

• **inadequate oral hygiene — this leads to the formation of bacterial plaque and its products, which are the primary etiologic factors in gingivitis**

The initial microbiota of **acute** gingivitis consists of gram-positive rods, gram-positive cocci, and gram-negative cocci. The transition to gingivitis is evident by inflammatory changes and is accompanied first by the appearance of gram-negative rods and filaments, then by spirochetal and motile organisms.

The microbiota of **chronic** gingivitis consists of approximately equal proportions of gram-positive (56%) and gram-negative (44%) species, as well as facultative (59%) and anaerobic (41%) microorganisms. Predominant **gram-positive** species include *S. sanguis*, *S. mitis*, *S. intermedius*, *S. oralis*, *A. viscosus*, *A. naeslundii*, and *P. micros*. The **gram-negative** microorganisms are predominantly *F. nucleatum*, *P. intermedia*, and *V. parvula*, as well as *Haemophilus*, *Capnocytophaga*, and *Campylobacter species*.

Comparing the microbiota in health, gingivitis, and periodontitis, the following microbial shifts can be seen:

- From gram-positive to gram negative
- From cocci to rods
- From nonmotile to motile organism
- From facultative anaerobes to **obligate anaerobes**
- From fermenting to proteolytic species

All surfaces of the oral cavity (*both hard and soft tissues*) are coated with a **pellicle** (*initial phase of plaque development*). Within nanoseconds after vigorously polishing the teeth, a thin, saliva-derived layer, called the **acquired pellicle**, covers the tooth surface. This pellicle consists of numerous components, including glycoproteins (*mucins*), proline-rich proteins, phosphoproteins (*e.g., statherin*), histidine-rich proteins, enzymes (*e.g., alpha-amylase*), and other molecules that can function as adhesion sites for bacteria (*receptors*).

**Halitosis** (*bad breath/oral malodor*): At least 85% of breath malodors have an oral source. Gingivitis, periodontitis, and tongue coating are the predominant causes of bad breath. The gram-negative anaerobic bacteria associated with gingivitis and periodontitis cause bad breath by their proteolysis, which produces foul-smelling volatile sulfide compounds (*VSCs*).



1. The overall pattern observed in dental plaque development is a very characteristic shift from the **early** predominance of **gram-positive facultative** microorganisms to the **later** predominance of **gram-negative anaerobic** microorganisms.
2. The major factor in determining the different bacteria is **oxygen**. The redox potential of the gingival sulcus **greatly influences** the bacterial composition.