lesions.
- Gram positive cocci and facultative anaerobe



Reason why E .Faecalis survived

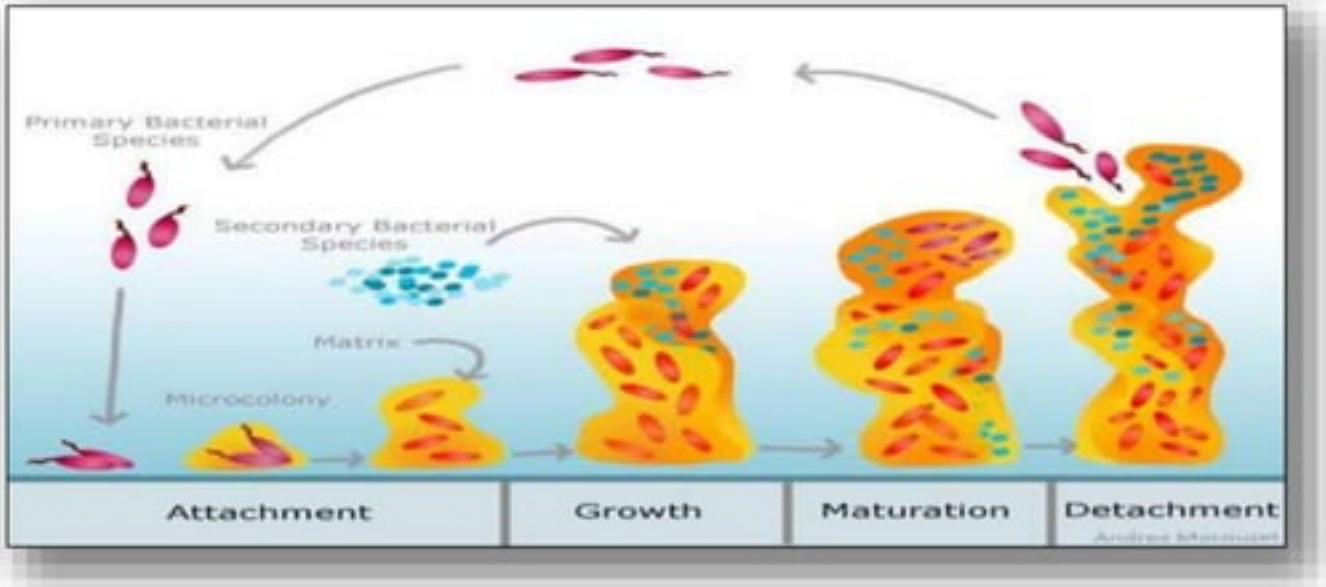
- Persist in poor nutritional environment of root canal
- Survive in presence of medicament.
- Stay alive in presence of irrigants
- Forms biofilm in medicated canal.
- Penetrate and utilize fluid from dentinal tubules
- Survive prolong period of starvation
- Survive in low pH and temperature.
- Acquire resistance to antibiotics

Extra radicular infection

- It can be dependent or independent of Intra radicular infection.
- Commomly found micro organism:
  - Actinomyces sp
  - Treponema sp
  - P. gingivalis
  - F. nucleatum
  - P. endodontalis

biofilms

- Community of micro colonies of micro organisms in an aqueous solution that is surrounded by matrix made of glycocalyx, which also attaches bacterial cells to a solid substratum.



biofilms

- According to Caldwell et al biofilm has the following attributes:
- Autopoiesis: ability to self organize
- Homeostasis: ability to resist environmental disturbance.
- Synergy: effective in association with fellow micro organism than isolation.
- Communality: responds to environmental challenges as combined unit

biofilms

- Responsible for endodontic failures.
- Ability to protect the bacteria from environment as well as help entrap nutrient for growth of microbial constituents.
- Offer safe environment for the exchange of genetic material amongst bacteria.
- Inherent resistance to antimicrobial agent.

Classification of biofilms

- Intracanal microbial biofilm:
  - Formed on radicular dentin in infected canal.
  - E.faecalis responsible for most therapy resistant and prevalent endodontic biofilm

Classification of biofilms

- Extra-canal microbial biofilm:
  - Cemental surface around root apex of endodontically infected tooth.

Classification of biofilms

- Periapical microbial biofilm:
  - Isolated biofilm
  - Independent of internal /external surface of root canal.
  - Actinomyces and P. propionicum to form periapical lesion resistant to endodontic therapy.

Identification of bacteria

- 1. Gram's stain:
  - Help to differentiate gram positive and negative organism.

Identification of bacteria

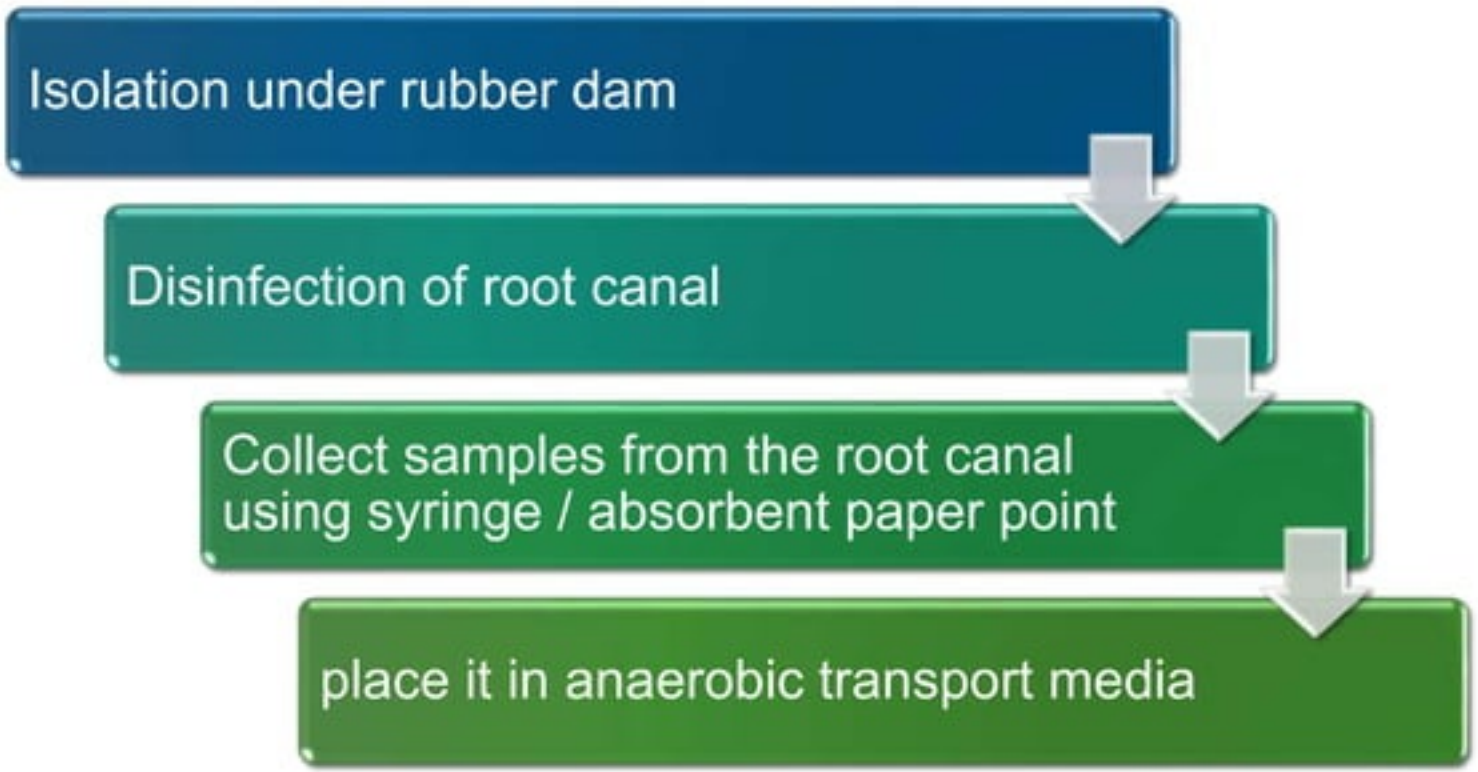
2. Culture:

Principle:

to grow and isolate the microflora for antibiotic sensitivity and resistance

determine the effectiveness of debridement procedure before obturation

How culturing is done



Molecular diagnostic methods

- Identify the microorganism using gene as target which is unique for each species.
- DNA-DNA HYBRIDIZATION
- POLYMERASE CHAIN REACTION

DNA-DNA HYBRIDIZATION

- Uses the DNA probes which target genomic DNA
- Advantage:
  - Can be used for epidemiological research
  - Simultaneous detection of multiple species

Polymerase chain reaction

- In vitro replication of DNA
- " GENETIC XEROXING"
- Advantage:
  - Remarkable specificity and sensitivity
  - Microbial diversity can be investigated.

Thank you !!!!


Dettol
E45
Dettol
E45
Lotus Flower
One day, I'll be a scientist &
Invent a soap that kills those
Remaining 0.01% germs.