

Clinical signs and histopathogenesis of gingivitis

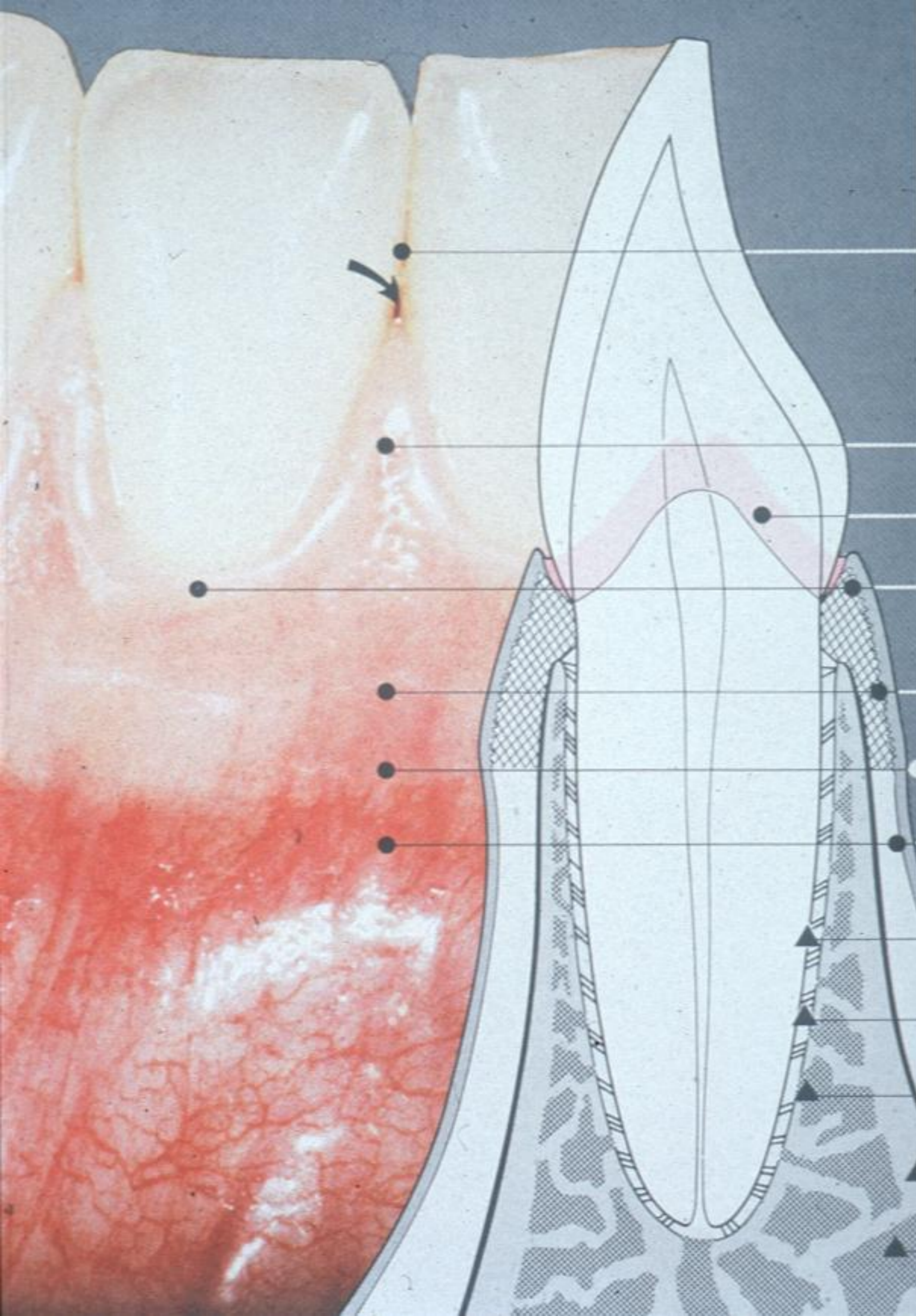
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Periodontal structures

- Gingiva
 - Periodontal ligament (PDL)
 - Cementum
 - Alveolar bone
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- ◆ **Gingivitis** – affects gingiva only
 - ◆ **Periodontitis** – affects all structures



Contact point

Interdental papilla

Free gingival margin

Attached gingiva

Mucogingival junction

Alveolar mucosa

Periodontal health

- Gingiva are pink and firm
- Stippling may be present
- Interdental papillae are pyramidal
- Gingival crevice $\leq 3\text{mm}$ deep

Periodontal health



Gingivitis

- A plaque-induced inflammation of the gingiva
 - Clinical signs are present within about 4-5 days of undisturbed plaque accumulation and maturation
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Gingivitis

- Gingiva are:
 - red (erythema)
 - swollen (oedema)
 - shiny
 - soft
- Bleed on probing
- Sulcus depths are increased
- Increased gingival crevicular fluid (GCF)flow

Gingivitis

NO:

- Breakdown of PDL fibres

NO:

- Bone destruction

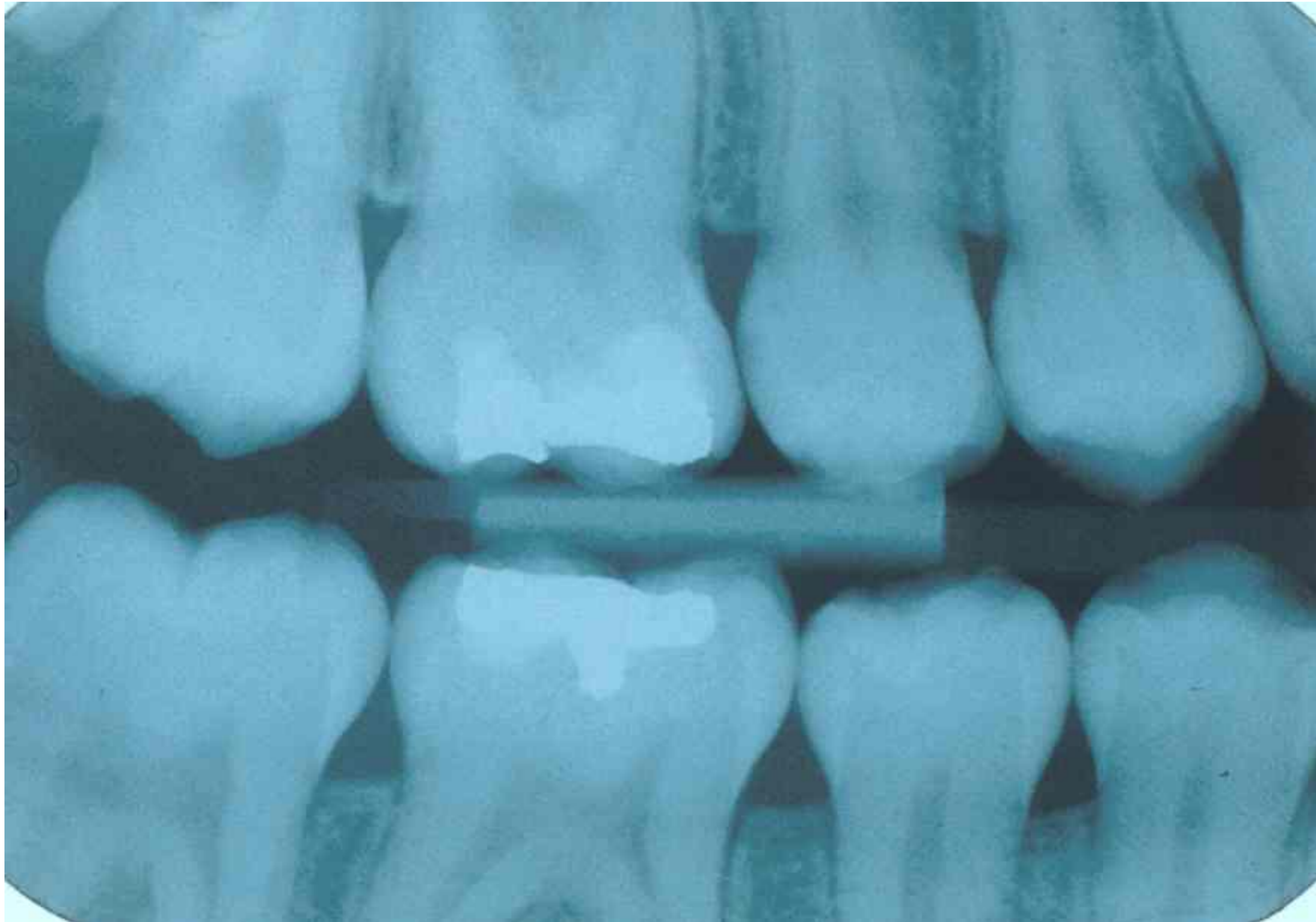
Gingivitis



Bleeding on probing



No bone destruction



Gingivitis: microbiology

- Approx 400 species can live in the mouth
- Typically find about 150 species in any one individual's mouth
- Approx 10^8 bacteria in deep pockets (100,000,000)

Plaque as a Biofilm

- Microbial community associated with a tooth surface or other hard, non-shedding material
 - Nutrients penetrate to the bacteria in deeper layers by diffusion
 - Deeper layers are very anaerobic
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Nature of biofilms

- Form on all surfaces immersed in natural aqueous environments
 - Form particularly in flow systems where there is a regular nutrient supply
 - Biofilms protect bacteria
 - Biofilm must be disrupted mechanically
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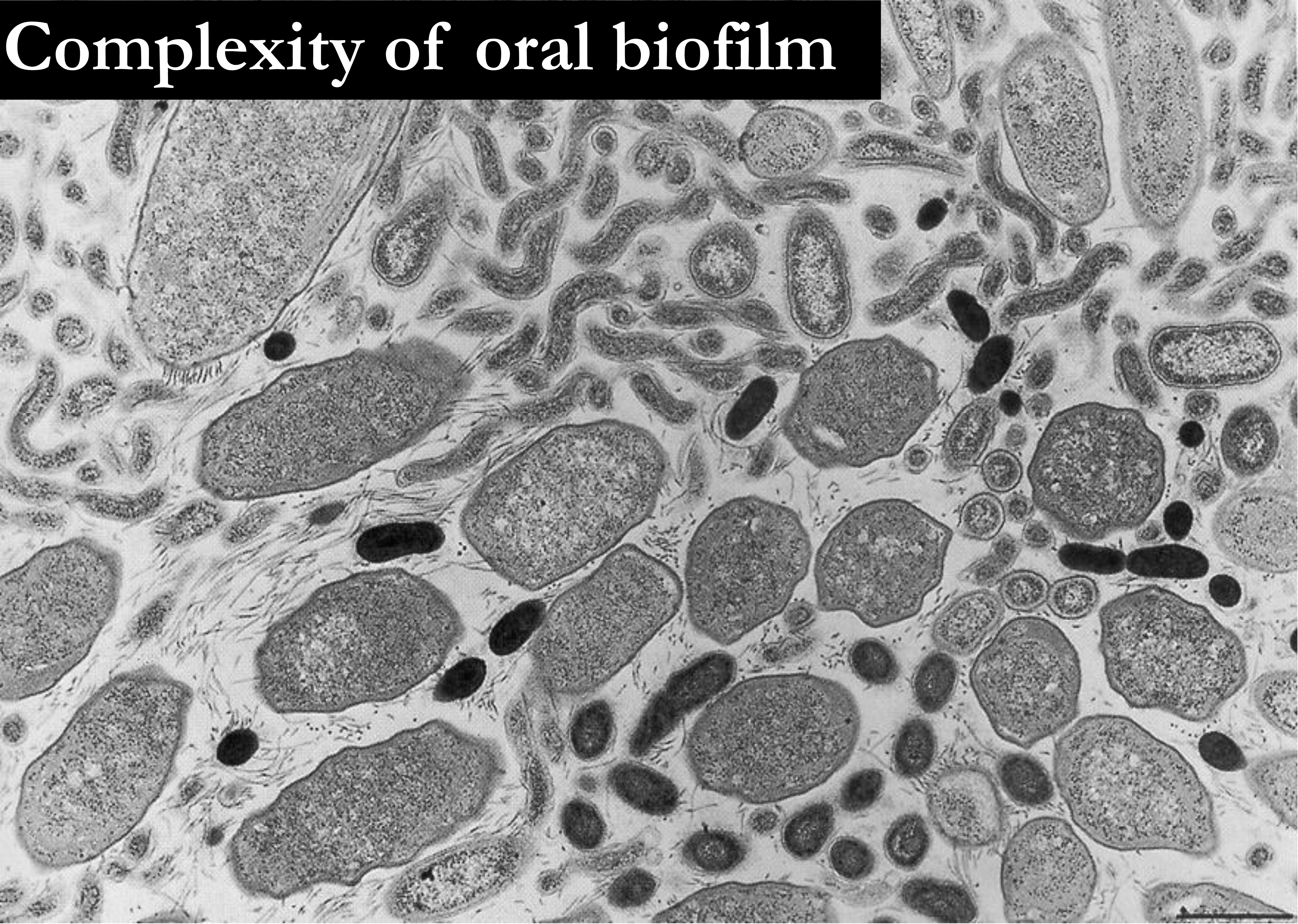
Early colonisers

- 0-2 days:
 - G+ facultative cocci (mainly *Streptococci*)
- 2-7 days:
 - G- anaerobic cocci (e.g. *Veillonella* species)
 - G+ rods (e.g. *Actinomyces* species)
 - G- rods (e.g. *Capnocytophaga* species)
- 7+ days:
 - Anaerobic species (e.g. *Fusobacterium*, *Prevotella intermedia*)

Late colonisers

- *Prevotella intermedia*
- *Porphyromonas gingivalis*
- Spirochetes
- *Motile G- rods*

Complexity of oral biofilm



Microbiology

- Gingivitis is not caused by one single bacterial species
 - Initiation of inflammation results from an interplay between the bacteria present, the local environment and the host response
 - Biofilms must be mechanically disrupted
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Histology in health

- Junctional epithelium (JE) is attached to tooth surface
- Neutrophils and macrophages migrate through the JE into the sulcus
- Collagen fibres maintain the form of the tissues and aid in attachment to the tooth
- GCF (gingival crevicular fluid) flows out through the gingival sulcus

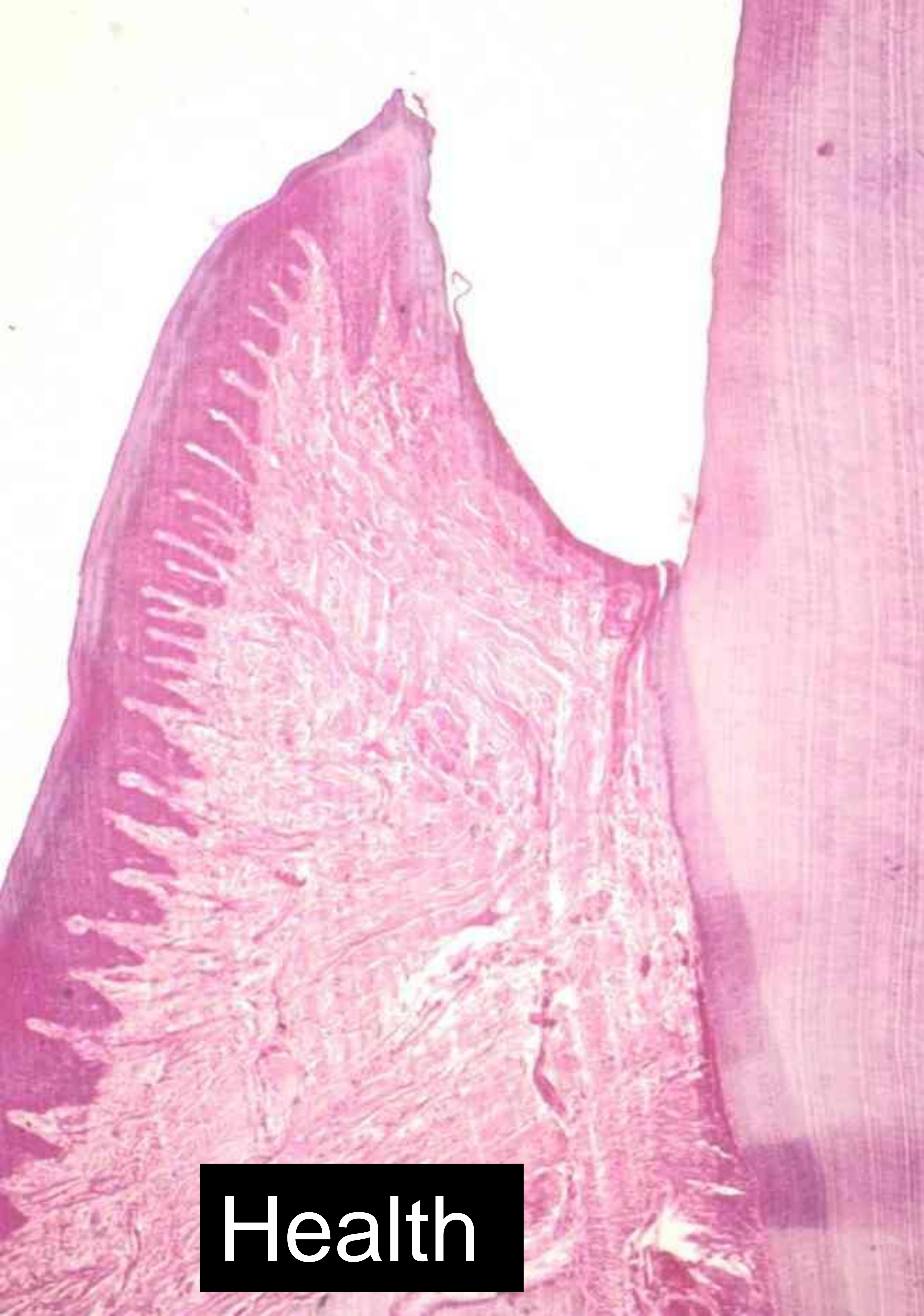
Health is maintained by:

- Antimicrobial effects of antibodies
 - Phagocytic function of neutrophils and macrophages
 - Complement activity
 - Shedding of epithelial cells
 - Intact epithelial barrier
 - Outflow of GCF
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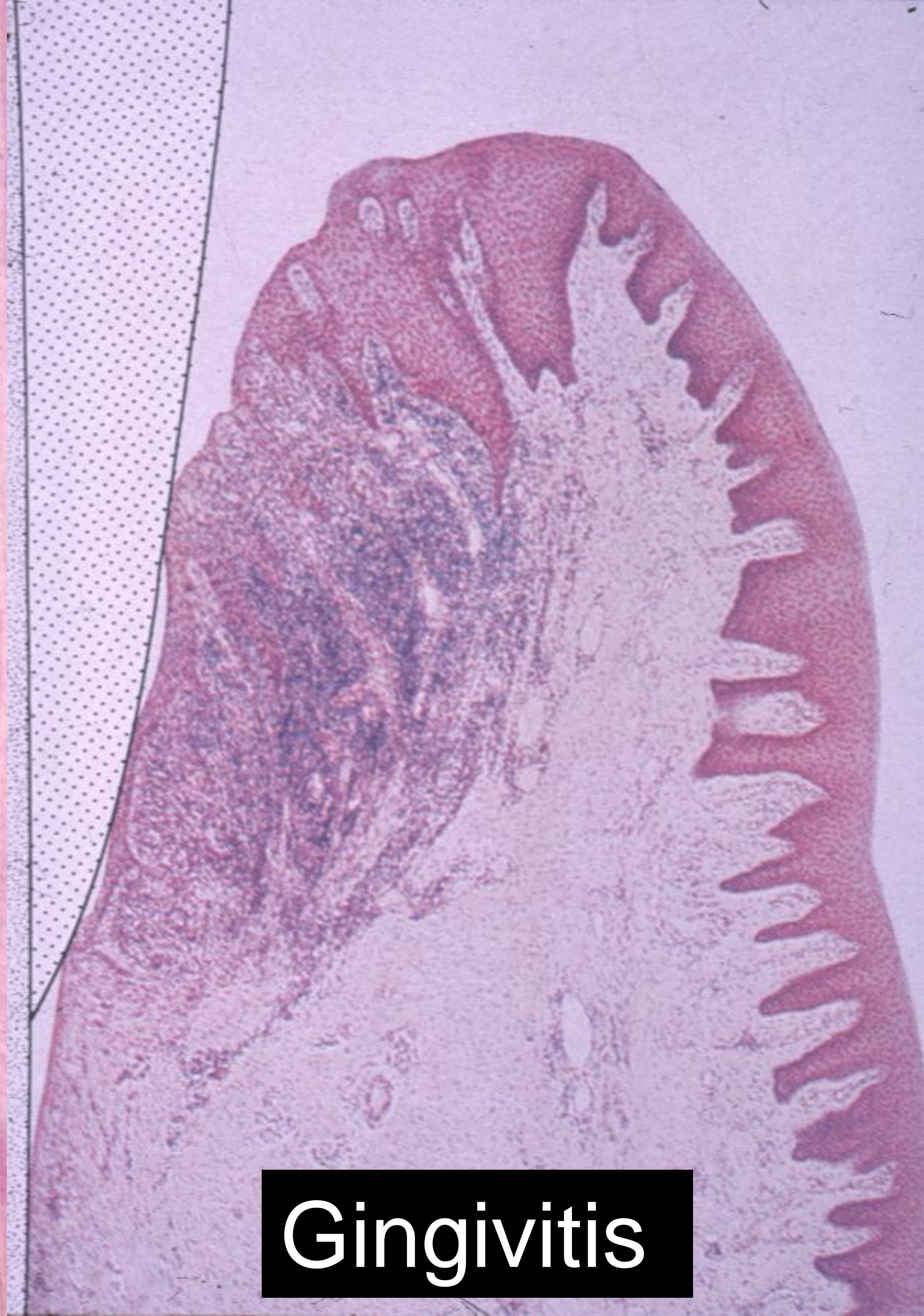
Histopathology of gingivitis: quick version

If plaque accumulates at the gingival margin:

- Vasodilatation and increased capillary permeability (*gingiva look red and swollen*)
 - Increased GCF flow
 - Infiltration by inflammatory cells (PMNs, lymphocytes, macrophages) which migrate into the gingival tissues
 - Breakdown of collagen in gingival tissues
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Health



Gingivitis

Histopathology of gingivitis: long version

- Divided into stages*
 - Initial gingival lesion
 - Early gingival lesion
 - Established gingival lesion

Page and Schroeder, 1976

* Please note: these stages were shown in experimental animals only, and have never been confirmed in humans (for ethical reasons)

And, these histological stages do not relate directly to what is seen clinically (i.e. it is not possible to diagnose an “initial gingival lesion” by clinically examining a patient)

Initial gingival lesion (0-2 days)

- Vasodilatation and increased vascular permeability
 - Increased GCF flow
 - Migration of leukocytes from capillaries into dentogingival tissues in response to chemotactic stimuli
 - Neutrophils enter the sulcus
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Early gingival lesion (7+ days)

- Increased vascularity
- Lymphocytes and neutrophils are the predominant infiltrating cells
- Fibroblasts degenerate (permitting more leukocyte infiltration)
- Collagen destruction to accommodate the infiltrating cells (space-creating)
- Proliferation of basal cells of junctional and sulcular epithelium

Established gingival lesion (21+ days)

- Further leukocyte migration into the tissues, now including plasma cells
 - Collagen destruction apically and laterally, resulting in collagen-depleted spaces extending deeper into the tissues, which are available for leukocyte infiltration
 - Further proliferation of dentogingival epithelium in an attempt to maintain an intact epithelial barrier
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Gingival inflammation

- The net results of these histological changes are:
 - the gingiva are swollen
 - they look more red
 - they bleed more easily

= Gingivitis