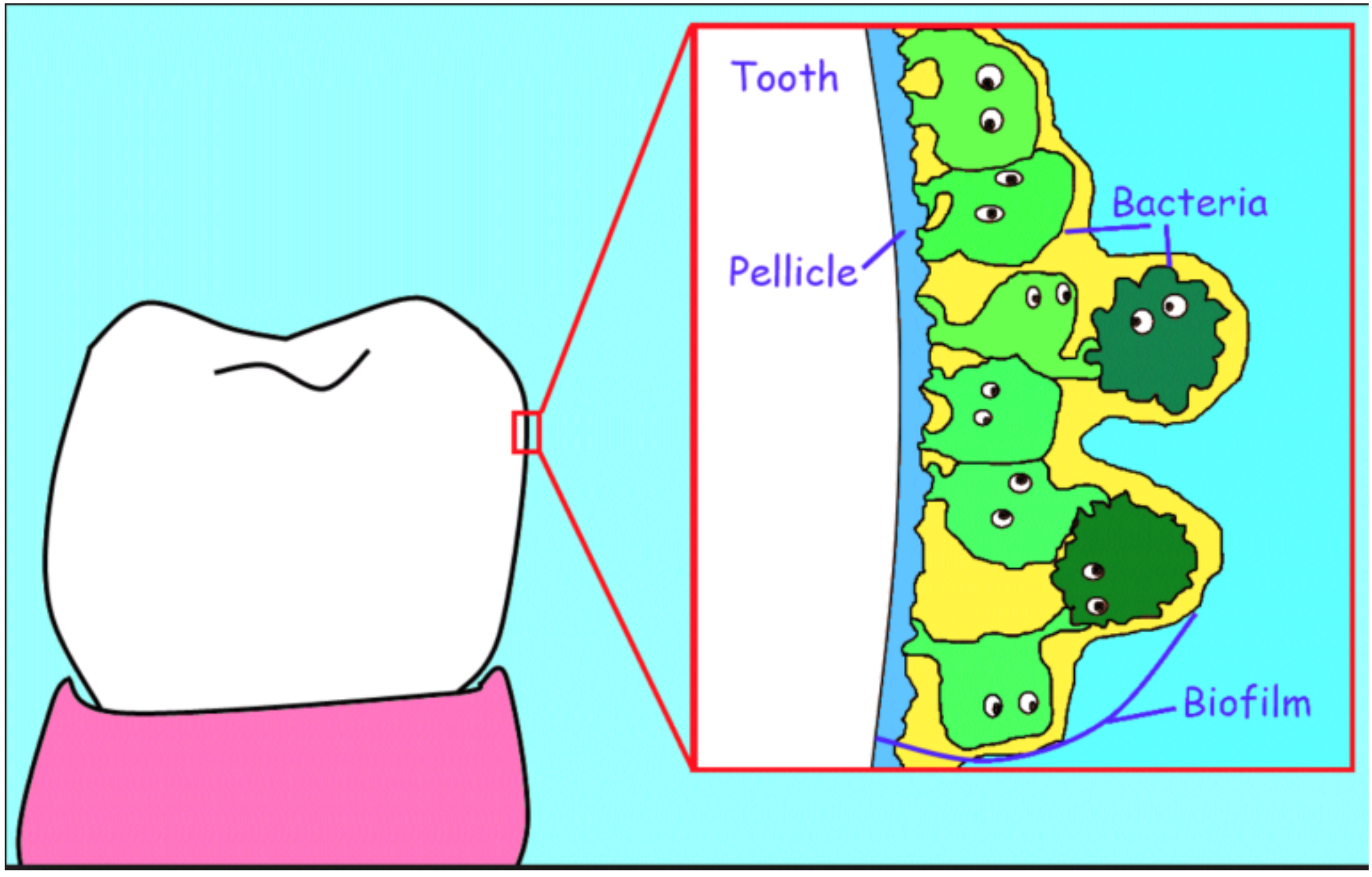
Pellicle and Dental Plaque



Dr .Huda Y K

Pellicle

The pellicle is a thin, bacteria-free layer covering the teeth, It is formed by the adsorption of salivary proteins, for example, glycoproteins, which have high affinity for the mineral in the surface of the tooth.

- The positively charged HAP crystals will attract negatively charged organic components from the saliva.
- If the pellicle is removed, for example, by the dentist during a professional cleaning, it will start forming again within seconds.

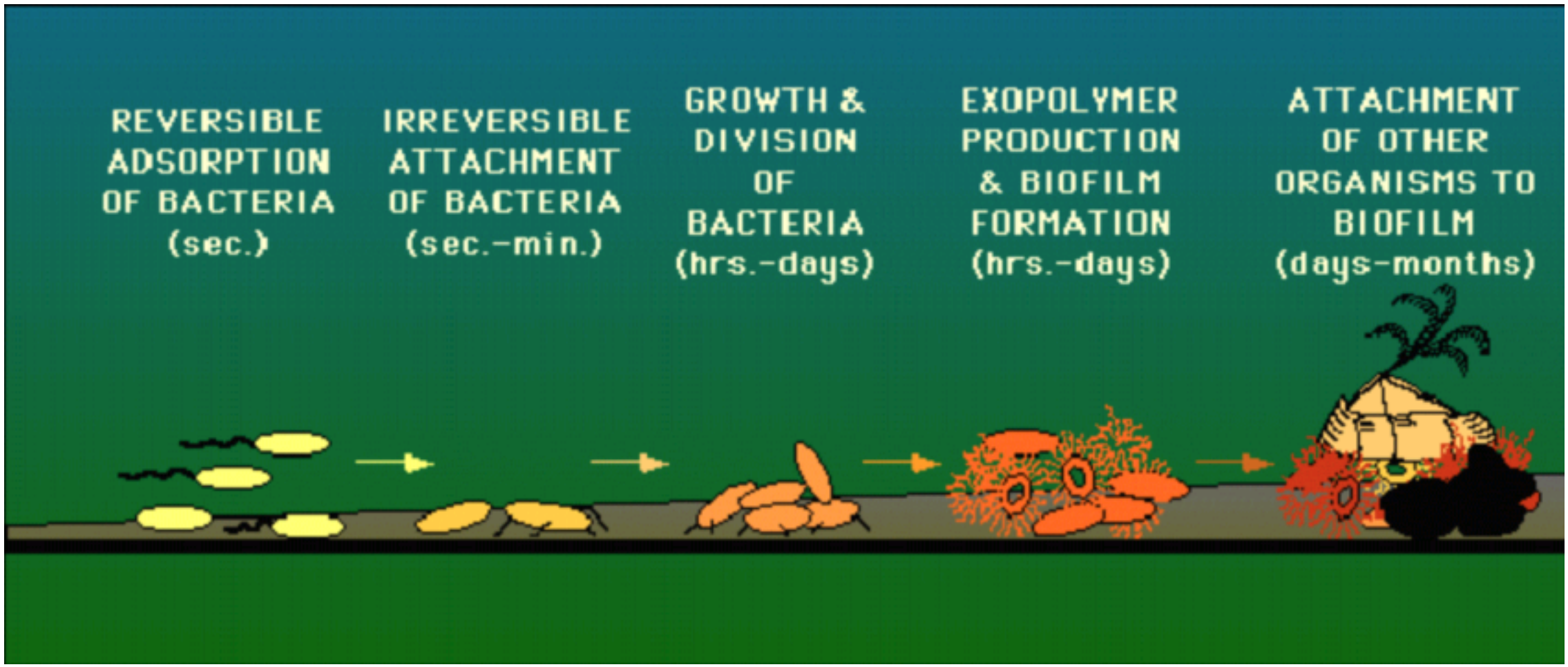
The pellicle plays an important role in protecting the dental hard tissue against mechanical and chemical damage:

- Mechanically, so it is not worn away, and
- Chemically because the pellicle serves as a permselective diffusion barrier, limiting what can pass through it, including plaque acids.

DENTAL PLAQUE/BIOFILM

- Dental plaque is an adherent deposit of bacteria and their products, which forms on all tooth surfaces.
- Plaque is a biofilm.

- Biofilm is defined as a microbiologically derived community, characterized by cells which are irreversibly attached to substrate or interface or with each other, embedded in matrix of extracellular polymeric substances.



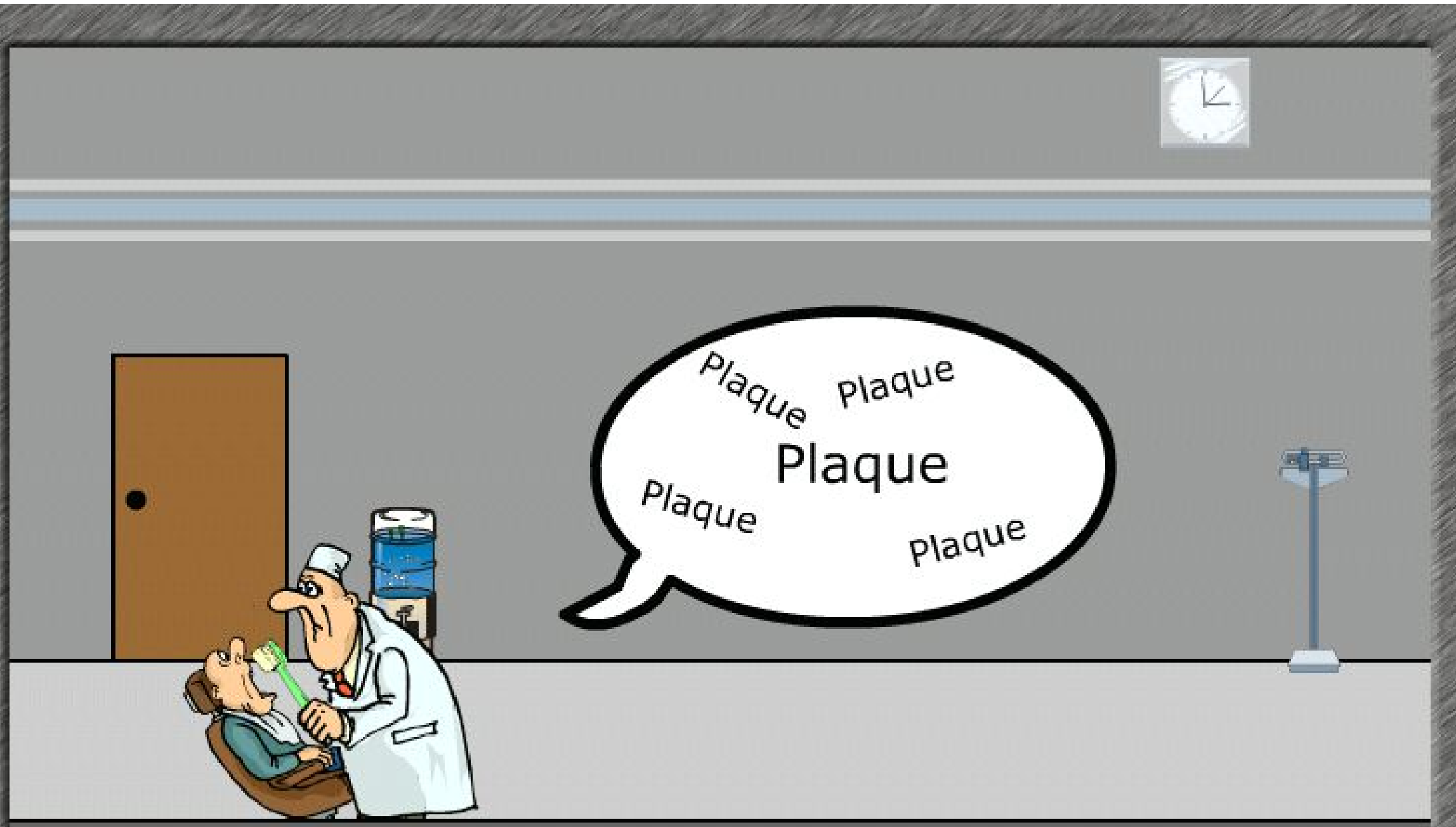
- Dental plaque must be differentiated from other tooth deposits, like materia alba and calculus.

- Materia Alba refers to soft accumulations of bacteria and tissue cells that lack the organized structure of dental plaque.

- Calculus(Tartar) is hard deposits that form by mineralization of dental plaque and is generally covered by a layer of un mineralised plaque.

- Materia alba

- Calculus



Composition of plaque

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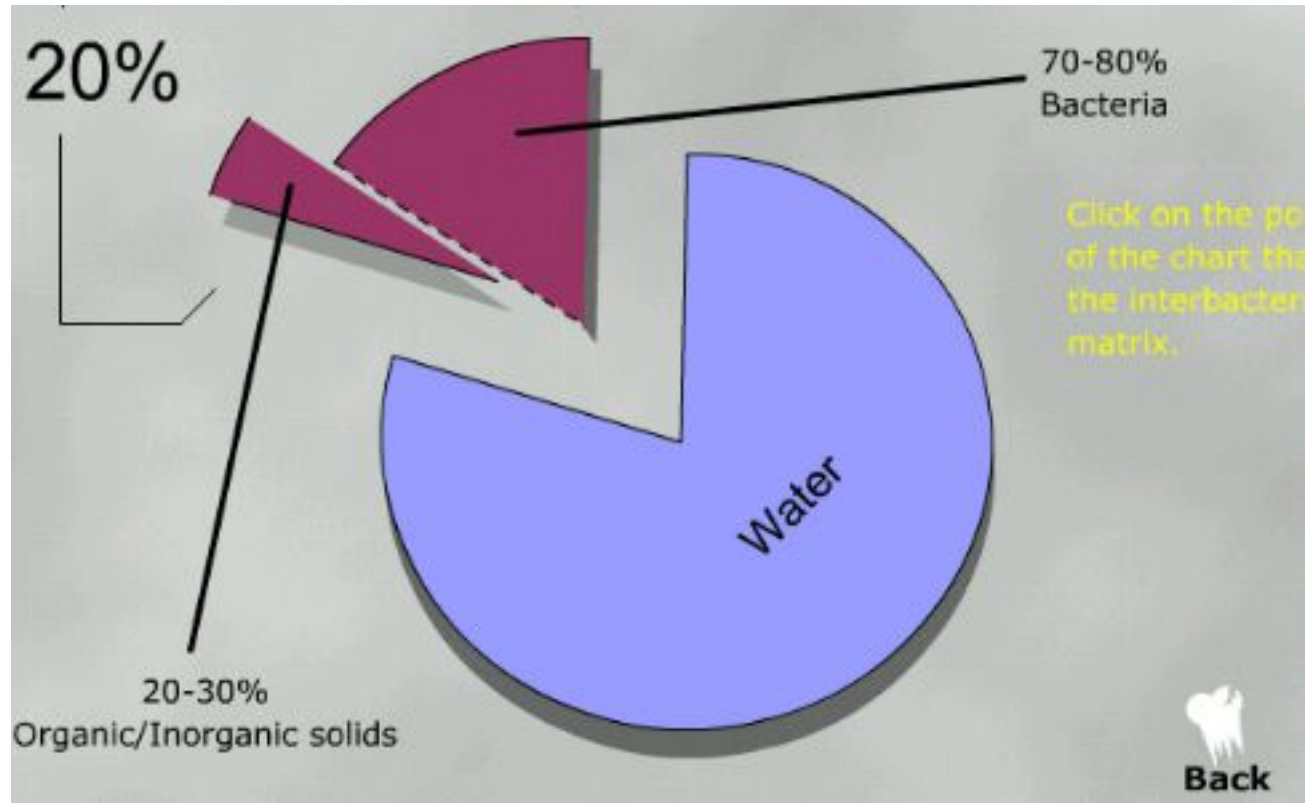
Components of Bio lm

- Water 80%
- Inorganic Components
- Organic Components
- Microorganisms
- Intermicrobial matrix

20%



Components of Bio lm

Inorganic Components

Calcium, phosphorus and fluoride are more in biofilm than in saliva.

Organic Components

- **Carbohydrates**: these are produced by bacterias. Commonly present carbohydrates are fructans and glucans.
- **Proteins:** Proteins are derived from saliva and gingival sulcus fluid.
- **Lipids:** they include endotoxins from Gram-negative bacterias.

Microorganisms

- 70 to 80 % of total solid plaque volume.
- The two most studied microorganisms in plaque relating to caries disease are:

1. *Streptococcus mutans*
2. *Lactobacillus acidophilus*

Intermicrobial Matrix

- The material present between the bacteria in the dental plaque is called the intermicrobial matrix.
- Consisting of organic, inorganic materials and glycoproteins from the saliva

STAGES OF FORMATION IN DENTAL PLAQUE

The formation of the pellicle on the tooth surface

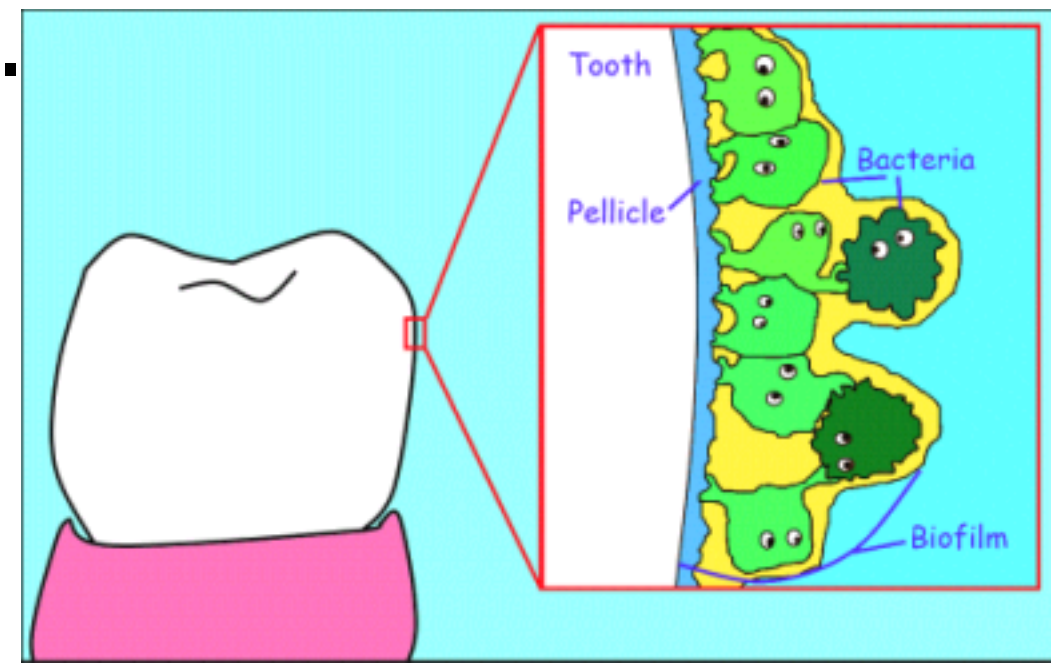
Colonization of bacteria

plaque maturation

STAGES OF FORMATION IN DENTAL PLAQUE

1. Formation of pellicle

In this stage, di erent bacteria reversibly or irreversibly attach to tooth surface enamel pellicle which acts as foundation for multilayered biofilm.



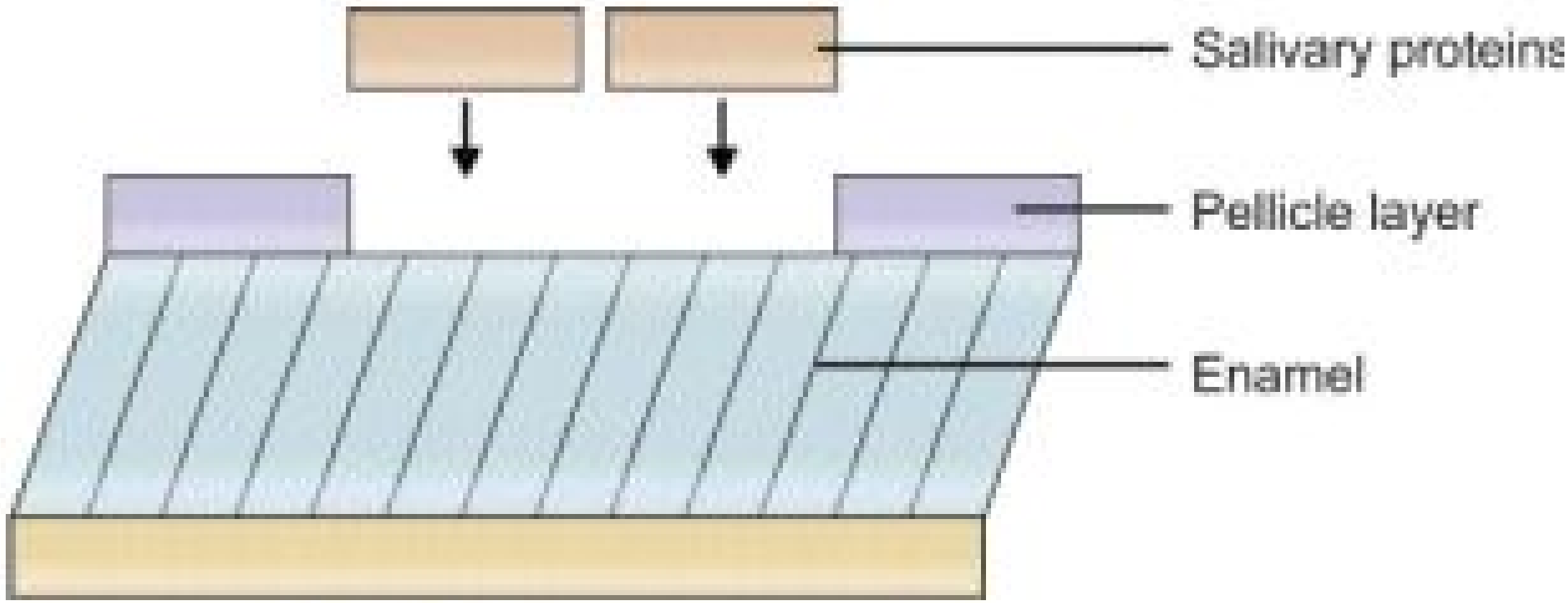


Figure 5.2: Formation of pellicle—1st stage

2. Colonization of bacteria

In this stage, bacteria which attach in to the dental pellicle, start dividing forming microcolonies. this bacterial composition further grow into more mature complex flora

- Primary colonizers: Gram-positive cocci. They provide new binding sites for adhesion by other oral bacteria.

- Secondary colonizers: Gram-negative organisms (anaerobes) .

They do not initially colonize the clean tooth surface but adhere to bacteria already in the plaque mass.

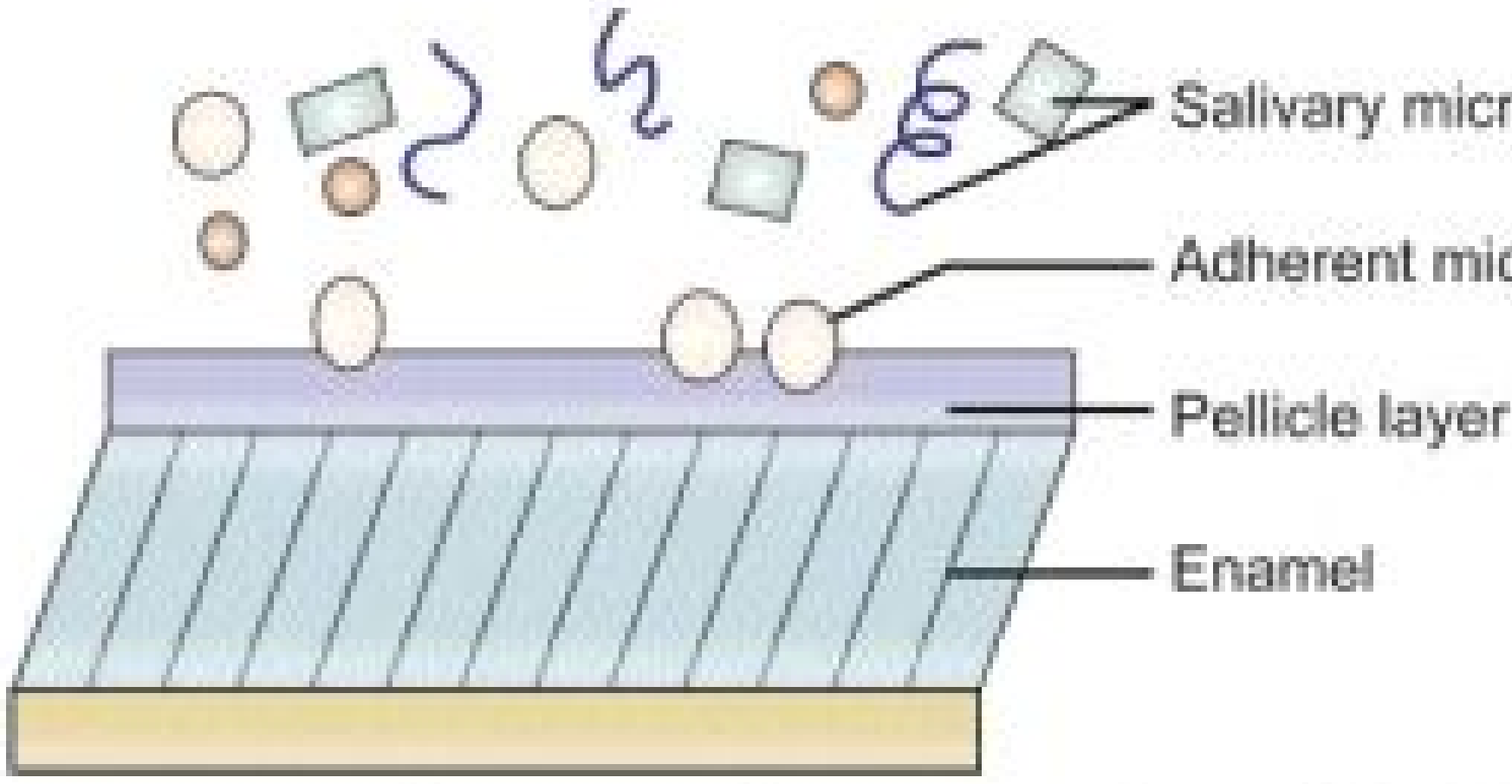


Figure5.3: Colonization of bacteria—2nd stage of biofilm formation

3. Maturation of biofilm :

In two weeks, the plaque becomes more mature. As the biofilm matures, spirochetes start growing into this ,there is site-to-site di erences in its composition, that is why caries progress in some sites but not others in the same mouth.

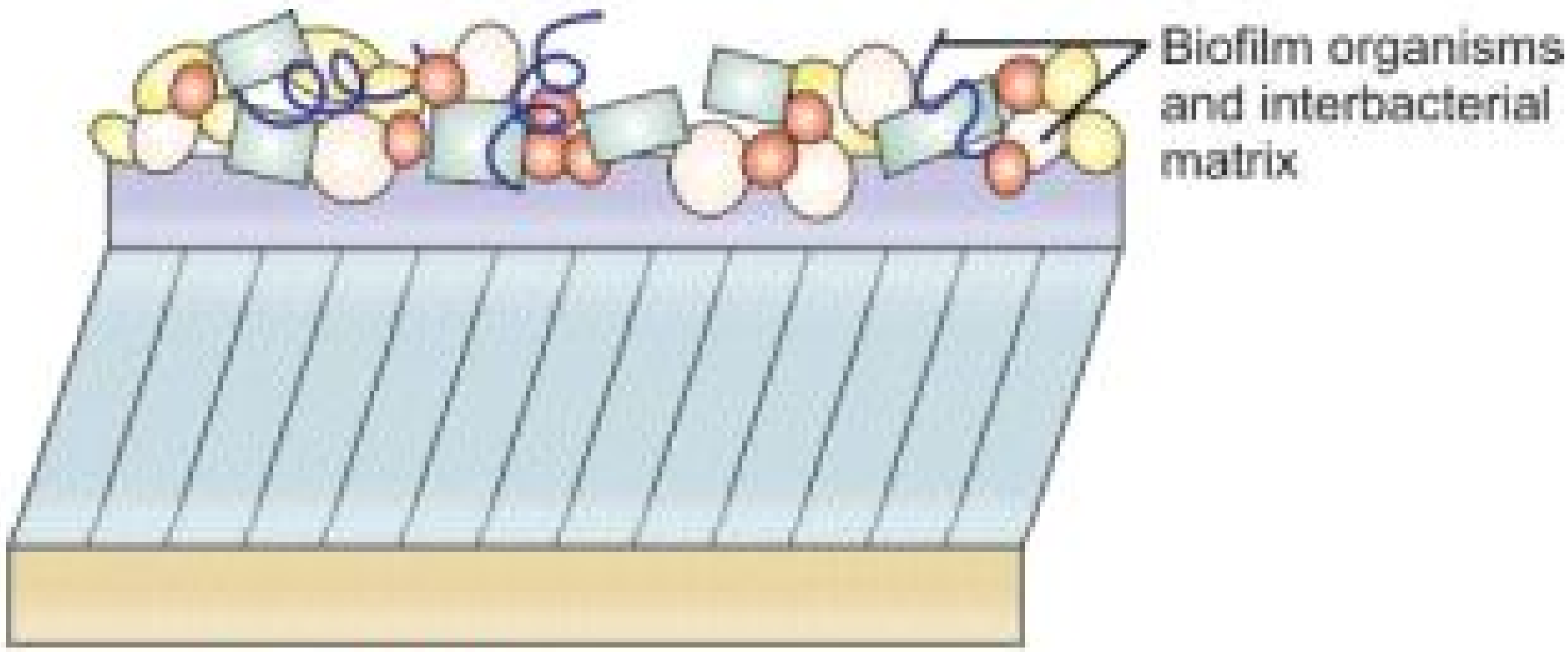
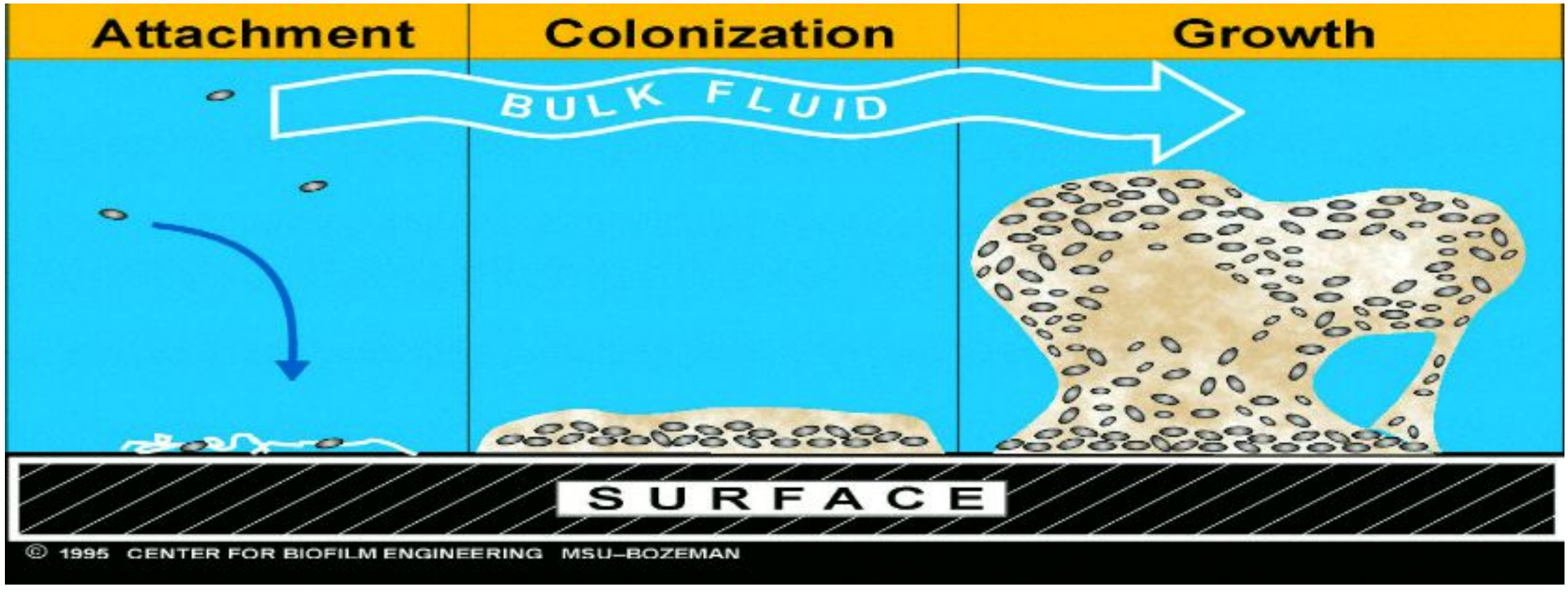


Figure 5.4: Maturation of biofilm—3rd stage


Attachment
Colonization
Growth
BULK FLUID
SURFACE
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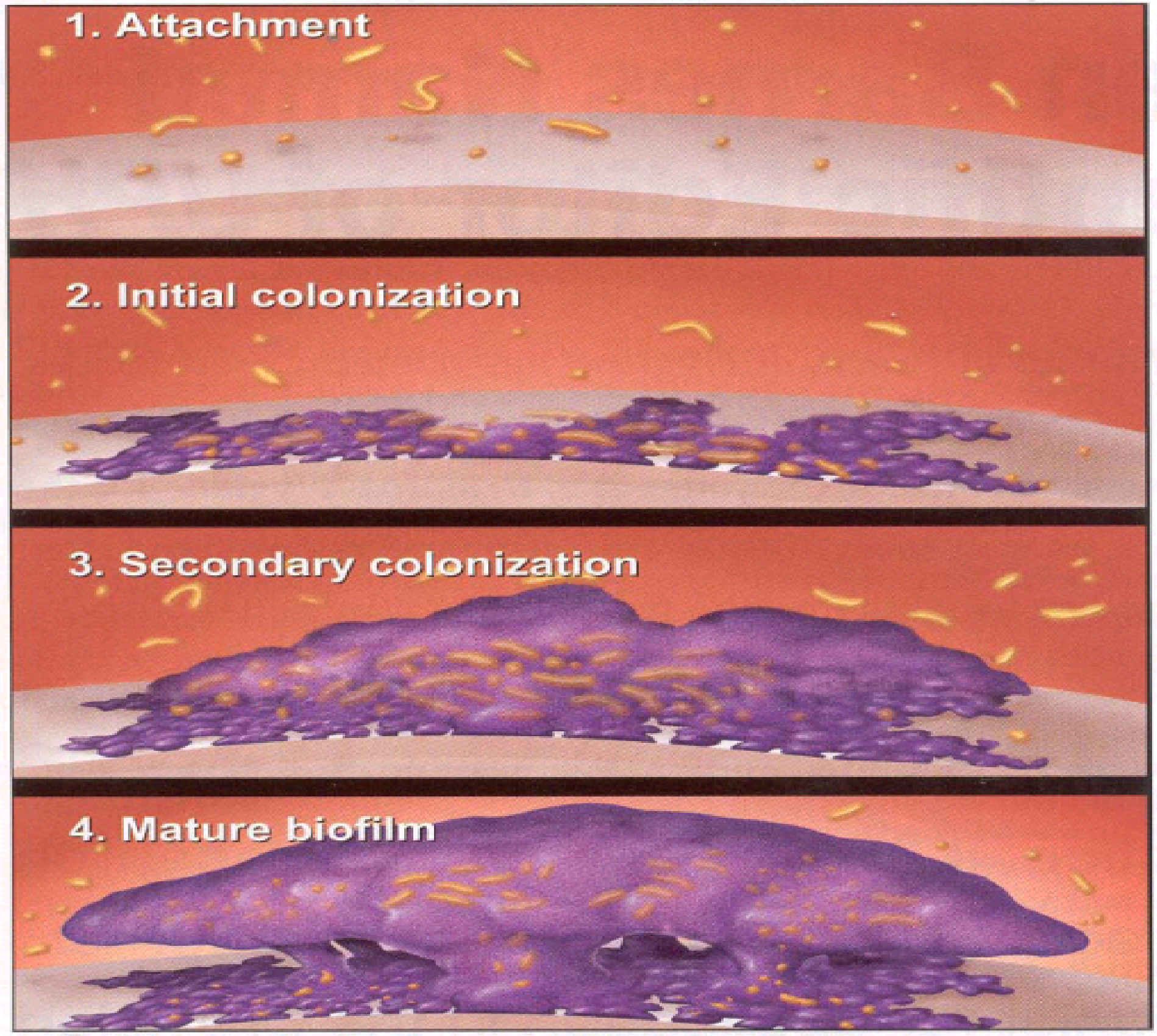


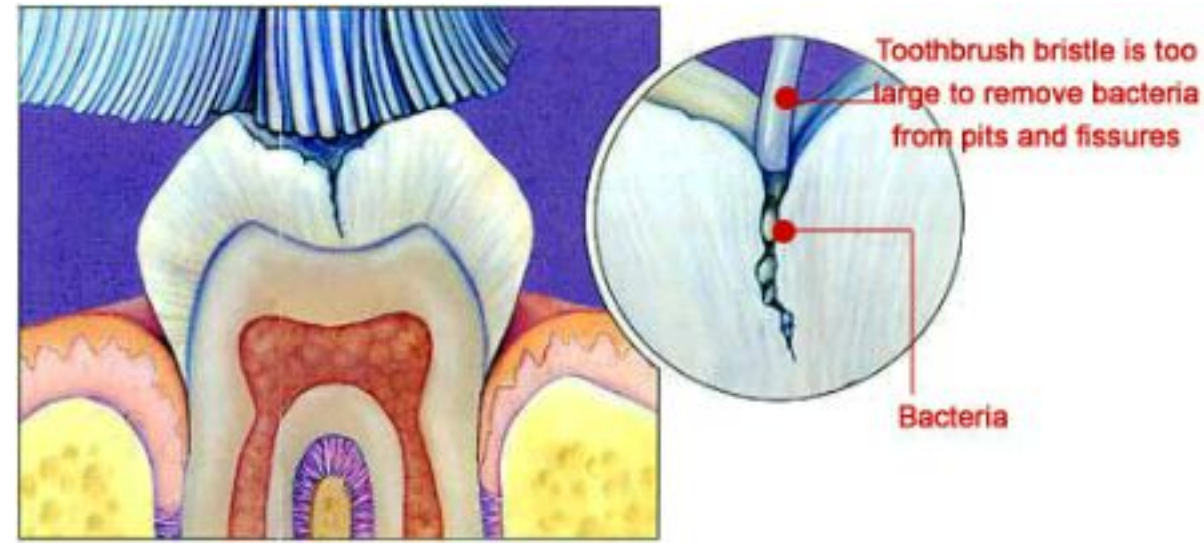
Figure 7. The Pattern of Biofilm Development. The stages of biofilm maturation are: attachment, initial colonization, secondary colonization, and mature biofilm.

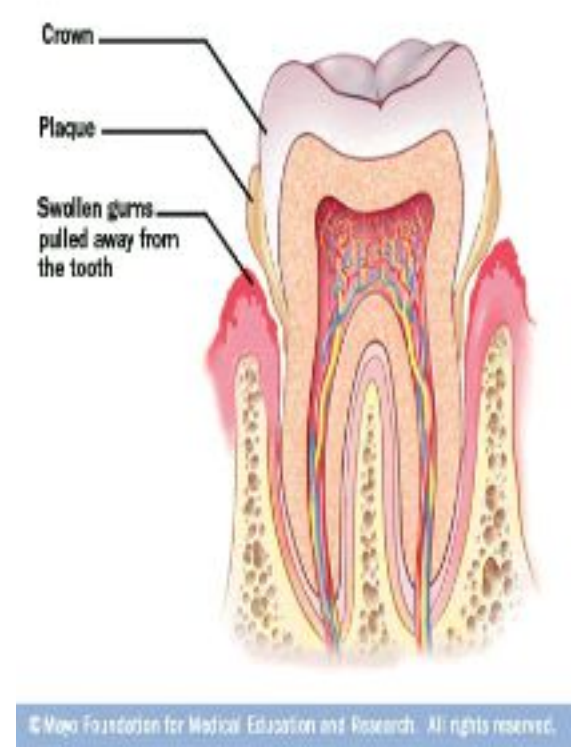
How the Plaque Causes Harm

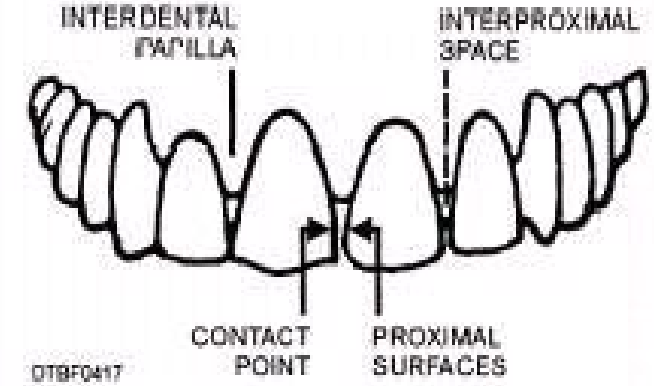
- The microorganisms found in plaque are usually seen in mouth at all times and are harmless.
- They feed on many of the foods we eat.
- Carbohydrates are their favorite.
- Plaque sticks to the teeth. If not removed properly by tooth brushing it will build up in thick layers.
- Those Microorganisms which are nearest to the tooth convert to anaerobic respiration. In this stage they produce acids.

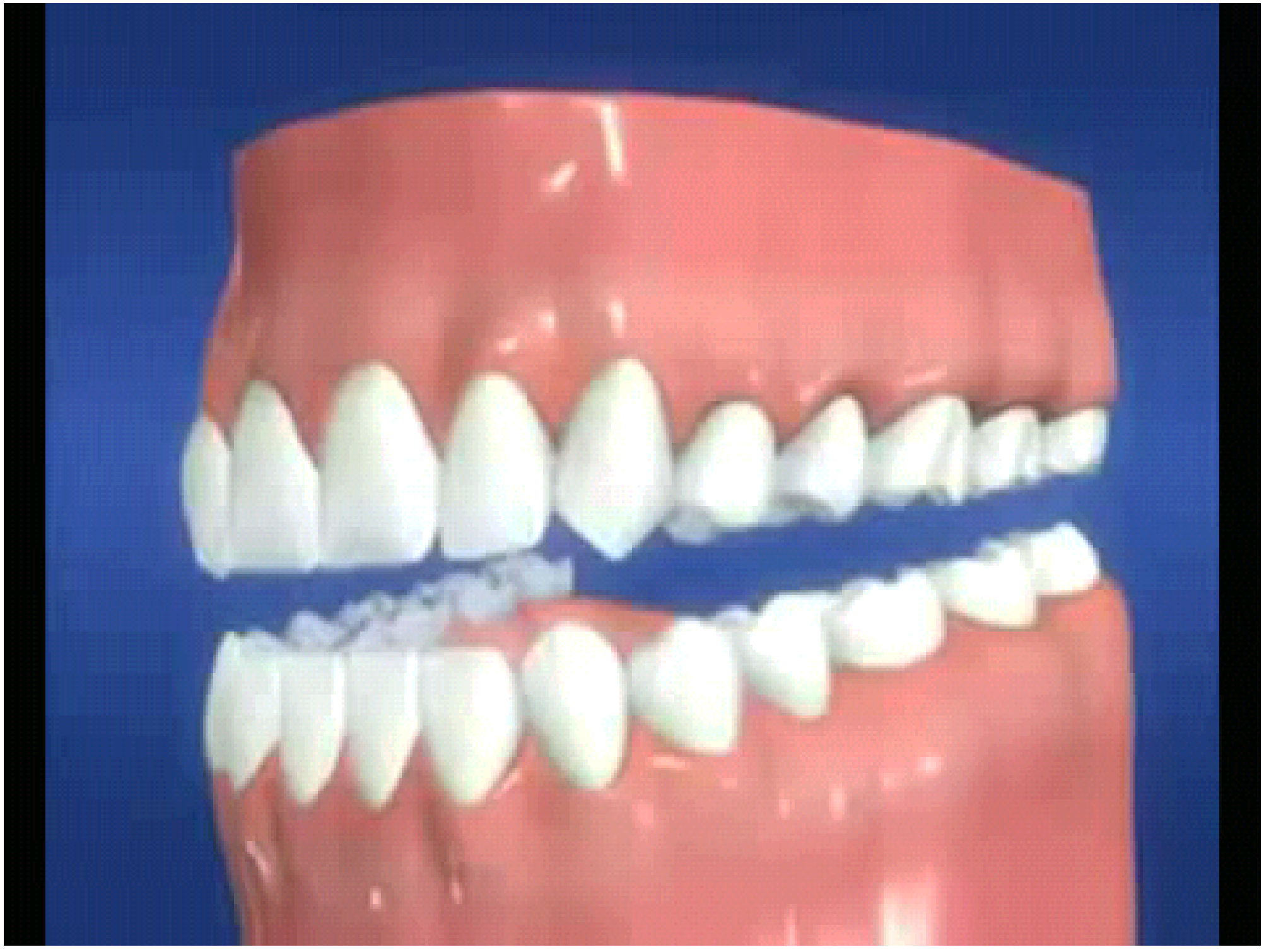
Plaque Stagnation Areas

- Pits and Fissures
- Gingival Margins
- Interproximal areas
- Dental appliences



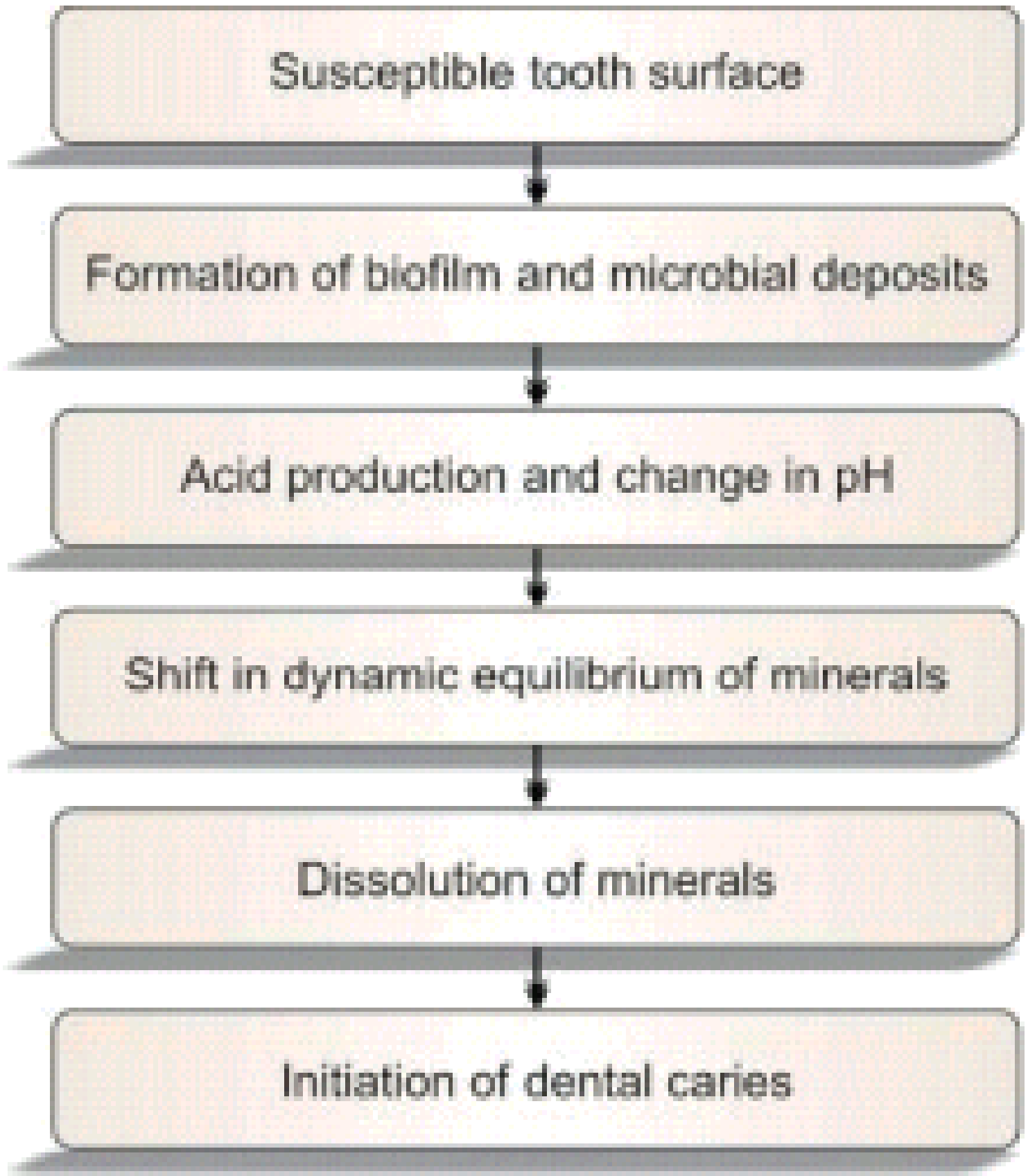






How the Plaque Causes Harm

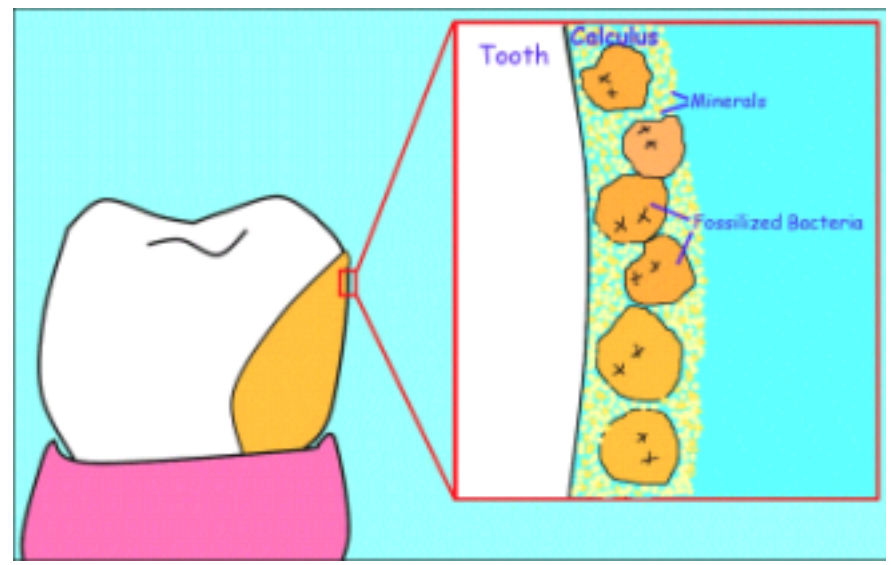
Being the thick film saliva can not penetrate and cannot neutralize the acid produced by bacteria. These acids demineralize the closest tooth surface. Thus it will lead to dental caries.


Susceptible tooth surface
Formation of biofilm and microbial deposits
Acid production and change in pH
Shift in dynamic equilibrium of minerals
Dissolution of minerals
Initiation of dental caries

How the Plaque Causes Harm

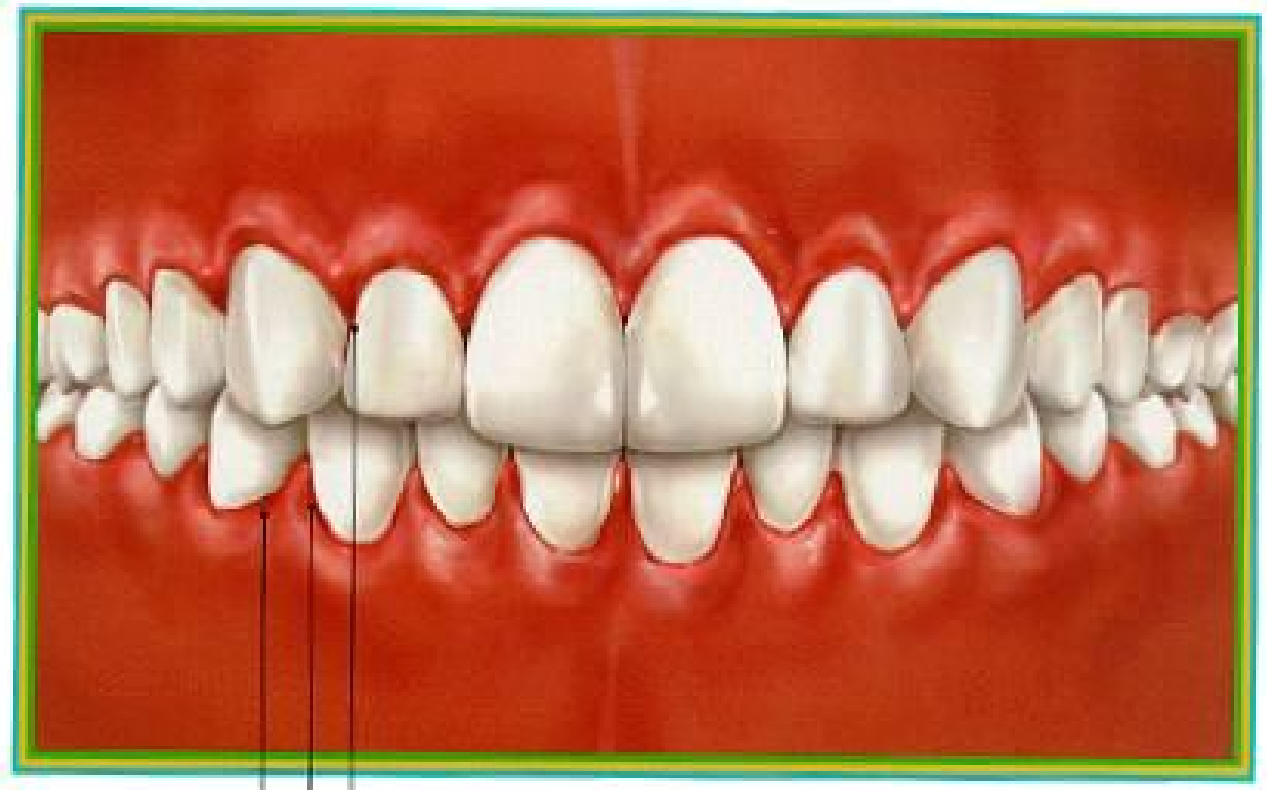
Plaque also causes irritation of gums and leads to gingivitis and if not removed, further will lead to periodontitis and tooth loss.

Plaque can also mineralize and become hard called calculus (tartar) which invites more deposits causing more gum problems.



How the Plaque Causes Harm

GINGIVITIS



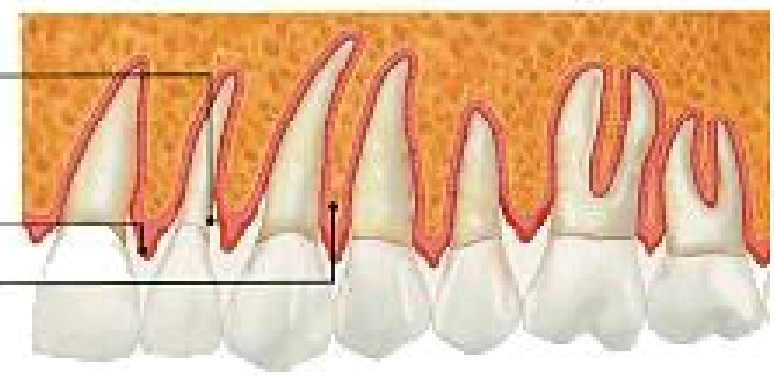
GUMS:

- Red
- Swollen
- Bleed easily

How the Plaque Causes Harm

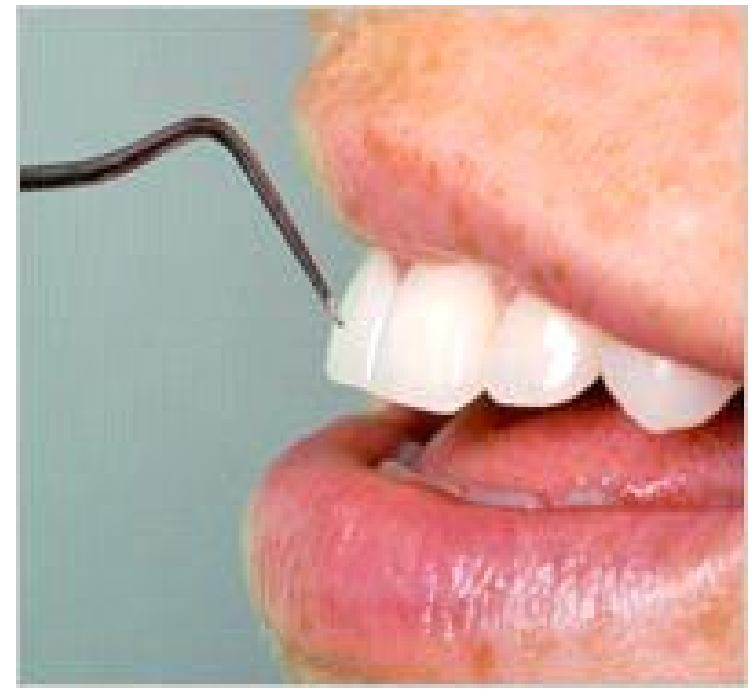
EARLY PERIODONTITIS

- Pockets form as gums separate from teeth
- Tissue that anchors teeth to bone becomes inflamed
- Slight bone loss



Testing of Plaque

- Plaque is usually clear and can not be seen by naked eyes unless it is colored with a special dye.
- Dentist can identify plaque with dental instruments.
- Testing of plaque should be done after brushing and flossing to see if any residual plaque is remaining.

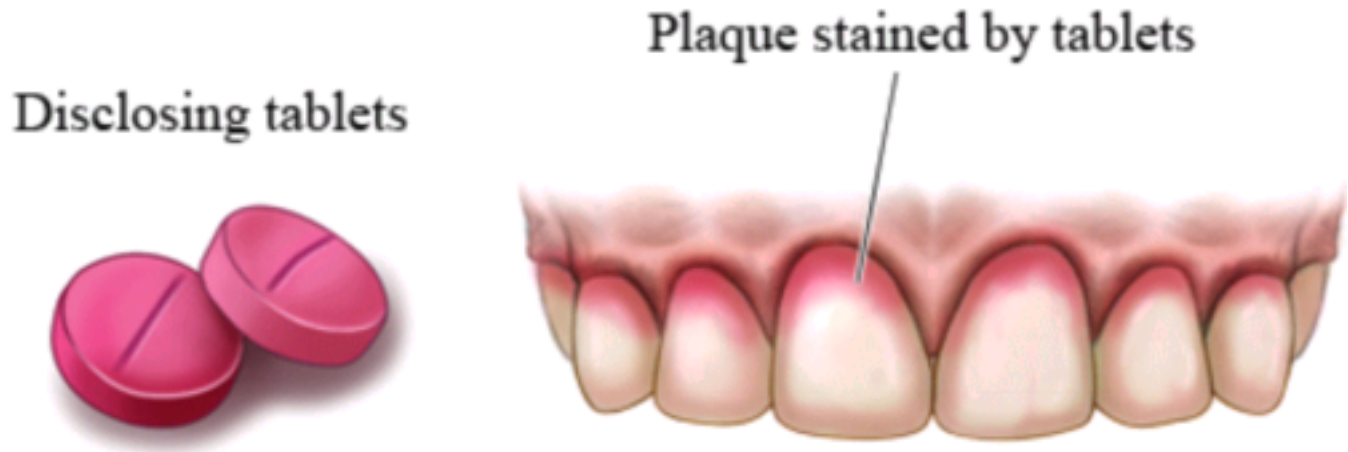


Testing of Plaque

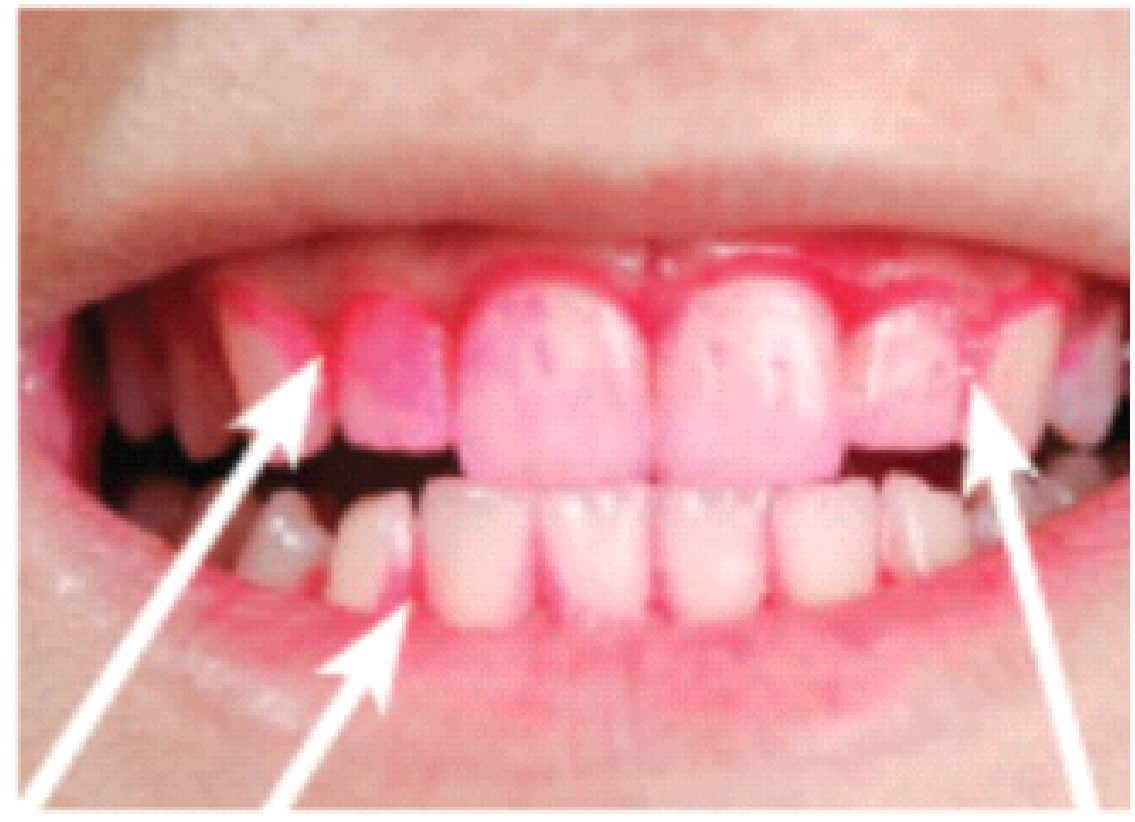
Disclosing agents

Special tablet containing red dye is chewed thoroughly and mixture of saliva and dye is moved over teeth and gums for about 30sec.

Mouth is then rinsed. The unremoved plaque gets stained pink which can be removed later on by brushing.



Before disclosing



After disclosing
(showing plaque)

Control of Plaque

- Some of the plaque is removed by saliva and by movement of cheeks and tongue over the teeth.
- Regular brushing and flossing everyday (at least two times) is necessary to remove the plaque.
- Regular professional cleaning by a dentist is the best way to get rid of the plaque and tartar.

Keep Smiling