وزارة التعليم العالي والبحث العلمي
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المادة: احياء مجهرية
المرحلة: الاولى

تدريسي المادة:

م.م زهراء حسين عبد اللطيف

الايميل الجامعي للتدريسية
zahraa.almosawie.inj@atu.edu.iq /

العام الدراسي

2025-2026

المفردات النظرية	
Week	**Syllabus**
1	Introduction to Microbiology: Branches of Science
2	Bacterial Morphology: Internal Structure, Shape & Size
3	Bacterial Classification: Taxonomic Methods, Structural Functions
4	Growth Curve: Phases & Influencing Factors
5	Sterilization & Disinfection: Types, Methods & Materials
6	Oral Normal Flora: Types & Pathogenic Roles
7	Fermentation: Types & Role in Dental Caries
8	Role of Normal Flora in Dental Caries: Pathogenesis Stages
9	Oral Bacteria: Mutans & Mitis Groups
10	Streptococci: Streptococcus pyogenes
11	Staphylococci: Staphylococcus aureus
12	Oral Viruses: Herpes Simplex Virus
13	Oral Protozoa: Entamoeba gingivalis
14	Oral Trichomonads: Trichomonas tenax
15	Oral Fungi: Candida albicans

Introduction of microbiology

Microbiology is the branch of biology that studies microorganisms such as bacteria, fungi, protozoa, and viruses.
These microorganisms are too small to be seen clearly with the naked eye.
Some microorganisms are beneficial, while others can cause infectious diseases.
Microbiology studies their structure, growth, reproduction, and interactions with humans and the environment.
It is important in medicine, laboratory diagnosis, infection control, biotechnology, and public health.

Microbiology Course Overview

Microbiology is the study of microorganisms and their characteristics, growth, and classification.
The course covers bacterial morphology, internal structure, classification, and growth phases.
It introduces sterilization and disinfection methods used to control microorganisms.

The course focuses on oral normal flora, fermentation, and their role in dental caries.
It provides basic knowledge of microbial pathogenesis and its relationship with oral health.

-Target Group：First-Year Students of the Department of Dental Prevention and Orthodontic Technologies

(Justification of the Course) :This module is designed to provide students with fundamental knowledge of microbiology, including the characteristics, classification, growth, and control of microorganisms. It also introduces the role of microorganisms in oral health and dental caries, providing students with the basic microbiological knowledge required for their future professional practice.

Central Idea

1. Introduction to Microbiology
2. Bacterial Morphology, Classification and Growth
3. Sterilization and Disinfection
4. Oral Normal Flora and Its Role in Dental Caries
5. Microbial Pathogenesis **and Oral Diseases**

Lec 1 Bacterial Classification

1. Classification by Morphology

1. Cell Shape

Cocci (spherical)	Bacilli (rod-shaped)	Spiral forms	Vibrio (comma-shaped)
Single cocci	Single bacilli	• Spirilla (rigid)	
Diplococci	Streptobacilli (chains)	Spirochetes (flexible)	
Streptococci (chains)	Coccobacilli		
Staphylococci (clusters)	• Fusiform bacilli		

2. Classification by Gram Stain Reaction

Gram-Positive Bacteria

- Thick peptidoglycan layer
- Retain crystal violet (purple)
- Examples: Staphylococcus, Streptococcus, Bacillus, Clostridium

Gram-Negative Bacteria

- Thin peptidoglycan
- Outer membrane with LPS
- Stain pink
- Examples: E. coli, Salmonella, Pseudomonas, Neisseria

3. Classification by Oxygen Requirements

1. Obligate aerobes – require oxygen (e.g., Pseudomonas)
2. Obligate anaerobes – oxygen is toxic (e.g., Clostridium)
3. Facultative anaerobes – grow with or without oxygen (e.g., E. coli)
4. Microaerophiles – need low oxygen (e.g., Helicobacter pylori)
5. Aerotolerant anaerobes – tolerate oxygen but don’t use it

4. Classification by Temperature Preference

1. Psychrophiles – grow at 0–20°C
2. Mesophiles – 20–45°C (most pathogens)
3. Thermophiles – 45–80°C
4. Hyperthermophiles – >80°C

5. Classification by Antigenic Structure (Serotyping)

• O antigen (LPS)

• H antigen (flagella)

• K antigen (capsule)

Used for strains like Salmonella, E. coli, Shigella.

6. Classification by Motility

• Flagellated

• Non-motile

• Types of flagella: monotrichous, lophotrichous, amphitrichous, peritrichous

7. Classification by Spore Formation

• Spore-formers: Bacillus (aerobic), Clostridium (anaerobic)

• Non–spore-formers

Nutritional Requirements

• Autotrophs – use CO_2

• Heterotrophs – use organic carbon

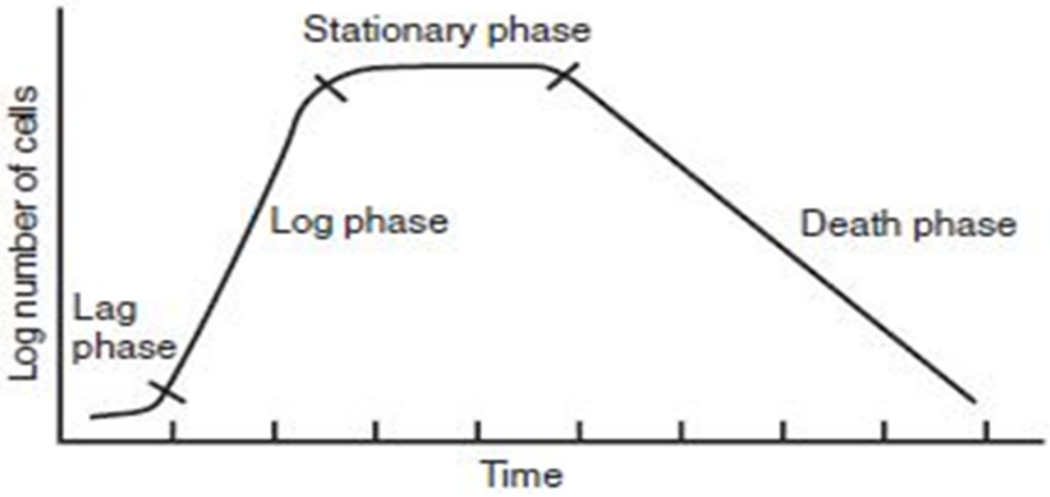
• Phototrophs – use light energy

• Chemotrophs – chemical energy

2. Bacterial Growth

Phases of growth curve in closed system:

1. Lag phase – adaptation
2. Log (exponential) phase – rapid division
3. Stationary phase – nutrients decrease
4. Death phase



3. Bacterial Reproduction

- Binary fission
- Very fast (some species divide every 20 minutes)

4. Genetic Variation in Bacteria

Even though bacteria reproduce asexually, they exchange genes via:

1. Transformation – uptake of naked DNA
2. Transduction – bacteriophage-mediated
3. Conjugation – plasmid transfer via sex pill

5. Bacterial Sporulation

- Occurs in harsh conditions
- Produces highly resistant endospores
- Seen in Bacillus and Clostridium species

6. Biofilms

- Structured communities of bacteria

- Attached to surfaces
- Highly resistant to antibiotics
- Important in chronic infections (catheters, implants)

Lec 2

Pre-Test – Bacterial Classification & Physiology

Q1. Choose the correct answer:

1. **Which bacterial shape is spherical?**
   A. Bacilli
   B. Cocci
   C. Vibrio
   D. Spirilla
   Answer: B. Cocci

2. **Gram-positive bacteria have:**
   A. Thin peptidoglycan layer
   B. Thick peptidoglycan layer
   C. No cell wall
   D. Outer membrane with LPS
   Answer: B. Thick peptidoglycan layer

3. **Which bacteria require oxygen for growth?**
   A. Obligate anaerobes
   B. Facultative anaerobes
   C. Obligate aerobes
   D. Aerotolerant anaerobes
   Answer: C. Obligate aerobes

4. **Which bacteria can grow with or without oxygen?**
   A. Obligate aerobes
   B. Facultative anaerobes
   C. Microaerophiles
   D. Obligate anaerobes
   Answer: B. Facultative anaerobes

5. **Most pathogenic bacteria are:**
   A. Psychrophiles
   B. Mesophiles
   C. Thermophiles
   D. Hyperthermophiles
   Answer: B. Mesophiles

6. **Which antigen is associated with bacterial flagella?**
   A. O antigen
   B. H antigen
   C. K antigen
   D. L antigen
   Answer: B. H antigen

7. **Which bacteria are spore-formers?**
   A. E. coli and Salmonella
   B. Bacillus and Clostridium
   C. Neisseria and Streptococcus
   D. Pseudomonas and E. coli
   Answer: B. Bacillus and Clostridium

8. **Which phase of bacterial growth involves rapid cell division?**
   A. Lag phase
   B. Log phase
   C. Stationary phase
   D. Death phase
   Answer: B. Log phase

9. **The usual method of bacterial reproduction is:**
   A. Budding
   B. Binary fission
   C. Conjugation
   D. Sporulation
   Answer: B. Binary fission

10. **Transfer of bacterial DNA by a bacteriophage is called:**
    A. Transformation
    B. Transduction

C. Conjugation
D. Mutation
Answer: B. Transduction

Post-Test – Bacterial Classification & Physiology

Q1. Choose the correct answer:

1. **Which bacterial shape is comma-shaped?**
   A. Cocci
   B. Bacilli
   C. Vibrio
   D. Spirilla
   Answer: C. Vibrio

2. **Gram-positive bacteria retain which stain?**
   A. Safranin
   B. Crystal violet
   C. Methylene blue
   D. Iodine
   Answer: B. Crystal violet

3. **Which structure is present in Gram-negative bacteria?**
   A. Thick peptidoglycan only
   B. Outer membrane with LPS
   C. Capsule only
   D. Endospore
   Answer: B. Outer membrane with LPS

4. **Which organism is an obligate anaerobe?**
   A. Pseudomonas
   B. E. coli
   C. Clostridium
   D. Helicobacter pylori
   Answer: C. Clostridium

5. **Bacteria that require low levels of oxygen are called:**
   A. Obligate aerobes
   B. Microaerophiles

C. Facultative anaerobes
D. Aerotolerant anaerobes
Answer: B. Microaerophiles

6. **Bacteria that grow between 20–45°C are called:**
   A. Psychrophiles
   B. Mesophiles
   C. Thermophiles
   D. Hyperthermophiles
   Answer: B. Mesophiles

7. **Which antigen is associated with the bacterial capsule?**
   A. O antigen
   B. H antigen
   C. K antigen
   D. L antigen
   Answer: C. K antigen

8. **Which type of flagella is distributed all around the bacterial cell?**
   A. Monotrichous
   B. Lophotrichous
   C. Amphitrichous
   D. Peritrichous
   Answer: D. Peritrichous

9. **During which phase does bacterial adaptation occur?**
   A. Lag phase
   B. Log phase
   C. Stationary phase
   D. Death phase
   Answer: A. Lag phase

10. **During which phase does rapid bacterial division occur?**
    A. Lag phase
    B. Log phase
    C. Stationary phase
    D. Death phase
    Answer: B. Log phase

True / False

11. Autotrophs use CO_2 as a carbon source.
Answer: True

12. Heterotrophs use organic carbon.
Answer: True

13. Bacteria normally reproduce by binary fission.
Answer: True

14. Conjugation involves bacteriophage-mediated DNA transfer.
Answer: False

15. Sporulation occurs under harsh conditions.
Answer: True

16. Bacillus and Clostridium can form endospores.
Answer: True

Complete the following

17. The uptake of naked DNA by bacteria is called _____.
Answer: Transformation

18. The transfer of DNA by a bacteriophage is called _____.
Answer: Transduction

19. The transfer of plasmids between bacteria is called _____.
Answer: Conjugation

20. Bacterial communities attached to surfaces are called _____.
Answer: Biofilms

Lec 3

Pre-Test – Safety in Microbiology Laboratories

Q1. Choose the correct answer:

1. Which of the following is a possible hazard in a microbiology laboratory?
   A. Fire
   B. Electrical hazards
   C. Chemical hazards
   D. All of the above
   Answer: D. All of the above
2. What is the main purpose of a Biological Safety Cabinet (BSC)?
   A. To store chemicals
   B. To protect workers from infectious aerosols
   C. To heat bacterial cultures
   D. To sterilize laboratory glassware
   Answer: B. To protect workers from infectious aerosols
3. Which filter is commonly used in Biological Safety Cabinets?
   A. HEPA filter
   B. Paper filter
   C. Cotton filter
   D. Sand filter
   Answer: A. HEPA filter
4. Which item should be worn during laboratory work?
   A. Lab coat
   B. Sandals
   C. Jewelry
   D. None
   Answer: A. Lab coat
5. Which of the following should NOT be practiced in the laboratory?
   A. Washing hands
   B. Wearing a lab coat
   C. Mouth pipetting
   D. Careful handling of infectious materials
   Answer: C. Mouth pipetting
6. What should be done with contaminated materials before disposal?
   A. Ignore them
   B. Decontaminate them
   C. Put them in normal waste
   D. Leave them on the bench
   Answer: B. Decontaminate them

True / False

7. **Eating and drinking are allowed inside microbiology laboratories.**
   Answer: False
8. **Hands should be washed after laboratory work.**
   Answer: True
9. **Laboratory coats should be removed before leaving the laboratory.**
   Answer: True

10. **Autoclaving is a method used for decontamination.**
    Answer: True

Short Questions

11. **What does BSC stand for?**
    Answer: Biological Safety Cabinet.
12. **What does BSL stand for?**
    Answer: Biosafety Level.
13. **How many Biosafety Levels are there?**
    Answer: Four levels: BSL-1, BSL-2, BSL-3, and BSL-4.
14. **Which BSL represents the highest level of containment?**
    Answer: BSL-4.

Lecture :3
Safety in Microbiology Laboratories

1. Laboratory Hazards

Microbiology labs contain several risks, including:

- Fire
- Electrical hazards
- Chemical hazards
- Slippery floors
- Radioactive materials
- Biological hazards (Biohazards)

2. Biological Safety Cabinets (BSC)

BSCs protect workers from infectious aerosols.
The air entering or leaving the cabinet is sterilized by:

- Heat
- UV light
- HEPA filters (remove particles > 0.3 μm)

Classes of Biological Safety Cabinets:

Class I

- Protects the worker, but not the sample
- Negative pressure
- Vented to the outside
- Open front

Class II (Laminar Flow Cabinet)

Most common in hospitals.

- Protects both worker and sample
- Air flows in a clean, filtered sheet

Types:

- Type A2: fixed opening
- Type B2: variable opening

Class III

Highest level of protection

- Completely enclosed
- Negative pressure
- All handling done through attached rubber gloves

3. Protective Clothing

- Lab coats must be worn during work
- Removed before leaving the lab
- If contaminated, they must be autoclaved

4. Decontamination

Contaminated materials:
- Must be decontaminated before disposal
- Labeled with “Biohazard”
- Tools (scissors, forceps, blades) placed in metal containers

Main method:
- Autoclave: 121°C, 15 psi, 15 minutes

Work surfaces:
- Clean before and after work
- Use 70% ethanol, phenolic compounds, or diluted bleach

5. Personal Practices in the Lab
1. Handle infectious materials carefully
2. Avoid aerosol formation
3. Mouth pipetting is forbidden
4. Keep the burner in a protective container
5. No eating, drinking, smoking, cosmetics, or chewing gum
6. Wash hands with soap and water after work and before leaving

6. Biosafety Levels (BSL)
BSL-1

Non-pathogenic organisms
Examples: Bacillus subtilis, M. gordonae, S. epidermidis

BSL-2

Common infectious agents
Examples: HBV, HIV, Salmonella, Shigella, Brucella, M. tuberculosis

BSL-3

More dangerous agents (airborne infections)
Examples: Arboviruses, Arenaviruses
Requires strict procedures and protective clothing

BSL-4

Most dangerous viruses
Examples: Filoviruses (Ebola)
Requires maximum containment

Post-Test – Safety in Microbiology Laboratories

Q1. Choose the correct answer:

1. Which class of BSC provides the highest level of protection?
   A. Class I
   B. Class II
   C. Class III
   D. Class IV
   Answer: C. Class III
2. Class I Biological Safety Cabinet protects:
   A. The worker only
   B. The sample only
   C. Both worker and sample
   D. Neither
   Answer: A. The worker only

3. Class II BSC protects:
   A. The worker only
   B. The sample only
   C. Both worker and sample
   D. Neither
   Answer: C. Both worker and sample
4. The standard autoclave conditions mentioned in the lecture are:
   A. 100°C, 10 psi, 10 minutes
   B. 121°C, 15 psi, 15 minutes
   C. 150°C, 20 psi, 20 minutes
   D. 80°C, 15 psi, 15 minutes
   Answer: B. 121°C, 15 psi, 15 minutes
5. Which concentration of ethanol is recommended for cleaning work surfaces?
   A. 30%
   B. 50%
   C. 70%
   D. 100%
   Answer: C. 70%
6. Which practice is prohibited in the microbiology laboratory?
   A. Washing hands
   B. Wearing a lab coat
   C. Mouth pipetting
   D. Avoiding aerosols
   Answer: C. Mouth pipetting
7. Which Biosafety Level is used for the most dangerous viruses?
   A. BSL-1
   B. BSL-2
   C. BSL-3
   D. BSL-4
   Answer: D. BSL-4
8. Ebola virus is classified under:
   A. BSL-1
   B. BSL-2
   C. BSL-3
   D. BSL-4
   Answer: D. BSL-4

True / False

9. **Class III BSC is completely enclosed and operates under negative pressure.**
   Answer: True
10. **Contaminated laboratory materials can be disposed of without decontamination.**
    Answer: False
11. **Laboratory coats should be removed before leaving the laboratory.**
    Answer: True

12. **Eating, drinking, smoking, and chewing gum are prohibited in the laboratory.**
    Answer: True

Complete the following

13. The filter used in BSCs to remove particles greater than 0.3 µm is _____.
    Answer: HEPA filter
14. The main method of decontamination mentioned in the lecture is _____.
    Answer: Autoclave
15. The highest Biosafety Level is _____.
    Answer: BSL-4
16. BSL-3 is associated with dangerous agents that can cause _____ infections.
    Answer: Airborne

Q1. Choose the correct answer (اختر الإجابة الصحيحة):

1. **What is the main end product of oral sugar fermentation by bacteria?**
    - A. Oxygen
    - B. Lactic acid
    - C. Alcohol
    - D. Carbon dioxide
    - **Answer: B. Lactic acid**

2. **At what critical pH value does enamel demineralization usually begin?**
    - A. Below 7.0
    - B. Below 6.5
    - C. Below 5.5
    - D. Below 4.0
    - **Answer: C. Below 5.5**

3. **Which bacterial species is primarily associated with lactic acid fermentation in dental caries?**
    - A. *Streptococcus mutans*
    - B. *Escherichia coli*
    - C. *Bacillus subtilis*
    - D. *Clostridium tetani*

- **Answer: A. *Streptococcus mutans***

4. **Which factor helps protect teeth by neutralizing acids and promoting remineralization?**
    - A. Frequent sugar consumption
    - B. Saliva flow
    - C. High plaque accumulation
    - D. Poor oral hygiene
    - **Answer: B. Saliva flow**

True / False (صح أم خطأ):

1. **Oral fermentation leads to a drop in oral pH.**
    - **Answer: True**

2. **Demineralization refers to the gain of calcium and phosphate in tooth enamel.**
    - **Answer: False** *(Demineralization is the loss of minerals)*

3. **Fluoride products can be used as a strategy to prevent dental caries.**
    - **Answer: True**

Short Answer Questions (أسئلة قصيرة):

1. **What is oral fermentation?**
    - **Answer:** It is the process by which oral bacteria metabolize sugars and fermentable carbohydrates into organic acids (mainly lactic acid).
2. **Mention two factors that increase the risk of dental caries.**
    - **Answer:**
        1. Frequent sugar intake
        2. Poor oral hygiene (or reduced saliva flow / high plaque accumulation)

Lecture :4

1. What Is Fermentation in the Oral Cavity?

Oral fermentation is a process carried out by oral bacteria when they metabolize:

• Sugars

• Fermentable carbohydrates

These bacteria convert sugars into: Organic acids and mainly lactic acid

This leads to:

1 • A drop in oral pH

2• Demineralization of tooth enamel

•3 Development of dental caries

2. Types of Fermentation Related to Dental Caries

A- Lactic Acid Fermentation

• The most important fermentation type in dental caries Carried out by bacteria such as: Streptococcus mutans and Lactobacillus species

Sugars → Lactic acid

📌 Effect:

1 • Oral pH falls below 5.5

2• Enamel demineralization begins

B-Mixed Acid Fermentation

• Produces multiple acids, including: Lactic acid ,Acetic acid and Formic acid

📌 Effect:

1• Stronger and prolonged acidity

2• Faster progression of dental caries

3. Role of Fermentation in Dental Caries

1. Acid Production: Acids produced during fermentation attack tooth enamel

2. pH Reduction: Low pH prevents enamel demineralization

3. Enamel Demineralization: Loss of calcium and phosphate from enamel

4. Dental Plaque Formation: Fermentation supports bacterial growth and adhesion to teeth

5. Progression of Tooth Decay: Continuous fermentation leads to deeper carious lesions (enamel → dentin → pulp)

4. Factors That Increase Fermentation and Caries Risk

1 • Frequent sugar intake

2 • Poor oral hygiene

3 • Reduced saliva flow

4 • High plaque accumulation

5. Prevention Strategies

1 • Reduce sugar consumption

2 • Maintain good oral hygiene

3• Use fluoride products

4• Stimulate saliva flow

Q1. Choose the correct answer (اختر الإجابة الصحيحة):

1. **What type of acid is mainly produced during lactic acid fermentation by oral bacteria?**
    - A. Acetic acid
    - B. Lactic acid
    - C. Formic acid
    - D. Citric acid
    - **Answer: B. Lactic acid**

2. **Which of the following is produced during mixed acid fermentation in the oral cavity?**
    - A. Lactic acid only
    - B. Lactic acid, Acetic acid, and Formic acid
    - C. Hydrochloric acid
    - D. Carbonic acid
    - **Answer: B. Lactic acid, Acetic acid, and Formic acid**

3. **What is the effect of mixed acid fermentation on dental caries?**
    - A. Slows down caries progression
    - B. Stronger/prolonged acidity and faster progression of caries
    - C. Neutralizes oral pH
    - D. Promotes enamel remineralization
    - **Answer: B. Stronger/prolonged acidity and faster progression of caries**

4. **Which process involves the loss of calcium and phosphate from tooth enamel?**
    - A. Remineralization
    - B. Demineralization
    - C. Fermentation
    - D. Salivation
    - **Answer: B. Demineralization**

5. **What is the correct sequence of tooth decay progression if continuous fermentation occurs?**
    - A. Pulp → Dentin → Enamel

- B. Enamel → Dentin → Pulp
- C. Dentin → Enamel → Pulp
- D. Enamel → Pulp → Dentin
- **Answer: B. Enamel → Dentin → Pulp**

True / False (صح أم خطأ):

1. **Lactic acid fermentation is the most important fermentation type related to dental caries.**
   - **Answer: True**

2. **Low oral pH prevents enamel demineralization.**
   - **Answer: False** *(Low oral pH promotes/causes demineralization)*

3. **Streptococcus mutans and Lactobacillus species are involved in lactic acid fermentation.**
   - **Answer: True**

4. **Reduced saliva flow decreases the risk of dental caries.**
   - **Answer: False** *(Reduced saliva flow increases the risk)*

Complete the following (أكمل الفراغات التالية):

1. Fermentation leads to dental caries through the loss of _____ and _____ from tooth enamel.
   - **Answer: Calcium, Phosphate**

2. Bacteria metabolize sugars and fermentable carbohydrates into _____ acids, mainly _____ acid.
    - **Answer: Organic, Lactic**

3. To prevent dental caries, one should stimulate _____ flow and use _____ products.
    - **Answer: Saliva, Fluoride**

Short Answer Questions (أسئلة قصيرة):

1. **List three roles of fermentation in the development of dental caries.**
    - **Answer:**
        1. Acid production (attacks enamel)
        2. pH reduction (causes drop in oral pH)
        3. Enamel demineralization (loss of minerals) *(يمكن ذكر أيضاً: Dental plaque formation / Progression of decay)*
2. **State four strategies to prevent dental caries related to oral fermentation.**
    - **Answer:**
        1. Reduce sugar consumption
        2. Maintain good oral hygiene
        3. Use fluoride products
        4. Stimulate saliva flow

Lec 5 **(Pre-Test)**

Q1. Choose the correct answer (اختر الإجابة الصحيحة):

1. **What is normal oral flora?**
   - A. Pathogenic bacteria that cause disease
   - B. Microorganisms that normally inhabit the mouth without causing disease
   - C. Fungi that only grow on teeth
   - D. Viruses found in saliva
   - **Answer: B. Microorganisms that normally inhabit the mouth without causing disease**
2. **Which bacterium is known to initiate dental caries?**
   - A. *Lactobacillus*
   - B. *Streptococcus mutans*
   - C. *Escherichia coli*
   - D. *Staphylococcus aureus*
   - **Answer: B. *Streptococcus mutans***
3. **What is the first step in the formation of dental caries?**
   - A. Cavity formation
   - B. Acid production
   - C. Pellicle formation
   - D. Plaque formation
   - **Answer: C. Pellicle formation**
4. **At what pH level does demineralization of enamel occur?**
   - A. Above 7.0
   - B. Below 5.5
   - C. Above 8.5
   - D. Exactly 7.4
   - **Answer: B. Below 5.5**

True / False (صح أم خطأ):

1. **Normal oral flora helps prevent colonization by harmful pathogens.**
   - **Answer: True**
2. **Lactobacillus contributes to the progression of dental caries.**
   - **Answer: True**
3. **Demineralization causes teeth to gain calcium and phosphate.**
   - **Answer: False** *(Demineralization causes the loss of calcium and phosphate)*

Short Answer Questions (أسئلة قصيرة):

1. **Mention two functions of normal oral flora.**
    - **Answer:**
        1. Maintain a balanced oral ecosystem
        2. Prevent colonization by harmful pathogens (or stimulate the immune system / aid in digestion)
2. **What are two factors that influence dental caries?**
    - **Answer:**

        1. Oral hygiene practices
        2. Frequent intake of sugars (or microbial factors)

Lecture :5

Normal Flora of the Oral Cavity

Normal oral flora refers to the microorganisms that normally inhabit the mouth without causing disease.

Functions of Normal Oral Flora

1 • Help maintain a balanced oral ecosystem

2 • Prevent colonization by harmful pathogens

3 • Stimulate the immune system

4 • Aid in digestion of food particles

Role of Oral Flora in Dental Caries

Dental caries is a multifactorial infectious disease caused mainly by bacteria in dental plaque.

• Streptococcus mutans: initiates caries

• Lactobacillus: contributes to progression of caries

Steps of Dental Caries Production

1. Pellicle Formation: A thin protein layer forms on the tooth surface from saliva

2. Plaque Formation: Bacteria adhere to the pellicle and multiply and Biofilm (dental plaque) develops

3. Sugar Intake: Consumption of fermentable carbohydrates (e.g. sucrose)

4. Acid Production: Bacteria metabolize sugars and produce acids

5. Demineralization: Acids lower pH (below 5.5) duo to Minerals (calcium and phosphate) are lost from enamel

6. Cavity Formation : Repeated demineralization leads to permanent tooth damage

Factors Influencing Dental Carie

1 - Oral hygiene practices

2- Microbial Factors: Presence of cariogenic bacteria

3. Frequent intake of sugars

Q1. Choose the correct answer (اختر الإجابة الصحيحة):

1. **Which bacteria are primarily responsible for the INITIATION of dental caries?**
    - A. *Lactobacillus*
    - B. *Streptococcus mutans*
    - C. *Staphylococcus aureus*
    - D. *Escherichia coli*
    - **Answer: B. *Streptococcus mutans***

2. **Which bacterium contributes mainly to the PROGRESSION of dental caries?**
    - A. *Streptococcus mutans*
    - B. *Lactobacillus*
    - C. *Streptococcus pneumoniae*
    - D. *Pseudomonas aeruginosa*
    - **Answer: B. *Lactobacillus***

3. **What forms on the tooth surface right before bacteria attach and form plaque?**

- A. Cavity
- B. Enamel
- C. Pellicle
- D. Dentin
- **Answer: C. Pellicle**

4. **The thin protein layer on the tooth surface (pellicle) originates from:**
   - A. Dental plaque
   - B. Food particles
   - C. Saliva
   - D. Bacterial toxins
   - **Answer: C. Saliva**

5. **Which minerals are lost from the tooth enamel during demineralization?**
   - A. Sodium and Potassium
   - B. Calcium and Phosphate
   - C. Iron and Zinc
   - D. Magnesium and Fluoride
   - **Answer: B. Calcium and Phosphate**

True / False (صح أم خطأ):

1. **Dental caries is a multifactorial infectious disease.**
   - **Answer: True**

2. **Dental plaque is a biofilm formed by bacteria adhering to the pellicle.**
    - **Answer: True**

3. **Bacteria metabolize sugars and produce alkaline substances that raise the oral pH.**
    - **Answer: False** *(Bacteria produce acids that lower the oral pH)*

4. **Frequent intake of fermentable carbohydrates like sucrose increases the risk of dental caries.**
    - **Answer: True**

Complete the following (أكمل الفراغات التالية):

1. Arrange the **steps of dental caries production** in correct chronological order:

(Plaque Formation - Cavity Formation - Pellicle Formation - Demineralization - Acid Production - Sugar Intake)

- **Answer:**
    1. **Pellicle Formation**
    2. **Plaque Formation**
    3. **Sugar Intake**
    4. **Acid Production**
    5. **Demineralization**

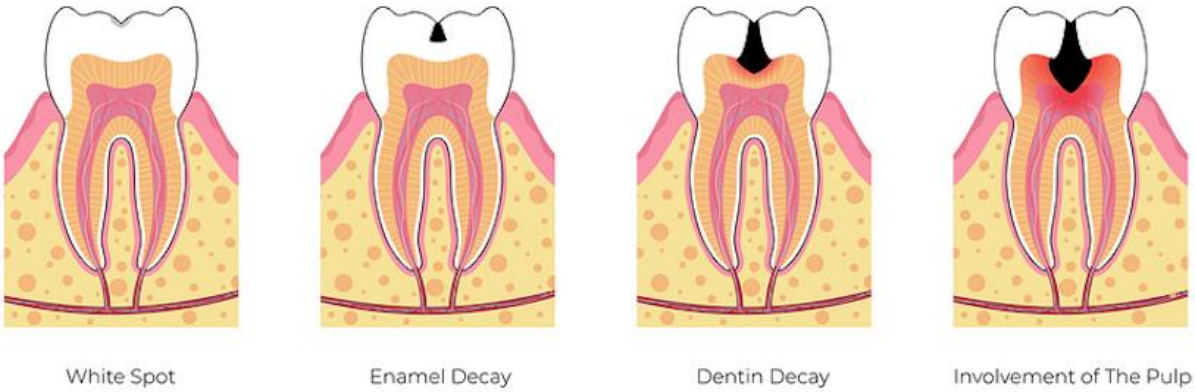
6. **Cavity Formation**

2. Repeated demineralization caused by low pH (below 5.5) eventually leads to permanent tooth damage known as _____.
    - **Answer: Cavity Formation**

Short Answer Questions (أسئلة قصيرة):

1. **Mention four functions of the normal oral flora.**
    - **Answer:**
        1. Help maintain a balanced oral ecosystem
        2. Prevent colonization by harmful pathogens
        3. Stimulate the immune system
        4. Aid in digestion of food particles
2. **List three main factors that influence the development of dental caries.**
    - **Answer:**
        1. Oral hygiene practices
        2. Microbial factors (presence of cariogenic bacteria)
        3. Frequent intake of sugars

Stages of Tooth Decay



Good Luck