

Objectives
Type of microorganisms found in endodontic Infections
Primary endodontic infection
Secondary endodontic infection
Biofilms
Antimicrobial Agents in Endodontics
Peri-radicular response to infections
Management of abscesses and cellulitis

Type of microorganisms found in endodontic Infections

- Aerobes
- · Streptococcus sp.: S.mitis, S.salivarius
- -Anaerobic
 - Streptococci : Pepto streptococcus
 - Enterococci: E. faecalis
 - · Bacteroides sp.: Porphy romonas, Prevotella
 - Actinomyces
- Fungi: Candida albicans
- Fusobacteria
- -Spirochetes
- -Viruses

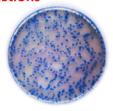


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Type of microorganisms found in endodontic Infections

Aerobes (Streptococcus sp.: S.mitis, S.salivarius)

- Beta hemolytic &#non-hemolytic streptococci
 →Less pathogenic
- S.mitis from root canal infection → pacterial endocarditis





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Type of microorganisms found in endodontic Infections

Anaerobes: Enterococci

- Is#acultative bacteria, frequency in #ndodontic failure
- Common in GI tract#
- <u>Enterococcus faecalis</u> (Difficult to be removed from the root canal) resistant to antibiotic)
- Resistance to benzylpenicillin, ampicillin, clindamycin, metronidazole & tetracycline
- Sensitive to #rythromycin & #ancomycin
- Treatment with #alcium hydroxide+ #rythromycin #etracycline

(Molander and Dahlen 2003)



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Type of microorganisms found in endodontic Infections

Anaerobes: Bacteroides

- Polymicrobial infection
 (facultative anaerobes → reduced oxygen→#
 Bacteriodes#rowth)
- Sensitive to Metronidazole & €lindamycin#
- Resistance to penicillin (beta-lactamase)

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Type of microorganisms found in endodontic Infections

Anaerobes: Bacteroides

- Is*trictly anaerobes, short chain, *eram negative rods and coccobacilli, common in dental plaque, non motile, no spore
- Have polysaccharide capsule :it is virulence factor
- → #erious anaerobic infection as #epsis, abscess
- Manufacture ndotoxin & proteases

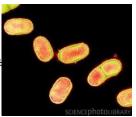


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Type of microorganisms found in endodontic Infections

Anaerobes: Bacteroides

- 2genera the porphyromonas & revotella
- Porphyromonas is #sacharolytic bacteria, short chain, #gram negative rods, non motile, no spore
- –P.gingivalis common in ***ubgingival sulcus** → # periodontal infection
- -P.endodontalis (first from#oot canal infection)
 common in#ental root canal, periodontal pocket,
 dental plaque →endodontic abscess (Samaranayake 2002)



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Type of microorganisms found in endodontic Infections

Anaerobes: Bacteroides

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Anaerobes: Actinomyces

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Fig. 1.—An electron intersecepe view of a whole cell prepara Actionspice steads, stain L110B. Main picture shows a magnified view of the circular domacated area of one of the locteria in the rectangular inset. The lastrike finishtse can be protrucing through a fuzzy coal. which covers the entire sur

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Type of microorganisms found in endodontic Infections

Fungi

 Candida albicans can be found in the root canal walls in the form of <u>blastospores</u> and <u>hyphal</u> structures, <u>which can diffuse through the dentinal</u> tubule.



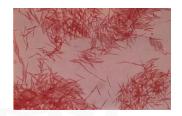


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Type of microorganisms found in endodontic Infections

Fusobacteria: Fusobacterium nucleatum

 All of F. nucleatum associated with severe pain, swelling and flare-ups case.





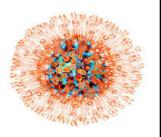


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Type of microorganisms found in endodontic Infections

 The presence of viruses in the root canal has been reported only for non-inflamed vital pulps of patients infected with human immunodeficiency virus and herpes viruses where living cells are found in abundance.



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Primary endodontic infection

- Primary infection is caused by microorganisms that initially invade and colonize the necrotic tissue.
- •Primary infections are characterized by a mixed clostridium composed of 10-30 species per canal.
- •The number of bacterial cells in an infected canals varies from 10³-10⁸ cells.



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Primary endodontic infection

Black pigmented bacteria

In 1980, Griffee et al reported that B.melaninogenicus was found to be significantly related to pain, sinus tract formation, and foul odor.

Prevotella

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Porphyromonas

They seem to play important role in etiology of both symptomatic and asymptomatic apical periodontitis.



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Primary endodontic infection

Fusobacterium nucleatum

- •Gram negative obligate nonmotile anaerobe bacteria.
- •Most common in symptomatic infection and abscess or exacerbation lesion than asymptomatic infection.

Spirochete bacteria

•They have been detected in both symptomatic and asymptomatic lesion

Dewhirst et al 2000 Baumgartner et al 2007 Rocas et al 2003

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Secondary endodontic infection

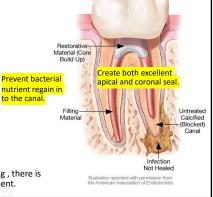
Inadequate treatment or re-infection of the root canal composition similar to the initial infection Possible resistant species

- Enterococcus faecalis
- · Candida species

Extra-radicular

- Actinomycoses
- Propionibacterium

If microorganisms are allowed to remain at the time of filling, there is increased risk of adverse outcome of the endodontic treatment.



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Secondary endodontic infection

Fungi in secondary infection

- It is also possible that yeasts from oral cavity gain access to root canal as contaminant during endodontic procedures.
- Or they can overgrow after inefficient intracanal antimicrobial procedures, which can cause imbalance in microbiota.

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Secondary endodontic infection

Fungi in secondary infection

 The occurrence of yeasts were taken from samples that not responding in favorably to conventional treatment (72% of cases).

Candida albicans was the most common species.

- By the new detection technology, C.albicans was detected in primary infection in 21% too.
- However the finding indicates that yeasts may be present in low number at the start of treatment, and they may reach higher proportion during root canal procedures.

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Secondary endodontic infection

E. feacalis in secondary infection

Facultative anaerobe, Gram positive coccus.

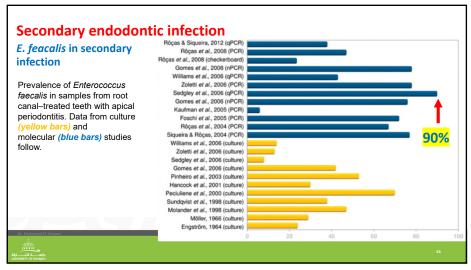
- This species has been found in low prevalence value in case primary infection and more relate in asymptomatic cases than symptomatic cases.
- E. feacalis has been found in root filled teeth with persistent apical periodontitis in prevalence values ranging from 30-90% of the cases.
- This species can be inhibited by other members of mixed bacterial consortium commonly present in primary infection.



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Secondary endodontic infection

- Studies have revealed that E.feacalis has ability to penetrate far 300micro m into dentinal tubules that can escape from intracanal instrumentation and irrigants.
- E. feacalis has been shown to be able to form biofilms in root canals and this ability can be important for bacterial resistance and persistence in the instrumented canals



resistance and persistence in the instrumented canals.

Biofilms
Definition
The colonization and proliferation of microorganisms at surface and solution interface; especially problematic in the small-bore water lines of dental unit.

Secondary Bacterial Species

Matrix

Microcolony

Attachment

Growth

Maturation

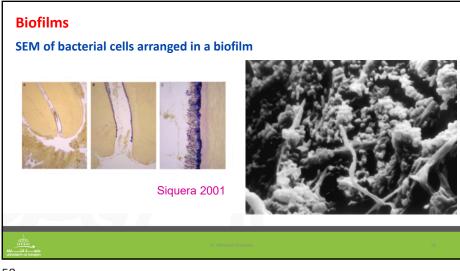
Detachment

Andrea Macoure

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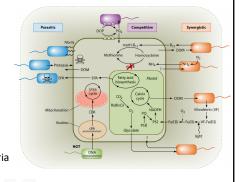
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Biofilms

Microbial Interactions

- Antagonistic
 - Competition for nutrients
 - · Production of toxic metabolites
 - H2O2, ammonia, sulphur, acids, nitrite.
 - Bacteriocins
- Synergistic
 - Consumption of O2 by facultative anaerobes
 - Production of nutrients for other bacteria
 - Proteolytic degradation of proteins



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Antimicrobial Agents in Endodontics Sodium hypochlorite Calcium hydroxide

- Ledermix
- Leacinn
- Odontopaste
- EDTA
- Others:CHX,
 - H2O2,
 - camphorated monochlorophenol (CMCP)
- Er:YAG lasers had an anti-biofilm effect at a low energy and could reduce numbers of species of biofilm-forming cells.



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Periradicular Response To Infections

- The peri-radicular inflammatory tissue is capable of an immunologic response to bacteria and bacterial byproducts.
- The cells associated with an <u>untreated</u>, infected root canal are **T** -lymphocytes.
- The cells associated with endodontically <u>treated</u> teeth had more **B-lymphocytes** than T-lymphocytes.
- The presence of IgG, IgA, IgM, or IgE have been demonstrated .

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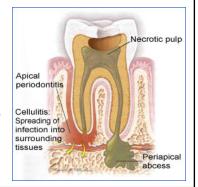
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Endadantis Microbiology

Periradicular Response To Infections

Abscess

- It is an accumulation of purulent exudate, consisting of bacteria, bacterial by-products, inflammatory cells (mainly neutrophils), lysed inflammatory cells, and the contents of those cells (e.g., enzymes).
- Abscesses of <u>periodontal origin</u> contain 30% to 58% spirochetes, whereas abscesses of <u>endodontic</u> origin contain less than 10% spirochetes.



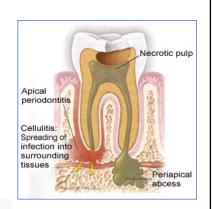
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Periradicular Response To Infections

- Abscesses and cellulitis are the result of bacteria invading and infecting periradicular tissues.
- Chemotaxis of neutrophils is a nonspecific inflammatory response to the presence of bacteria in normally sterile tissues
- With accumulation of neutrophils and the resulting purulent exudate, an acute apical inflammatory response develops.



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Periradicular Response To Infections

A cellulitis

• It is defined as a diffuse, erythemous, mucosal or cutaneous infection that may spread to deeper facial spaces and become life threatening.





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Management of Abscesses and Cellulitis

- Most endodontic infections can be effectively treated without the use of adjunctive antibiotics.
- The appropriate treatment is removal of the cause of the inflammatory event.





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Endadontia Microbiology

Management of Abscesses and Cellulitis

- The prescription of antibiotics is not recommended for:
- 1. irreversible pulpitis,
- 2. acute apical periodontitis,
- 3. a draining sinus tract,
- 4. after endodontic surgery,
- after incision for drainage of a localized swelling (without cellulitis, fever, or lymphadenopathy).
- Analgesics (not antibiotics) are indicated for the treatment of pain.





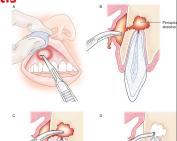
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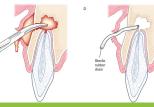
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Management of Abscesses and Cellulitis

- Aggressive incision for drainage is indicated for a cellulitis, (whether the cellulitis is indurated or fluctuant).
- Incision provide a pathway of drainage to prevent further spread of the abscess and/or cellulitis.
- An incision for drainage allows decompression of the increased tissue pressure associated with edema.
- Provides significant pain relief for the patient.

The incision provides a pathway for not only bacteria and bacterial by-products but also for the inflammatory mediators associated with the spread of cellulitis.





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Management of Abscesses and Cellulitis

Management of Abscesses and Cellulitis

 The use of adjunctive antibiotics is recommended in conjunction with appropriate endodontic treatment for progressive or

persistent infections or both, which have any of the following

• These include fever (>37.5°), malaise, cellulitis, unexplained

trismus, and progressive or persistent swelling or both.

- A minimum inhibitory concentration of antibiotic may not reach the source of the infection because of:
- 1) Decreased blood flow

systemic signs and symptoms.

2)The antibiotic must diffuse through the edematous fluid and pus.

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Indodontic Microbiology



What are the types of microorganisms found in endodontic infection?

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