Iodine in dental endodotic practice

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Aims of root canal treatment

- Bacteria free root canal- free of microorganisms by means of chemomechanical treatment
- Mechanical debridement so a proper permanent root filling can be performed

Treated root canal

Impact of persisting bacteria on periapical healing after 2 years in one study in humans (Molander et al 2007) and one experimental study in monkeys (Fabricius et al 2006).

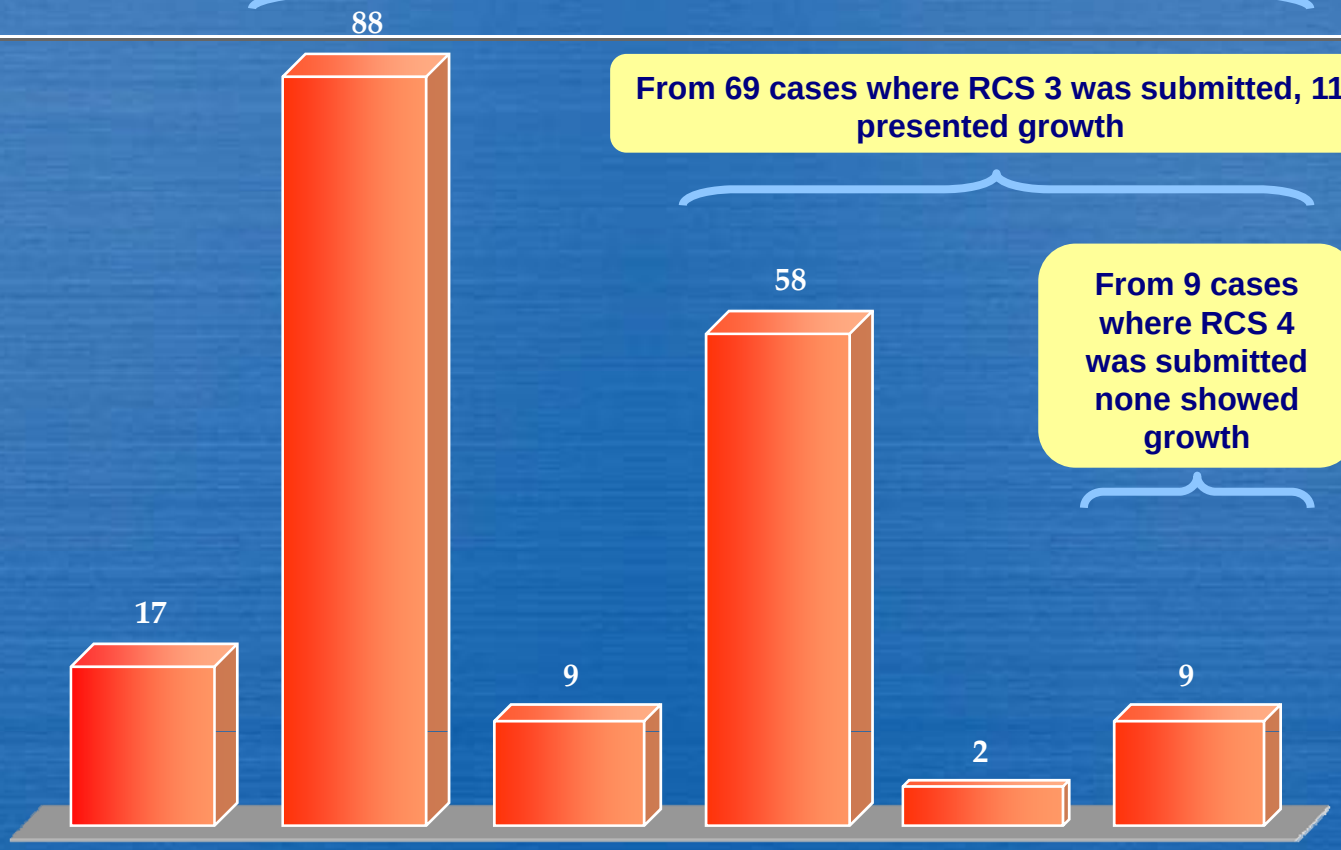
Study	Negative bacterial sample and healed	Negative bacterial sample and not healed	Positive bacterial sample and healed	Positive bacterial sample and not healed	Odds Ratio for healing
Molander et al 2007 n=101, 2 year follow up	49 80% of the negatives	12 20% of the negatives	18 44% of the positives	22 54% of the positives	5.0 if negative 0.82 if positive
Fabriciuset al 2006 n= 175 2 year follow up	61 72% of the negatives	24 28% of the negatives	19 21% of the positives	71 79% of the positives	2.6 if negative 0.27 if positive

From 276 cases, 183 presented growth in RCS 1

From 166 cases where RCS 2 was submitted, 78 presented growth

From 69 cases where RCS 3 was submitted, 11 presented growth

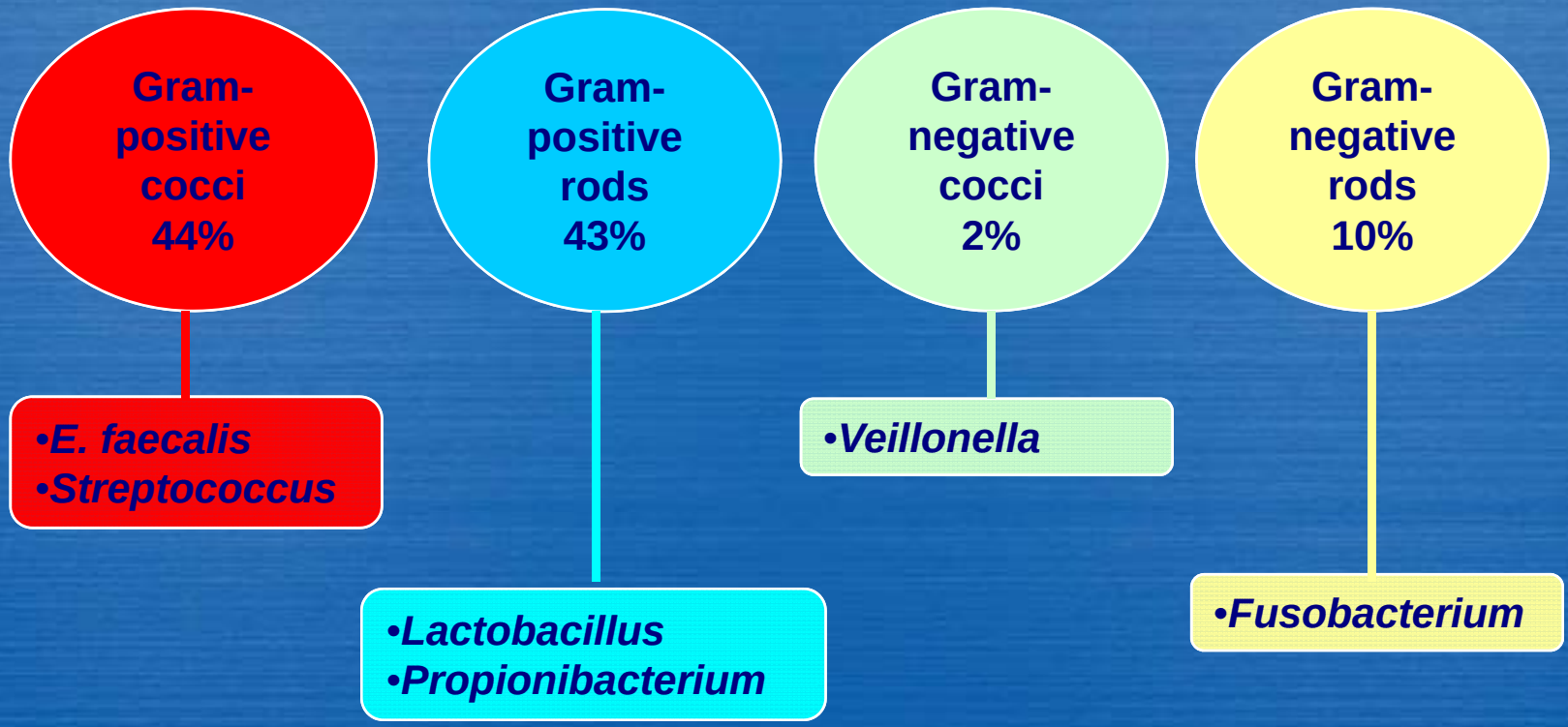
From 9 cases where RCS 4 was submitted none showed growth



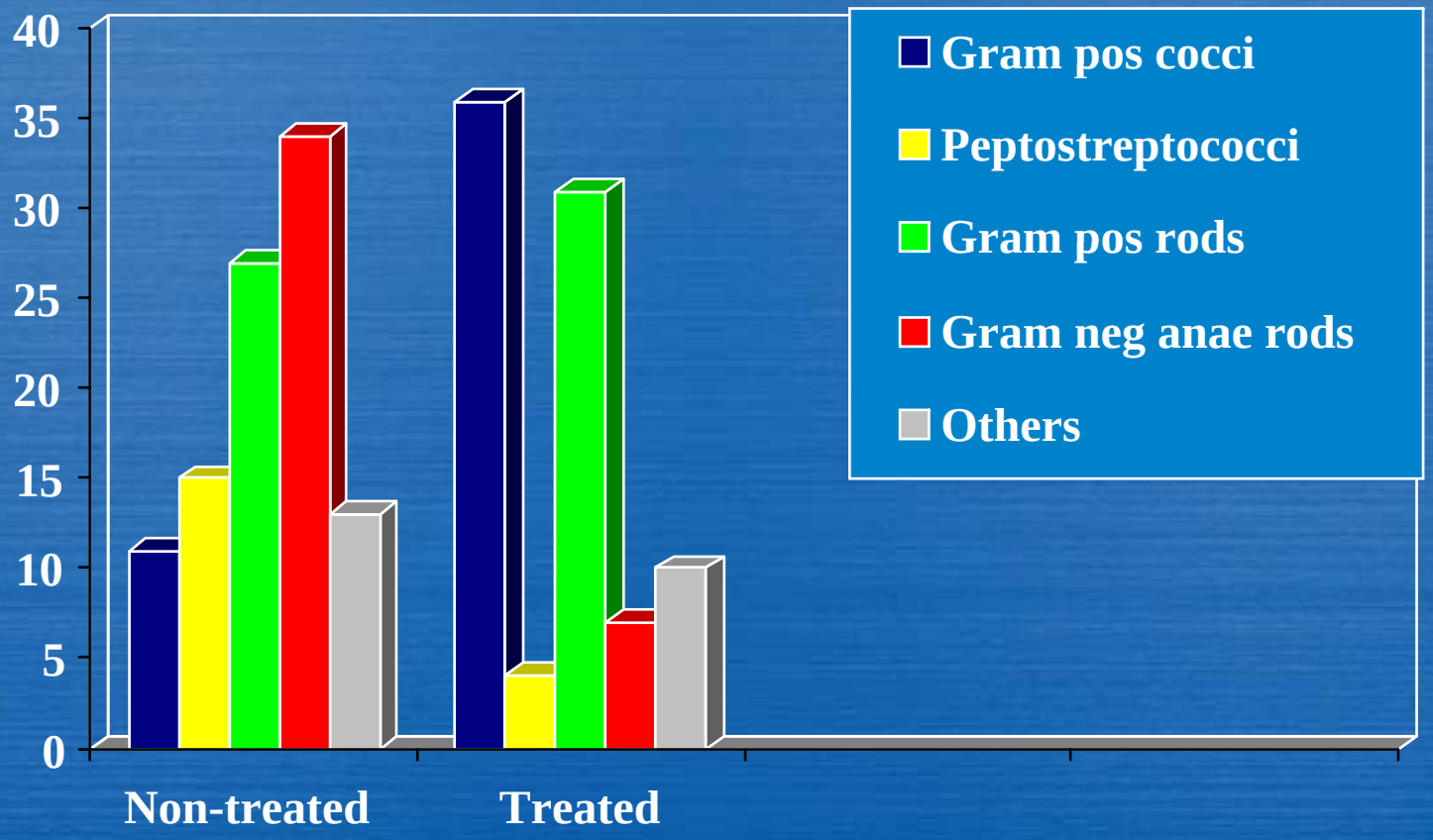
First sample	+	+	+	+	+	+
Second sample	////////////////////	-	+	+	+	+
Third sample	////////////////////	////////////////////	////////////////////	-	+	+
Fourth sample	////////////////////	////////////////////	////////////////////	////////////////////	////////////////////	-

A total of 276 teeth

183 presented bacteria, 405 strains



Comparison of the microbiological composition between non-treated (Sundqvist et al 1992) and root canals under treatment (Chavez de Paz et al 2003)



Bacterial findings in 107 teeth with persistent bacterial growth after CaOH or 5% Iodine-potassium-iodide treatment (Chavez de Paz et al 2003)

Bacterial groups	After CaOH dressing N=74	After IPI dressing N=33
Ps streptococci	1 (1.4)	3 (9.1)
Non-ps Streptococci	37 (50)	4 (12) p=0.003
Enterococci	28 (38)	0 (0) p=0.001
Peptostreptococci	7 (9.5)	2 (6.1)
Veillonella	5 (6.8)	1 (3.0)
Gram pos anae rods	36 (49)	19 (58)
Lactobacilli (fac)	40 (54)	9 (27)
Fusobacterium	7 (9.5)	2 (6.1)
Prevotella/Porphyromonas	6 (8.1)	6 (18)
Other Gram neg anae rods	0 (0)	0 (0)
Other fac anae bacteria	12 (16)	13 (39)

Choice of antibacterial agents for irrigation or interappointment dressing (Möller 1966). In vitro test with a streptococcal strain.

- All antiseptics are easily bound to organic material
- The faster the better effect on ”naked” bacteria
- The faster binding also means faster inactivation by organic material in vivo
- Iodine (5% IPI or Churchill and Grossman solutions) more efficient than CaOH paste or Dakin (1%) in vitro

Important statements

- Bacteria are usually more tolerant against antiseptics than human cells
- Gram-positive bacteria are more tolerant against antiseptics than Gram-negative bacteria
- Anaerobic bacteria are more sensitive for mechanical treatment than facultative bacteria

Factors of relevance for the antimicrobial effect of antiseptic interappointment dressings in the root canal treatment

- Type of antiseptic
- Type of microorganisms
- Anatomy
- Time (duration)
- Concentration
- Presence of organic material (necrotic tissue, exudate, dentine, dead bacteria)
- Biofilm formation

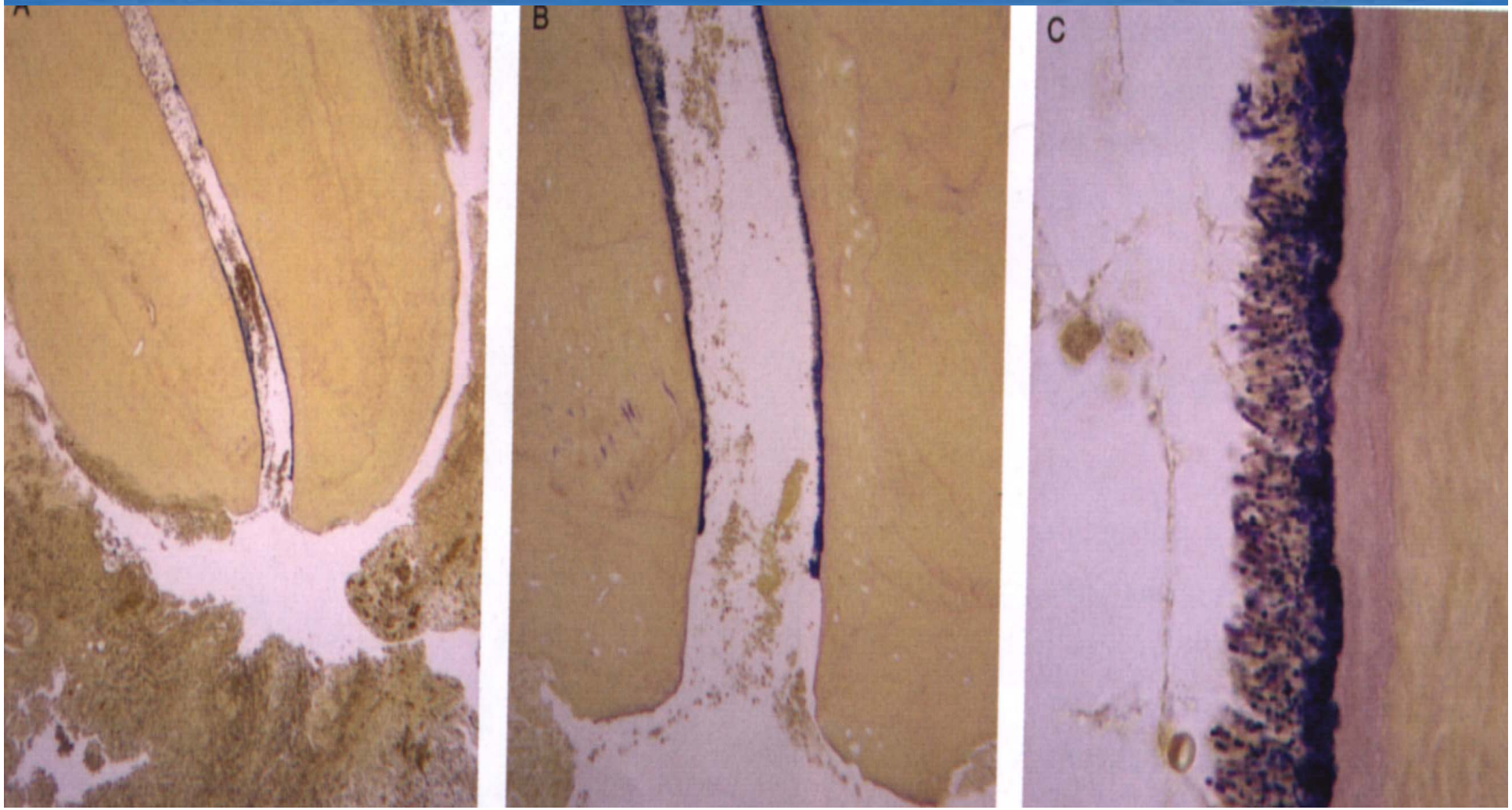
Irrigation of root canals

- NaOCl 5.25%
  Protein dissolving capacity. Tissue friendly?
- NaOCl 2% buffered
  Less good antibacterial effect but more tissue friendly
- Chlorhexidine 2%
  Good antimicrobial effect especially streptococci
- Hydrogenperoxide 10%
  Tissue dissolving and cleaning
- Iodine solutions
  Good antimicrobial effect but easily inactivated
- EDTA
  Chelating agent. Smearlayer and dentine dissolving

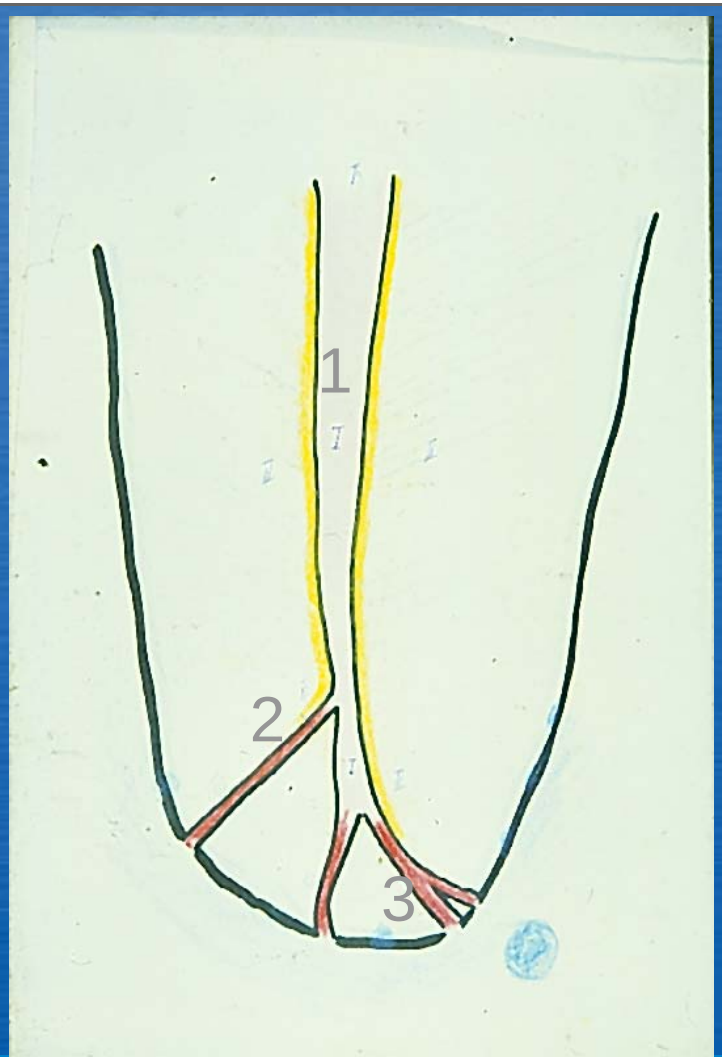
Pros and Cons of irrigation solutions in root canal treatment

- To support the mechanical debridement of the rootcanal - to break the biofilm effect
- To clean the root canal system - why not use an antibacterial agent?
- Too short time (duration) in clinical practice
- Does not always reach important parts such as apical area inside and outside the root canal system)

Root canal with a bacterial biofilm (smear layer) (from G. Bergenholtz)



Apical anatomy of a tooth root



- 1 = Main canal
- 2 = Side canal
- 3 = Apical delta

Root resobtion

Interappointment dressings in endodontic treatment

- CaOH
  - Tissue friendly but weak antibacterial effect especially against Gram positive bacteria
- Iodine Potassium iodide (5 or 10% or Grossman or Churchill solutions)
  - Good antibacterial effect but easily inactivated
- Chlorhexidine gel (2%)
  - Good antibacterial effect easily inactivated
- Antibiotics
  - No antibiotic covers all potential root canal bacteria

Pros and Cons for interappointment dressings in root canal treatment

- Long duration
- Often used as paste (Calciumhydroxide) or gels (Chlorhexidine). Penetration?
- All medicaments need to penetrate biofilms and peripheral parts of the root canal system
- All medicaments are inactivated by binding to organic material
- Bacteria tight sealing of the root canal is necessary

25 non-vital teeth with apical periodontitis treated with CaOH dressing for 14 days (Reit and Dahlén 1988)

Bacterial groups	Initial sample	After one week	After 1 week without dressing
Non-ps Streptococci	7	1	0
Enterococci	5	3	5
Peptostreptococci	7	1	0
Gram pos anae rods	28	3	2
Lactobacilli (fac)	4	1	4
Fusobacterium	10	0	0
Prevotella/Porphyromonas	9	0	0
Other Gram neg rods	14	1	0

Effect of 5% Iodine-potassium-iodide as a one week inter-appointment dressing in 50 teeth (Reit et al 1999)

Bacterial groups	Initial sample	Test sample 7 days with 5% IPI	Gold standard 7 days after TS and no dressing
Ps streptococci	5	10	10
Non-ps Streptococci	6	7	7
Enterococci	0	1	1
Peptostreptococci	20	0	3
Veillonella	7	0	3
Gram pos anae rods	29	3	3
Lactobacilli (fac)	15	5	5
Fusobacterium	11	2	4
Prevotella/Porphyromonas	37	1	4
Other Gram neg rods	7	0	1
Other fac anae bacteria	9	4	2
Total number of isolates	150	34	43

50 non-vital teeth with apical periodontitis treated with 5% iodine (3-7 days) and with CaOH dressing for 2 months (Molander et al 1999)

Bacterial groups	Initial sample	After 3-7 days with 5% IPI	After 2 months with CaOH dressing
Ps streptococci	7	12	3
Non-ps Streptococci	4	5	1
Enterococci	0	1	2
Peptostreptococci	20	3	1
Gram pos anae rods	29	3	0
Lactobacilli (fac)	15	5	6
Fusobacterium	11	4	0
Prevotella/Porphyromonas	37	4	1
Other Gram neg rods	7	1	0
Other fac anae bacteria	11	2	1

96 teeth subjected for a initial sample, instrumentation and a new sample (Postinstrumentation) and medication (5% IPI in 10 mins) and a new sample (Postmedication) performed in ONE VISIT or TWO VISITS (Kvist et al 2004).

Residual microorganisms in 29% of one visit teeth and 36% in two visits teeth (not significant)

Bacterial groups	Initial sample		Postinstru-mentation Sample		Postmedi-cation sample	
	One visit	Two visit	One visit	Two visit	One visit	Two visit
Anaerobe strains	106	90	38	32	18	9
Facultative strains	53	48	25	24	11	21

Conclusions

Root canal treatment in two appointments

- A good mechanical debridement is mandatory
- 2% sodium-hypochlorite as irrigation
- CaOH as interappointment dressing
- 5% IPI in 10 mins before permanent root filling is carried out