

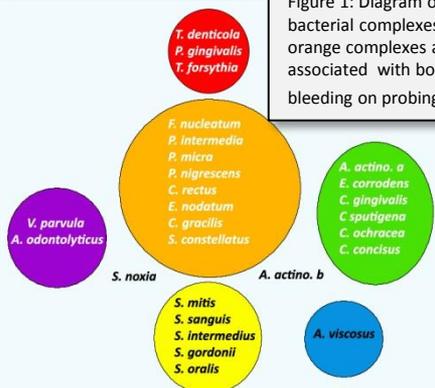
Question

What is the microbiology of peri-implantitis, and is it similar or distinct to chronic periodontitis?

Background

- Peri-implantitis is an inflammatory disease of bacterial aetiology, with a 20% prevalence in individuals after 5-10 years of placement.¹
- Bacterial complexes associated with chronic periodontitis (Figures 1, 2) have traditionally been linked to peri-implantitis.
- Recent studies suggest differences between the microbial profiles of peri-implantitis and periodontitis.

Figure 1: Diagram of periodontal bacterial complexes. Red and orange complexes are most associated with bone loss and bleeding on probing.²



Aims and Methods

- Literature review to investigate the microbiology of peri-implantitis, the role of periodontal pathogens, and how advances in microbe detection have shaped our understanding.
- Electronic search of MEDLINE, Web of Science, PubMed databases using keyword searches for clinical studies detecting microbes in peri-implantitis. Selected studies reviewed and quality assessed.

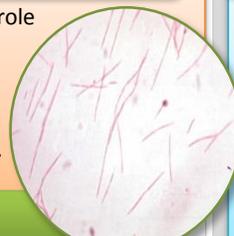


Figure 2: Gram stain of *F. nucleatum*, a pathogen linked to periodontitis and peri-implantitis.

Results

- 25 clinical studies obtained with 1,392 participants (1987 to 2015).
- Large variety in study designs and microbe detection techniques, including: Culture, DNA-DNA hybridisation, 16S rRNA sequencing, 16S pyrosequencing (Table 1). This limits the degree of cross-comparison between studies.
- Red and orange complex periodontal pathogens commonly detected in peri-implantitis (Table 2). Many studies also reported the presence of non-periodontal opportunistic pathogens i.e. *Staphylococcus spp.*, *Candida spp.*, and *Pseudomonas aeruginosa*. Still not clear whether these are aetiological or incidental findings.

Microbe group	Frequency
Red complex	15
Orange complex	25
Other complexes	8
Eubacterium spp.	4
Staphylococcus spp.	6
Enterics	3
Candida spp.	3

Table 2: A list of microbe groups and the frequency of studies reporting their detection in peri-implantitis.

- The majority of studies using next-gen molecular sequencing (i.e. 16S pyrosequencing) in a split-mouth study design found significant differences between the microbial profiles of periodontitis and peri-implantitis.

Table 1: A summary of the techniques used by studies in this review to analyse and identify microbes.

Technique	Advantages	Disadvantages
Culture & microscopy	Can visualise community superstructures	Many bacteria cannot be grown
DNA-DNA hybridisation	Less time consuming than culture	Selection bias; technique sensitive
16S rRNA sequencing	Can capture most species in a sample	Less prevalent species not detected
16S pyrosequencing	Can capture entire microbiome	High-res bacterial identification difficult

Conclusions

- Red and orange complex periodontal pathogens are **strongly associated** with peri-implantitis.
- Simultaneously, there is growing evidence using the latest advances in technology that **peri-implantitis has a unique microbial signature** that is distinct to chronic periodontitis.

Clinical application

- Antimicrobial therapies, where used, must be fine-tuned to ensure they are effective in complementing manual debridement.
- Future management may involve acquiring plaque samples from failing sites to conduct molecular analyses and thus enable precise antimicrobial intervention.

References

1. Mombelli A, Müller N, Cionca N. (2012) The epidemiology of peri-implantitis. *Clin Oral Implants Res.* 23(Suppl 6):67-76.
2. Socarransky SS, Haffajee AD, Cugini MA, Smith C, Kent RL Jr. (1998) Microbial complexes in subgingival plaque. *J Clin Periodontol.* 25(2):134-44.