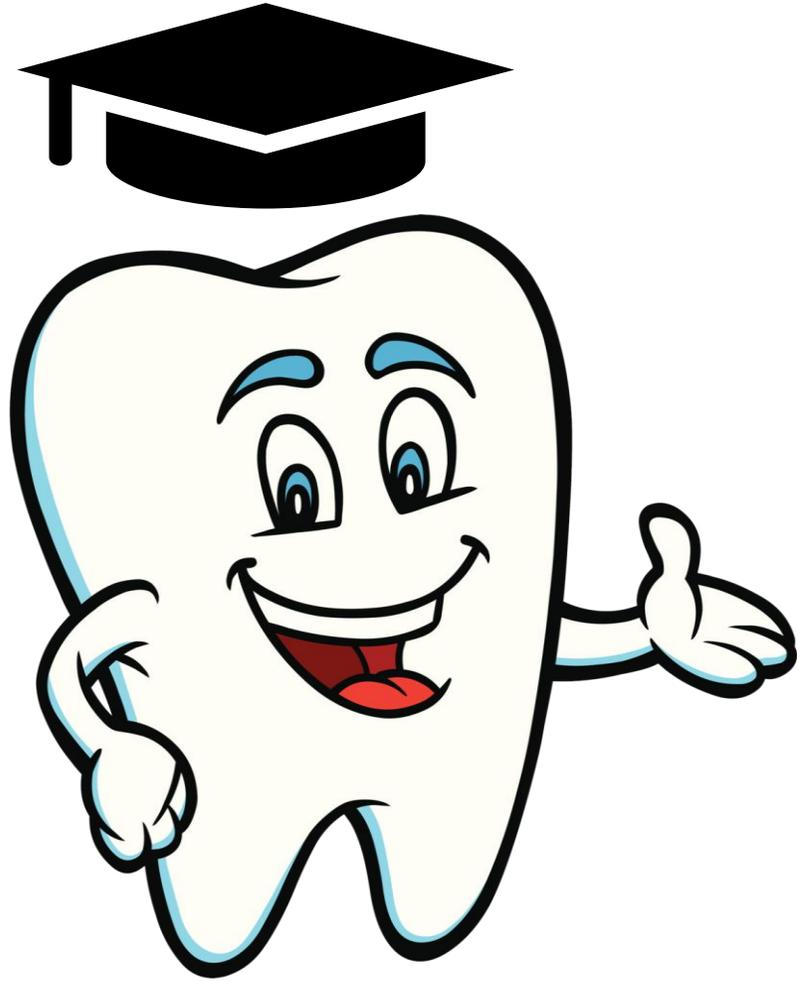






Welcome to our presentation

Dr. Sherif



تهنئة الى طلابي وطالباتي الأعزاء لبدء
الفصل الدراسي الثاني
أجمل امنياتي لكم

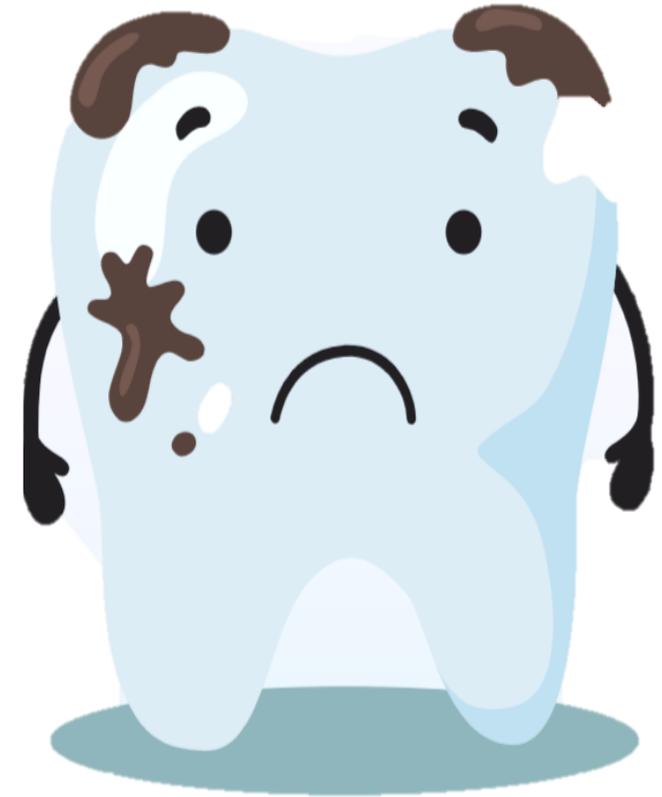


WELCOME TO JORDAN

Lecture 1

Dental Caries

Definition and Etiology



Dental Caries

=

Tooth Decay

Dental Caries Course

One Credit Hour



**All About Dental Caries in
one course**

Etiology
Incidence
Microbiology
Risk Factors
Types
Diagnosis
Histology
Prevention

7. Assessment Tools:



	Assessment	Percentage of marks due	Types of assessments
1	Midterm written exam	40%	60 MCQs
2	Final written exam	60%	80 MCQs

Dental Caries

Definition:

- Dental caries is a chronic microbial disease affecting the calcified tissues of the teeth.
- It is characterized by demineralization of the hard dental structures accompanied by subsequent breakdown of the organic matrix.
- Dental caries is a multifactorial disease.



Dental caries results from a dynamic imbalance between:

❖ Pathological factors that promote demineralization.

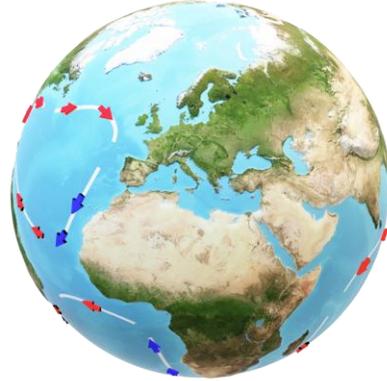


❖ Protective factors from saliva that support remineralization.

General information about dental caries

1. Dental caries is the most common disease of the world.

90%



2. Dental caries is the most important disease in dentistry.



3. Dental caries affects the individuals of all ages.



4. Dental caries need:
 - ☹ Carbohydrates intake.
 - ☹ Dental plaque.
 - ☹ Microorganisms.



5. Protection through saliva :
 - ✓ Washing action.
 - ✓ Buffering action.
 - ✓ Enamel remineralization.

6. Protection through Home care:
 - ✓ Good oral hygiene.
 - ✓ Dietary control.
 - ✓ Fluoride application.

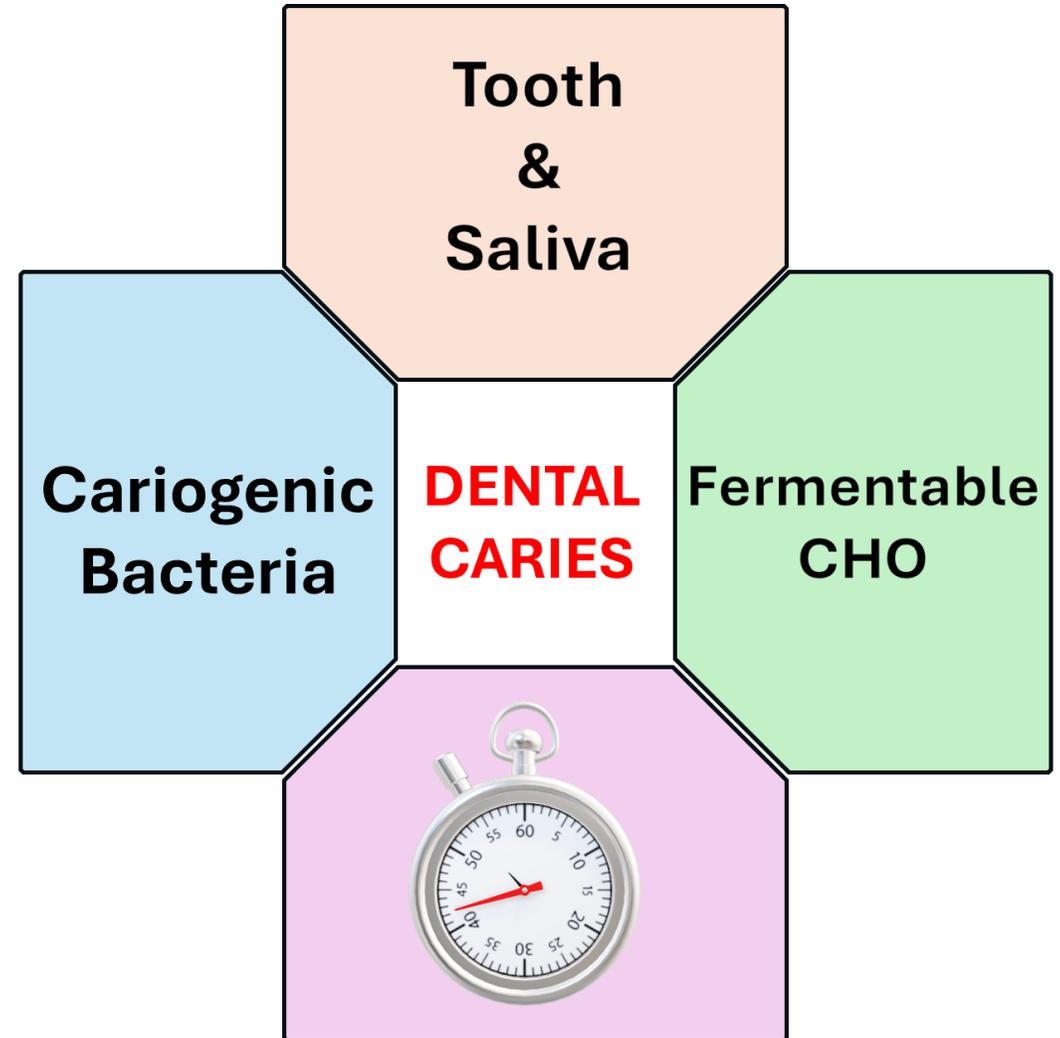


Chemical composition of dental hard tissues

	Inorganic contents (%)	Organic contents and H2O %	Inorganic components	Organic components
Enamel	96%	4%	<ul style="list-style-type: none"> • Calcium and Phosphorous in the form of Hydroxyapatite crystals ($\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$). 	<ul style="list-style-type: none"> • Enamel is ectodermal in origin. • 3% H₂O. • 1% amino acid enamelin + Amelogenin.
Dentin	65-70%	30-35%	<ul style="list-style-type: none"> • Magnesium. • Fluoride. 	<ul style="list-style-type: none"> • Dentin and cementum are mesodermal in origin. • 10% H₂O. • Collagen fibers type I and little III, V. • Ground substances: glycoprotein, proteoglycan, and lipid. • Osteopontin, bone sialoprotein). • Transforming growth factor β. • Bone morphogenic protein GF.
Cementum	45-50%	50-55%		

Multifactorial Need For Dental Caries

1. Tooth surface.
2. Dental plaque including bacteria.
3. Fermentable carbohydrates.
4. Sufficient time.



Dental Plaque

- **Dental plaque** is a soft, adhesive microbial biofilm that accumulates on the tooth surface.
- It appears colorless to pale yellow and cannot be readily removed by simple rinsing with water.

Dental plaque is composed of:

1. Cariogenic microorganisms (60–70 %).
2. Extracellular matrix over the tooth surfaces (30 - 40 %).
 - **Protein:** glycoprotein, amylase, gingival fluid.
 - **CHO: Dextran, levan , amylopectin.**
 - **Inorganic materials:** Ca, P, K, and fluoride.
 - **lipid:** small amount.
 - **Food debris:**
3. Water.



Clinical Features of Dental Plaque

Color:

- Stopping tooth brushing for 12 hours, dental plaque begins to form.
- Initially, plaque is colorless and reduce the glossy appearance of enamel.
- With time, it becomes yellowish in color.
- Later, it may become stained.
- Then become large amount of plaque that is easily observed.



Site:

1. Supragingival.
2. Subgingival locations.
3. Pits, and fissures.



Clinical Features of Dental Plaque

Diagnosis:

1. Visual examination:

Plaque appears as a soft, whitish or yellowish film.

2. A dental explorer can detect plaque on the tooth surface.

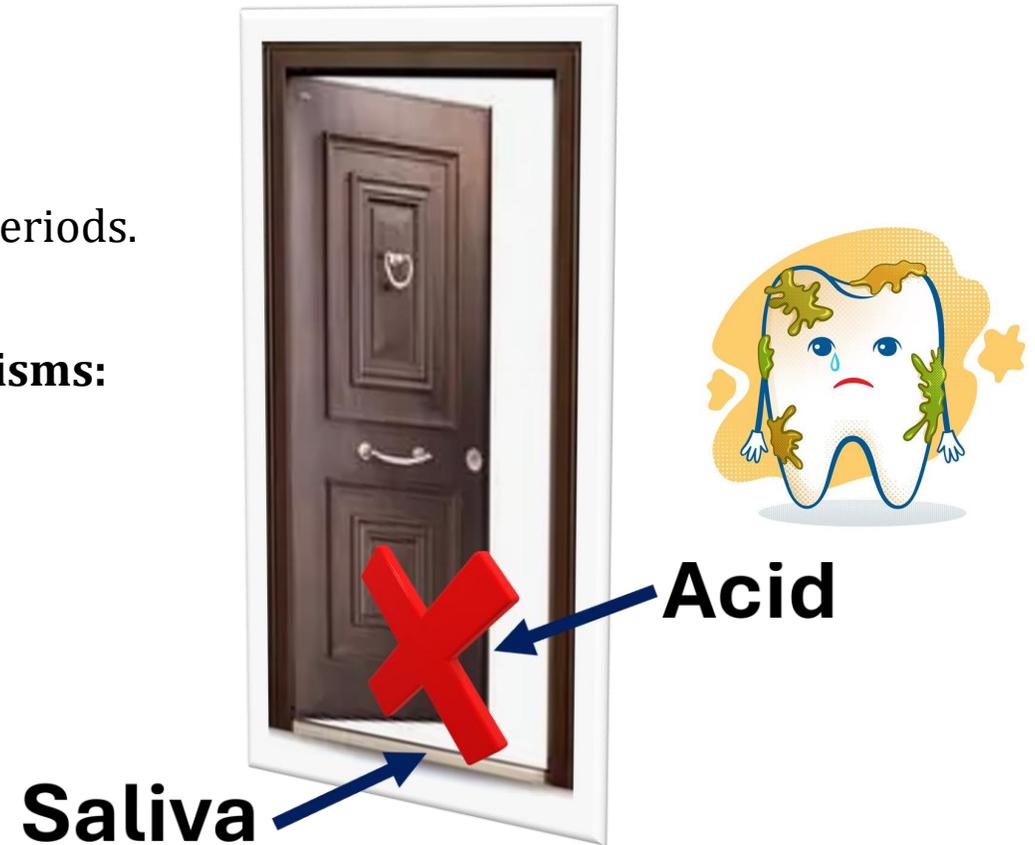
3. Plaque disclosing agent is special dyes stain plaque.

4. Gingival inflammation and halitosis.



Role of Dental Plaque in Formation of Dental Caries

- Dental plaque harbors **Cariogenic bacteria** on the tooth surface.
- Plaque adhere to the tooth surface by **CHO Dextran and Levan** (acts as glue).
- It provides nutrition to the bacteria for acid production.
- It retains acids in close contact with the tooth for prolonged periods.
- **It prevents acid from neutralization through two mechanisms:**
 1. Prevent acid from escaping to saliva in the oral cavity.
 2. Barrier effect that prevents salivary buffering.



Cariogenic Microorganisms

Definition:

Cariogenic microorganism are oral bacteria that cause dental caries by converting CHO into acids, which lower plaque pH and damage enamel and dentin.

Criteria:

- Cariogenic bacteria are **Acidogenic**, capable to produce acid from the fermentable carbohydrates which drop the Ph into 5.5.
- Cariogenic bacteria are **Aciduric**, can grow and metabolize in high acidic media.

Common example of cariogenic Bacteria:

- ❑ **Streptococcus mutans:** Initiator of enamel caries, highly acidogenic, and highly aciduric.
- ❑ **Lactobacillus species:** Involved mainly in caries progression in dentin and deep caries.
- ❑ **Actinomyces species (e.g., *A. viscosus*, *A. naeslundii*):** Associated with root caries.

Actions of Cariogenic Bacteria:

1. Formation of extracellular polysaccharide Dextran and Levan:

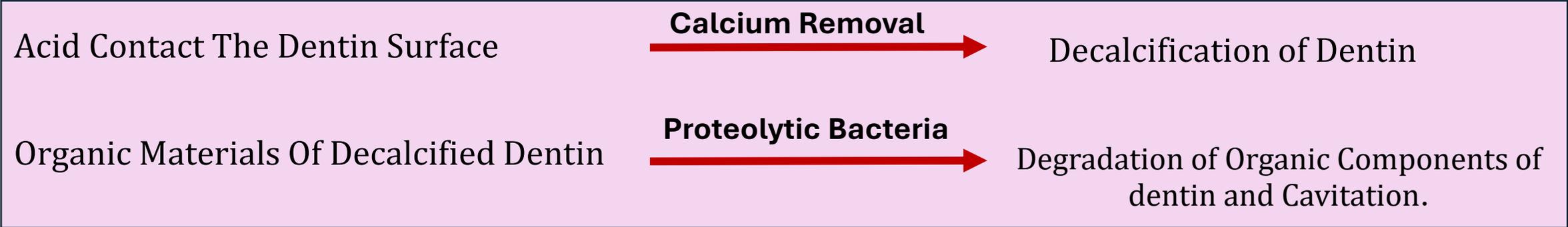
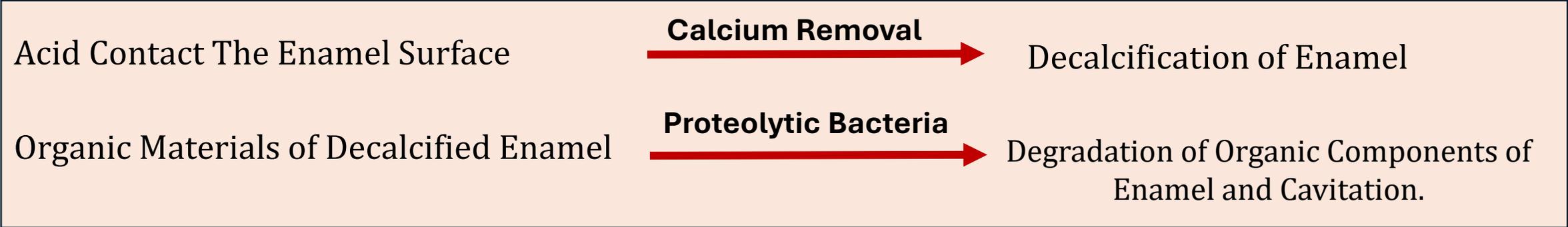
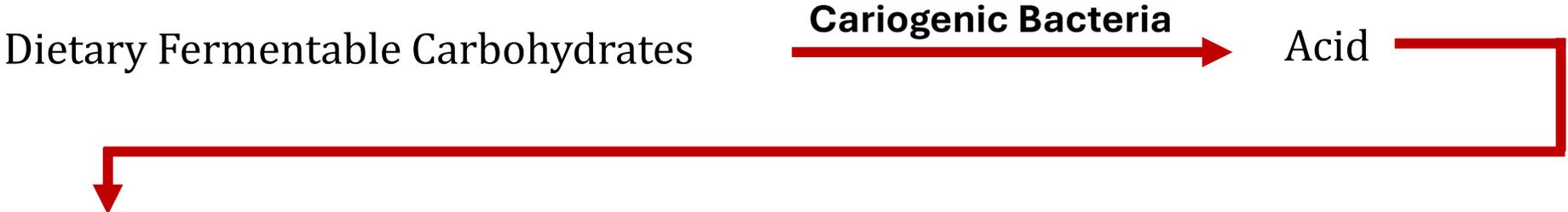
- Cariogenic bacteria can form extracellular monosaccharide mainly **dextran and levan** from fermentable CHO.
- Both dextran and levan are sticky, enhancing bacterial adhesion on the tooth surface to form mature dental plaque.
- The attached dental plaque with the bacteria and fermentable CHO are termed dental biofilm.
- As a result, acids produced within this biofilm remain in close contact with enamel, leading to dental caries on smooth surfaces as well as within pits and fissures.

2. Formation of intracellular polysaccharide Amylopectin:

- Cariogenic bacteria can synthesize and store intracellular polysaccharides **amylopectin** from excess CHO.
- These stored **amylopectin** act as an internal energy in the absence of external carbohydrate sources.
- Its breakdown allows continued acid production between meals, keeping plaque pH low and prolonging enamel demineralization.

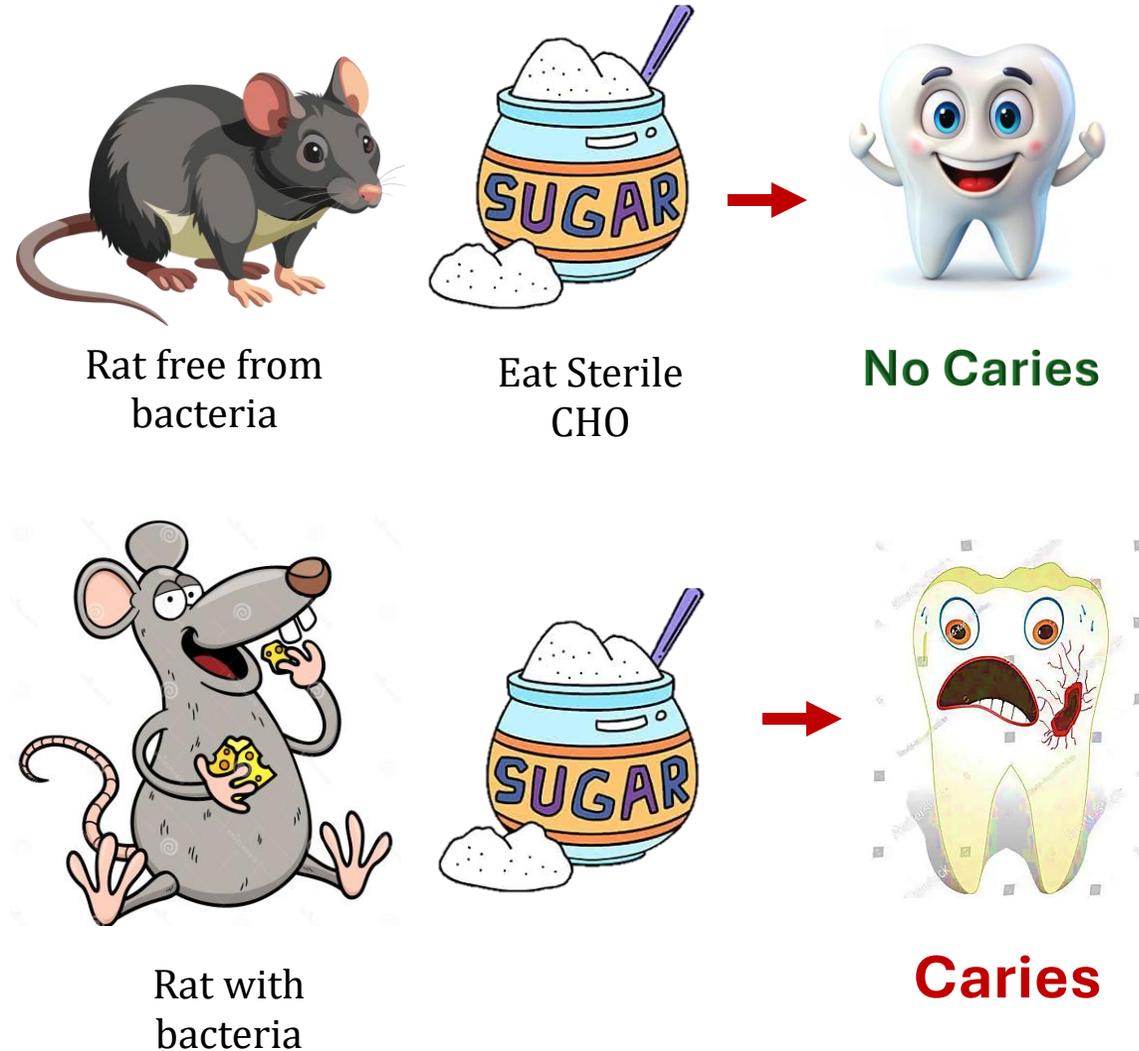
I. Miller's Theory 1890

Acidogenic theory of dental caries



II. Orland Experiment 1954

1. **Orland et al. (1954)**, conducted an experiment on germ-free laboratory rats that were completely free of bacteria.
2. The rats were fed sterile fermentable carbohydrates and did not develop dental caries.
3. The same rats were then inoculated with *Streptococcus mutans*, *Lactobacillus*, and *Actinomyces* species.
4. After exposure to these microorganisms and continuation of the same diet, the rats developed dental caries.
5. This experiment clearly demonstrated the essential role of cariogenic microorganisms in the initiation and development of dental caries.



Carbohydrates

Definition:

Carbohydrates are organic compounds composed of carbon, hydrogen, and oxygen, typically in a ratio of 1:2:1.

Types of carbohydrates in biochemistry:

1. **Monosaccharides:** Glucose, Galactose, and Fructose.
2. **Disaccharides:** Sucrose, Maltose and Lactose.
3. **Polysaccharides:** Starch, Glycogen, and Cellulose.

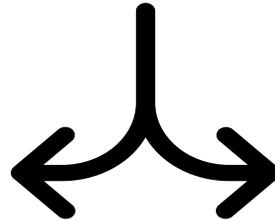
Types of carbohydrates Based on fermentability by oral bacteria:

1. Fermentable carbohydrates:



These CHO can be metabolized by bacteria to produce acids.

- Monosaccharides: Glucose, Fructose.
- Disaccharides: Sucrose, Lactose, Maltose.
- Refined starch: Cooked starch (e.g., bread, chips).



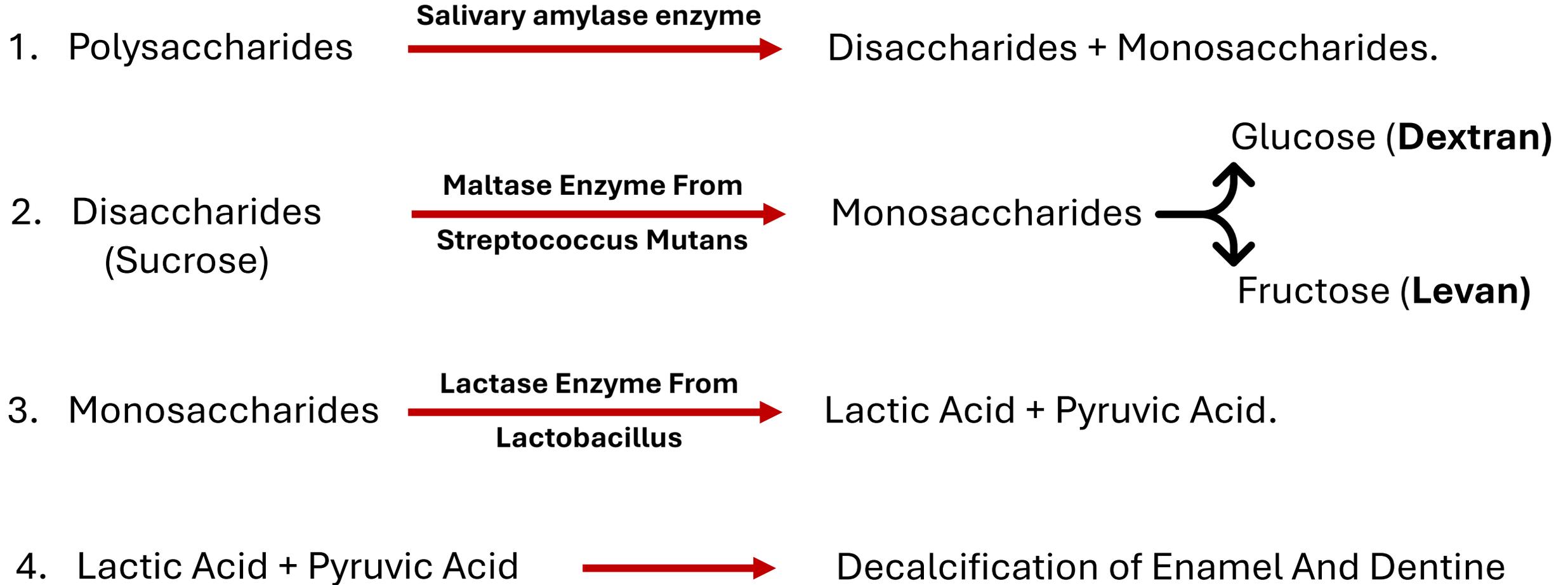
2. Non-fermentable carbohydrates: (Save)

These CHO are not fermented by oral bacteria.

- Non-refined starch: whole grains and vegetables.



Digestion of fermentable CHO inside the oral cavity:



Factors affecting the role fermentable CHO to form dental caries:

- 1. Type of CHO:** Simple sugars (e.g., sucrose, glucose, fructose) are more cariogenic.
- 2. Frequency of intake:** Frequent consumption of fermentable CHO increase the caries activity.
- 3. Timing of intake:** Consumption between meals or before sleep.
- 4. Route of administration:** Sticky foods adhere to tooth leading to prolonging acid production.
- 5. Amount consumed:** Larger quantities of fermentable CHO enhance acid production.
- 6. Refinement of CHO:** Improvement of whitening of CHO in industry increase the caries activity.
- 7. Oral clearance time:** Foods that are cleared slowly from the mouth increase the caries activity.
- 8. Presence of dental plaque:** Thick or mature plaque favors cariogenic bacteria.
- 9. Protective factors:** Fluoride, calcium, phosphate, and good oral hygiene can slow the caries formation.

Tooth susceptibility to caries

- Posterior teeth are more susceptible to caries than anterior teeth.
- Deep pits and fissures are more susceptible to caries.
- Thinner enamel in deciduous teeth is less resistant to acid attack.
- Crowded teeth are harder to clean and so are more susceptible to caries.
- Proximal surface cervical to the contact area are more susceptible to caries.
- Diseased enamel as enamel hypoplasia are more susceptible to caries.
- Newly erupted teeth are more susceptible to caries than in old age.
- Fluoride makes enamel more resistant to caries.



**THANK
YOU**

A vibrant, 3D-style graphic of the words "THANK YOU" in pink and yellow, surrounded by stars and motion lines. The text is rendered in a bold, bubbly font with thick outlines and a slight shadow. The word "THANK" is in pink with yellow outlines, and "YOU" is in yellow with pink outlines. The graphic is set against a white background with a faint, light blue circular pattern. The overall style is playful and celebratory.