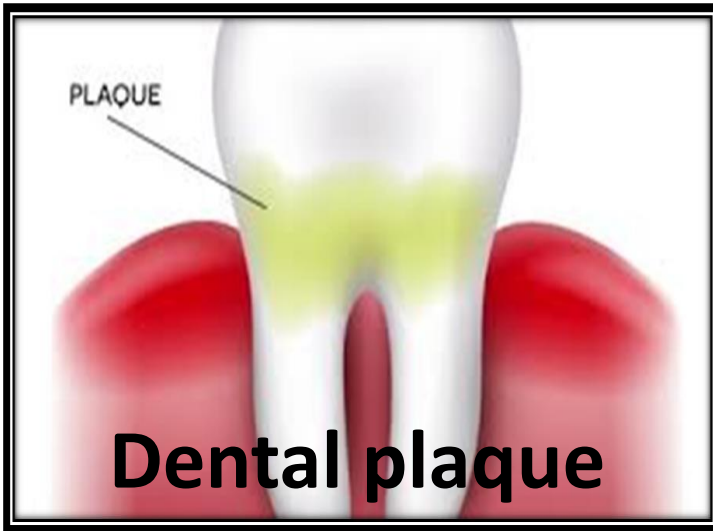




Third stage/ Microbiology



&

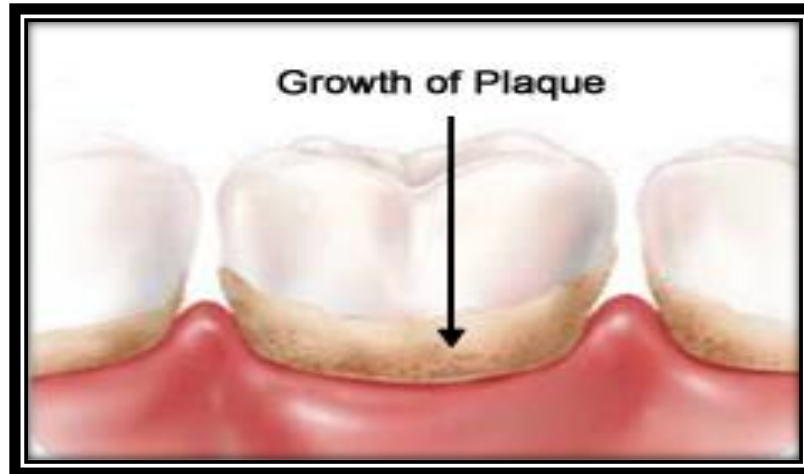


Assistant Lecturer
Najwan Sadik Shareef
Basic Science department
College of Dentistry
University of Basrah

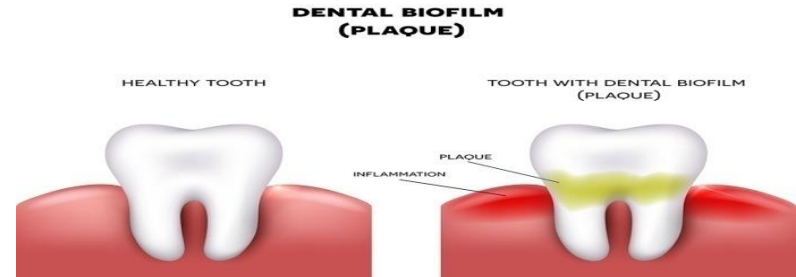


What is dental plaque

is material adhering to the teeth, consists of bacterial cells (60-70% the volume of the plaque), salivary polymers, and bacterial extracellular products.



❖ Plaque is a naturally-constructed biofilm, in which the accumulation of bacteria may reach a hundreds of cells on the surfaces of the teeth.



The accumulations of bacterial cells will effect the teeth and gingival tissues to high concentrations of bacterial metabolites, which lead to dental disease .

❖ The dominant bacterial species in dental plaque are *Streptococcus sanguis* and *Streptococcus mutans* , both of which are considered responsible for plaque.

***Biofilm** consists of densely packed bacteria, which is embedded in a matrix of organic polymers of bacterial and salivary origin.

Biofilm formation:

Attachment

Colonization

Growth

BULK FLUID

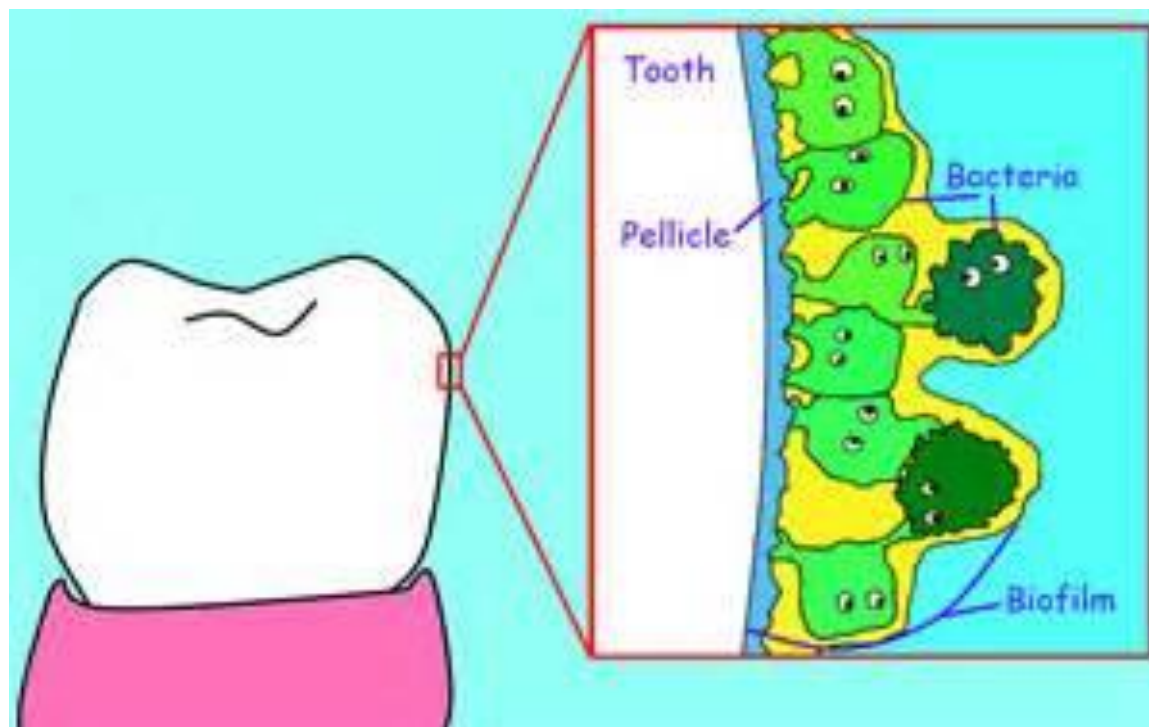
SURFACE

The diagram illustrates the three stages of biofilm formation on a surface. The surface is represented by a black hatched area at the bottom. The bulk fluid is shown as a light blue area above the surface. In the 'Attachment' stage, a blue arrow points from a bacterium in the bulk fluid to the surface. In the 'Colonization' stage, a layer of bacteria is shown on the surface. In the 'Growth' stage, a large, complex biofilm structure is shown, with a large arrow pointing from the bulk fluid towards it. The text 'BULK FLUID' is written in a white banner across the top of the diagram, and 'SURFACE' is written in a white box at the bottom.

Composition of Dental plaque

- bacteria which form 50-70% of dental plaque
- glycoprotein together with extracellular polysaccharides form the plaque matrix
- Muco-poly-saccharides such as glucans and fructans
- Inorganic components
 - calcium
 - phosphorus
 - fluorides

Steps of Plaque Formation	Description
Association	Dental pellicle forms on the tooth (normally on tooth), and provides bacteria surface to attach
Adhesion	Within hours, bacteria loosely binds to the pellicle.
Proliferation	Bacteria spreads throughout the mouth and begins to multiply.
Microcolonies	Microcolonies are formed. Streptococci secrete protective layer (slime layer).
Biofilm formation	Microcolonies form complex groups with metabolic advantages.
Growth or maturation	The biofilm develops a primitive circulatory system



The Formation of dental plaque is due to the following:

- The lowering of oral pH level to acidic zones.
- Poor oral hygiene.
- Predominance of carbohydrates in food.
- Increase of ionic concentration, especially in the saliva.
- Increase the concentration of mucine in saliva.

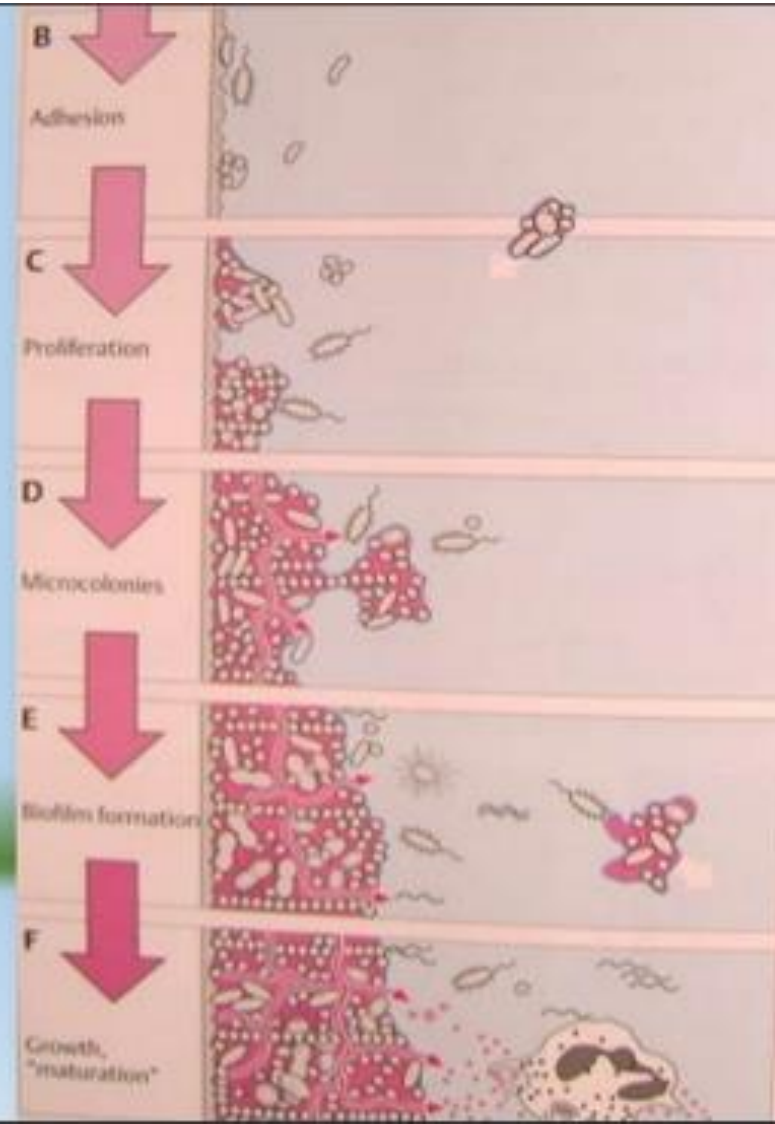
Dental plaque could be classified according to its relationship to the gingival margin.

- ☒ Supragingival plaque
- ☒ Subgingival plaque.

summary

dental plaque

1. Formation of pellicle
2. Attachment of bacteria to pellicle
3. Bacterial multiplication and colonization
4. Plaque growth and maturation
5. Matrix formation.



Dental Caries



Dental caries is a pathological process of destruction of tooth structure by microorganisms.

It is also known as **tooth decay** and is commonly called "cavities."

Definition:

Dental caries is an irreversible microbial disease of the calcified tissues of the teeth, characterized by demineralization of inorganic portion and destruction of organic substance of the tooth which often leads to cavitations.



- To understand dental caries remember the oral microflora .

Dental plaque (the oral flora which adhere to teeth) leads to breakdown of tooth enamel leading to caries.

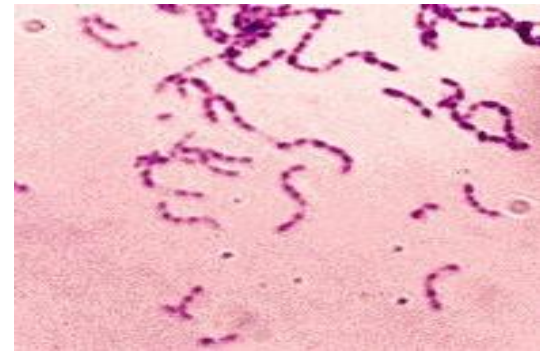
Organisms predominant in plaque are of the genus *Streptococcus*, with *Streptococcus mutans* being the species most important in the formation of dental caries.

•***S. mutans* have several properties that are important in the carious process:**

First, they colonize on tooth surfaces.

Second, they synthesize insoluble polysaccharides from sucrose. This allows their adhesion to smooth surfaces and appears to be important in the formation of smooth surface caries.

Third, they ferment sucrose to form lactic acid.



Streptococcus mutans and *Lactobacillus* are important in the formation of dental caries. Both bacteria are acidogenic, meaning that they can produce acids and can survive and even produce acids in a low pH environment.

Lactic acid is a strong acid that is effective in demineralization of tooth structure. It can dissolve the tooth substance (calcium phosphate in the form of hydroxyapatite crystals).

Streptococcus mutans initiate the process of dental caries, while *Lactobacillus* species are not important in the initiation of caries but in its continuation.

How dental caries occur

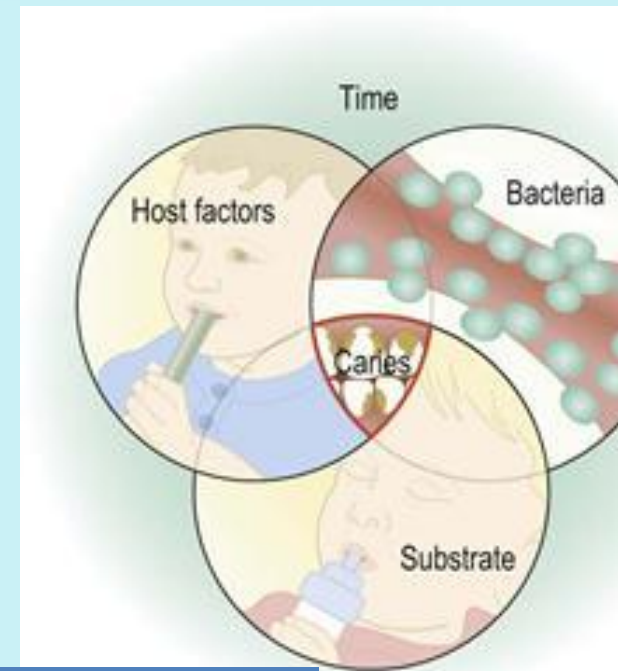


- ❖ Lactic acid is produced by lactic acid producing bacteria in the plaque (mostly *S. mutans*) from the fermentation of sugar and other carbohydrates in the diet of the host.
- ❖ Lactic acid and other organic acids which accumulate in dental plaque initiate caries by causing localized demineralization and initial weakening of the enamel.
- ❖ *Streptococcus mutans* and *Streptococcus sanguis* are most consistently been associated with the initiation of dental caries. It is not, however, the only cause of dental decay. After initial weakening of the enamel, various oral bacteria gain access to interior regions of the tooth.
- ❖ Lactobacilli, *Actinomyces*, and various bacteria are `secondary invaders that contribute to the progression of the lesions to dentin and cementum.



Factors Necessary for Tooth Decay

1. Bacteria: *Streptococcus mutans*
2. Food: fermentable carbohydrates (break down quickly)
3. Susceptible tooth
4. Exposure time



Tooth brushing can reduce the likelihood of caries by reducing number of cariogenic organisms and removing the substrate .

Prevention of Dental Caries

The prevention of dental caries can be approached in three ways:

- Use fluorides
- Reduce frequent consumption of sugars
- Apply pit and fissure sealants.

Summary

Dental Caries

Dental caries is an infectious microbiologic disease of the teeth that results in localized dissolution and destruction of the calcified tissues

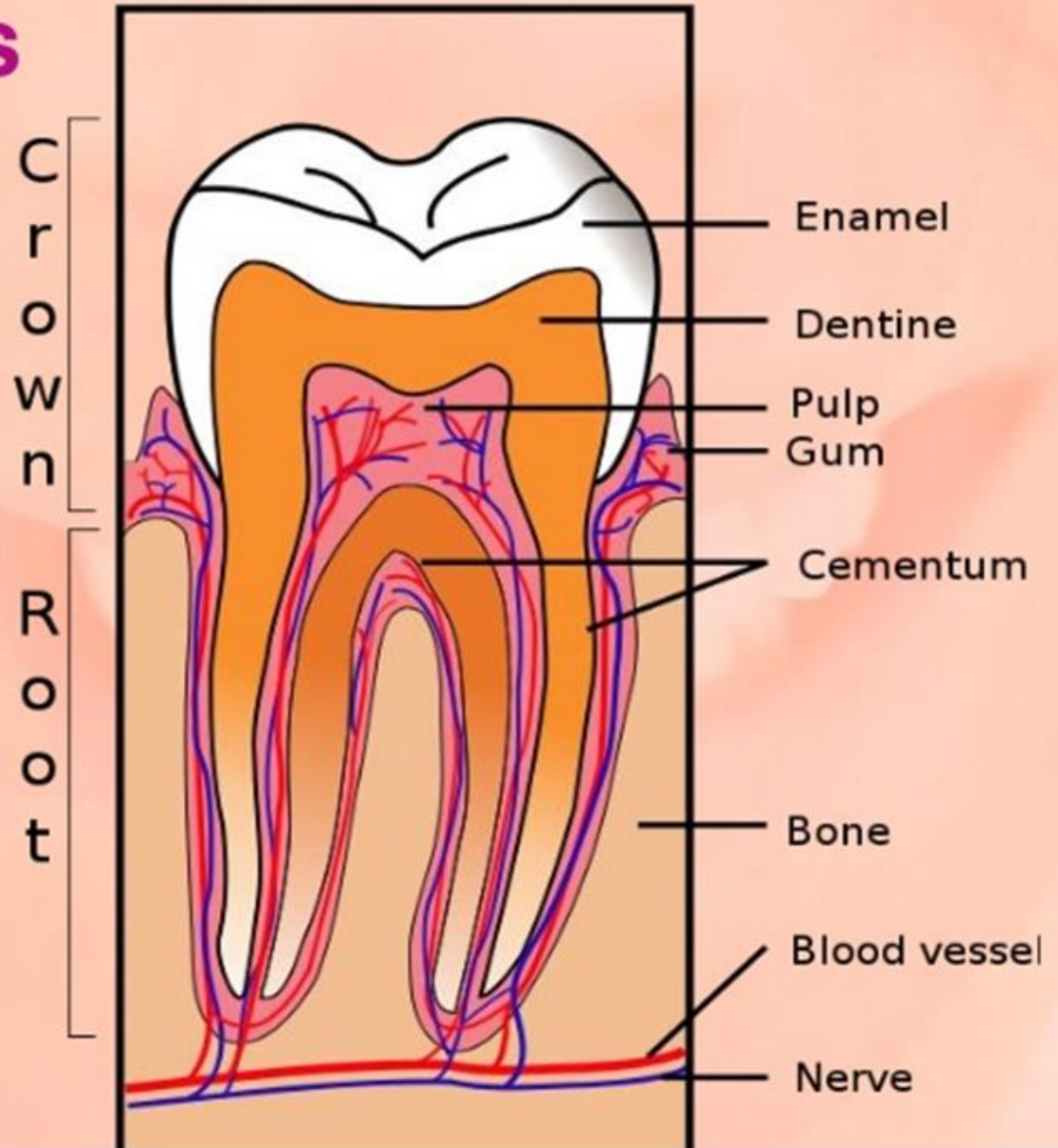
“Sturdevant”

□ Bacteria responsible of caries:

Streptococcus Mutans

And for the progression:

Lactobacilli



Thank you...