Al-Mustaqbal University
College of Science
Forensic Evidence Department

جامعة المستقبل
AL MUSTAQBAL UNIVERSITY

كلية العلوم
قسم الادلة الجنائية

Lecture (1)

عنوان المحاضرة

Introduction and Overview of Methods Used in Histology Classification of Histology and Tissue Preparation

المادة : علم الانسجة

المرحلة :الثانية

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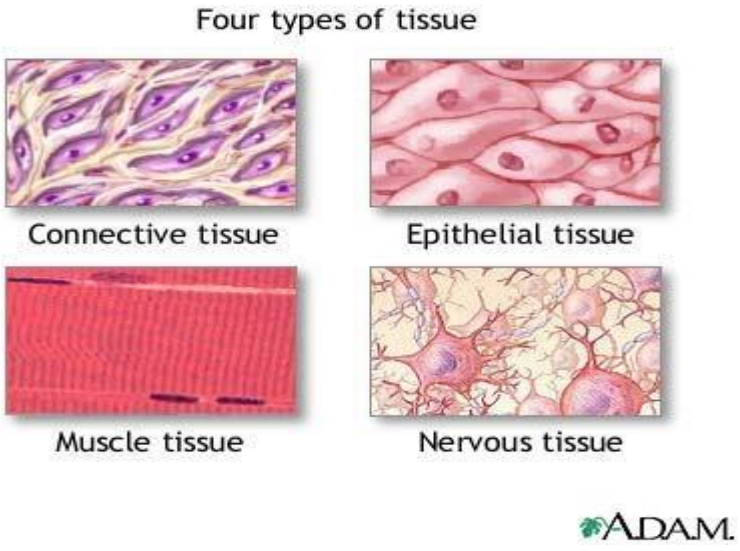
1. Introduction to Histology

Histology is a specialized branch of microscopic anatomy concerned with the study of **tissues at the cellular and subcellular levels**. It provides detailed insight into the organization of cells and extracellular components and explains how these structures contribute to normal physiological functions.

Histology represents a fundamental link between **cell biology, anatomy, and pathology**, enabling the understanding of both normal tissue architecture and pathological alterations.

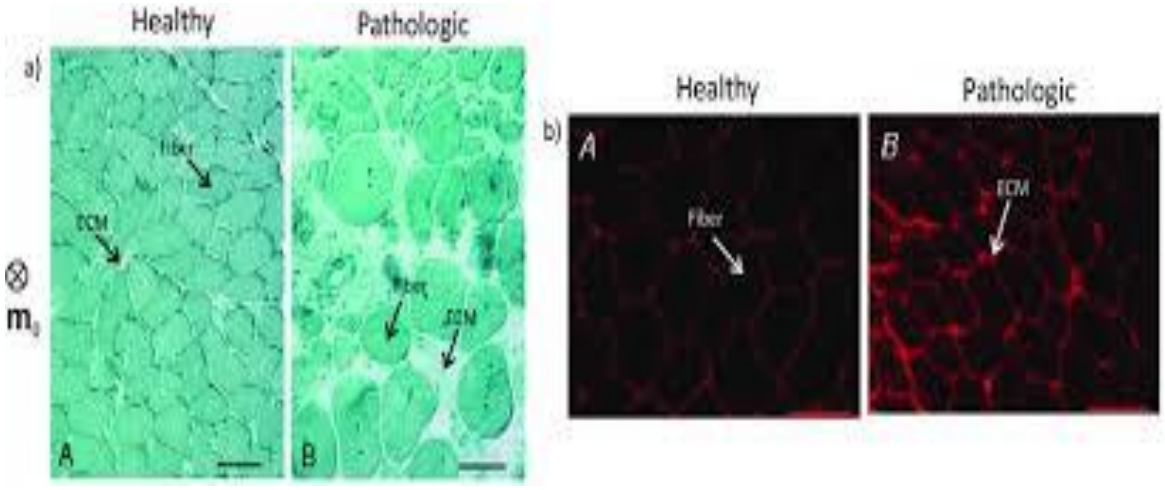


2. Importance of Histology

The study of histology is essential in medical and biological sciences as it enables the identification and interpretation of tissue structure and function. Knowledge of histology is crucial for understanding disease processes and supporting clinical diagnosis.

Histology contributes to:

- Recognition of normal and abnormal tissue architecture
- Interpretation of biopsy and surgical specimens
- Correlation between microscopic structure and organ function

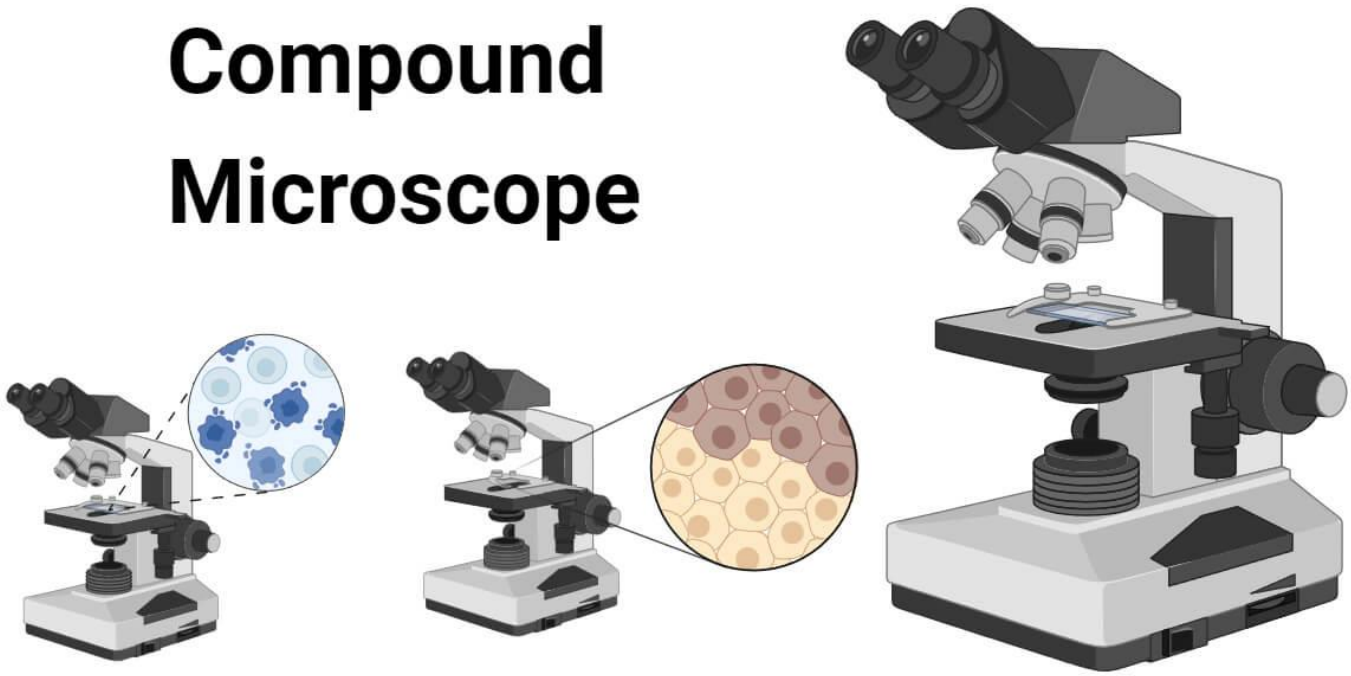


3. Overview of Methods Used in Histology

Histological investigations depend on several laboratory techniques that allow tissues to be preserved, processed, and examined microscopically.

3.1 Light Microscopy

Light microscopy is the most commonly used method in routine histological studies. It utilizes visible light to magnify thin tissue sections, allowing visualization of general tissue organization.



3.2 Electron Microscopy

Electron microscopy provides significantly higher resolution than light microscopy and is used for detailed ultrastructural studies.

a. Transmission Electron Microscopy (TEM)

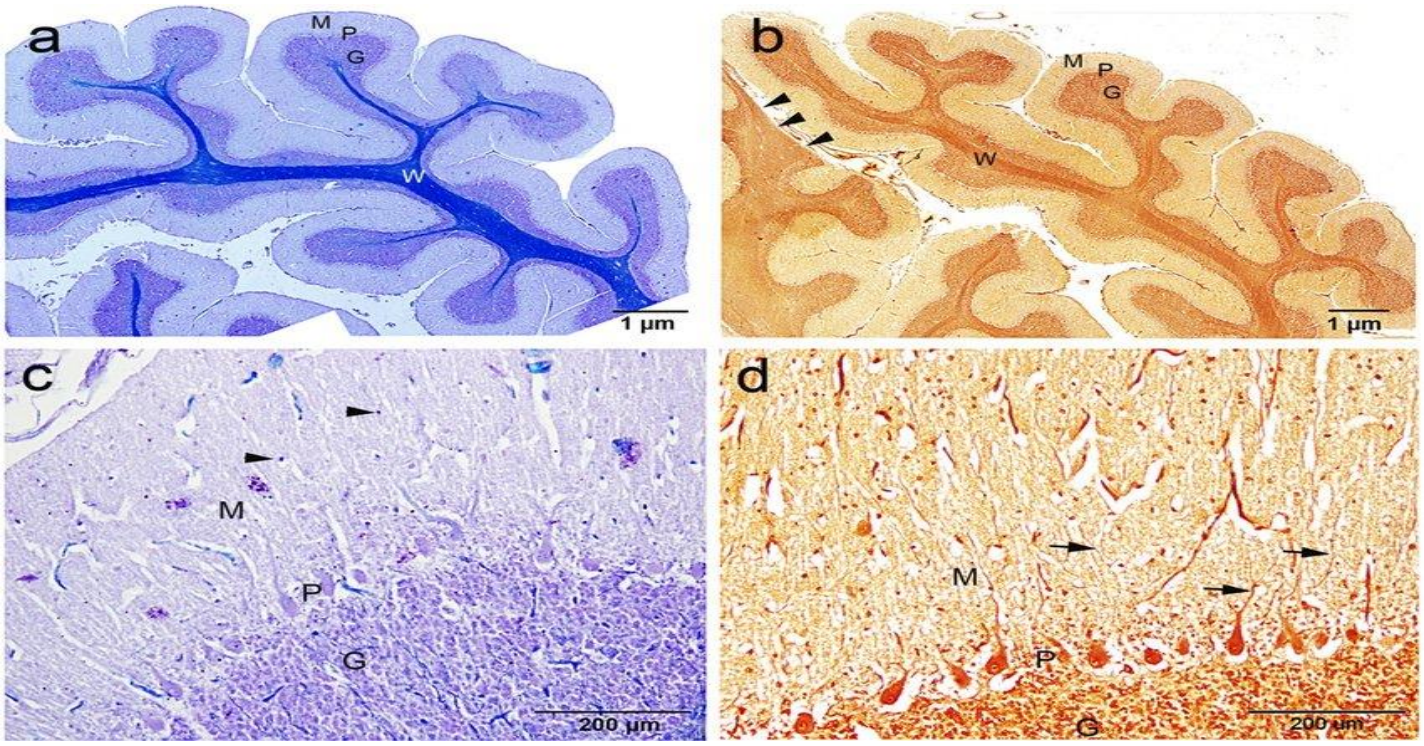
TEM is used to examine internal cellular structures and organelles.

b. Scanning Electron Microscopy (SEM)

SEM is used to study the surface characteristics of tissues in three dimensions.

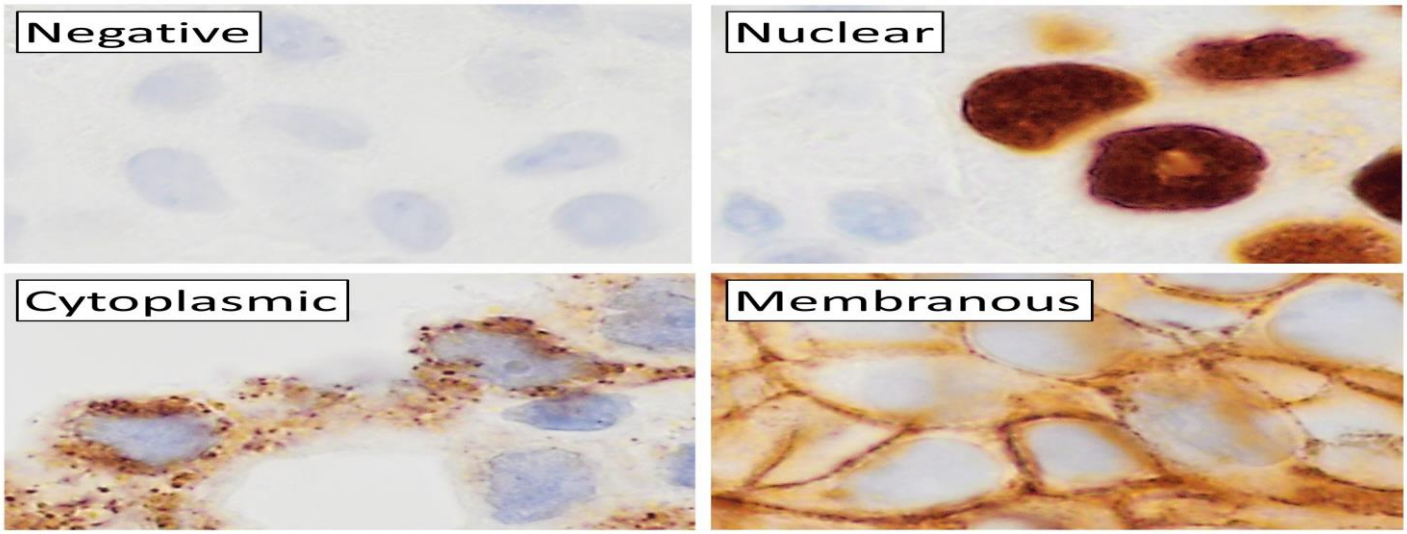
3.3 Histochemical and Cytochemical Techniques

These methods are employed to identify specific chemical substances such as carbohydrates, lipids, and enzymes within tissues through selective staining reactions.



3.4 Immunohistochemistry (IHC)

Immunohistochemistry is a specialized technique that uses antigen–antibody reactions to localize specific proteins within tissue sections. It is widely applied in diagnostic pathology.

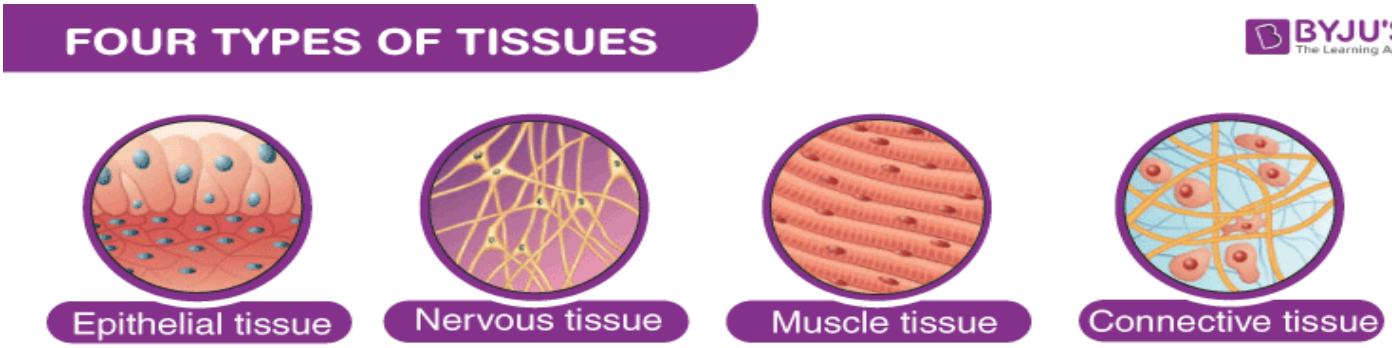


4. Classification of Histology

Histology can be classified according to the scope and purpose of study into several major branches.

4.1 General Histology

General histology focuses on the study of the **four basic tissue types** of the human body: epithelial, connective, muscle, and nervous tissues.



4.2 Special (Systemic) Histology

Special histology deals with the microscopic structure of individual organs and organ systems.

4.3 Developmental Histology

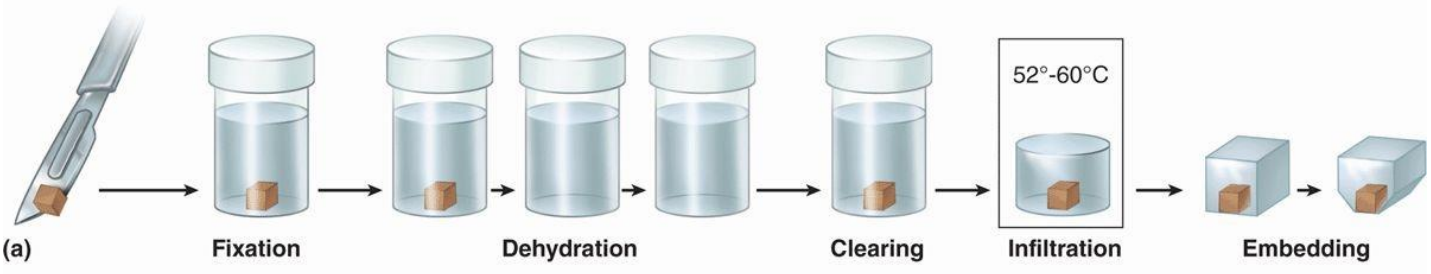
Developmental histology examines the processes of tissue differentiation and maturation from embryonic life to adulthood.

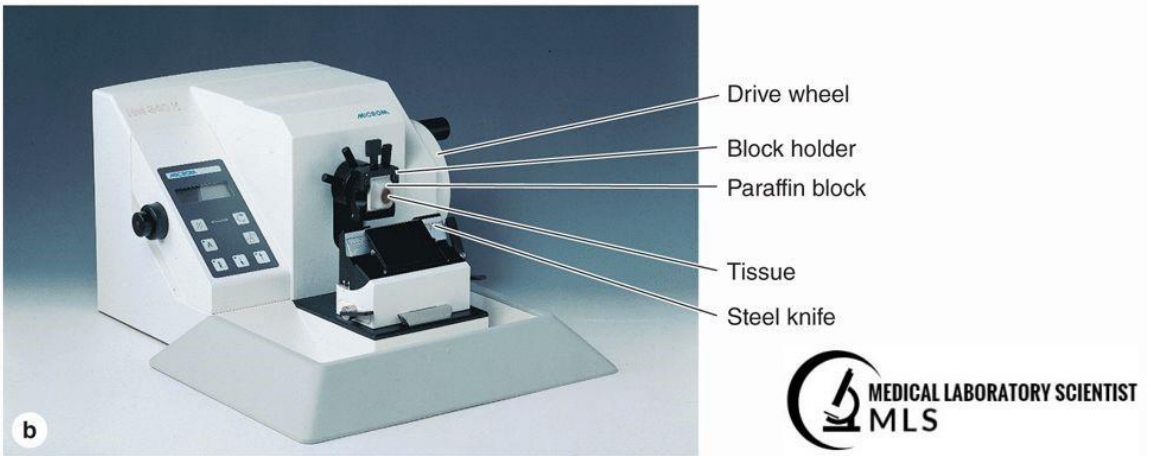
5. Tissue Preparation

Tissue preparation is a systematic procedure that converts fresh tissue into thin, stained sections suitable for microscopic examination.

5.1 Fixation

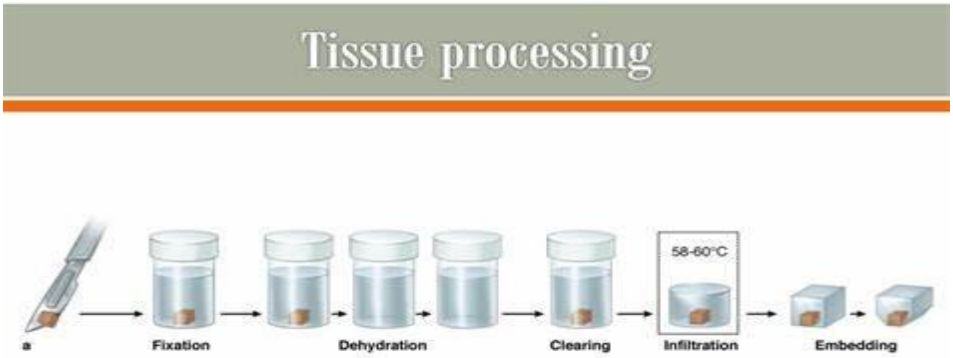
Fixation preserves tissue structure by preventing enzymatic degradation and bacterial decomposition.





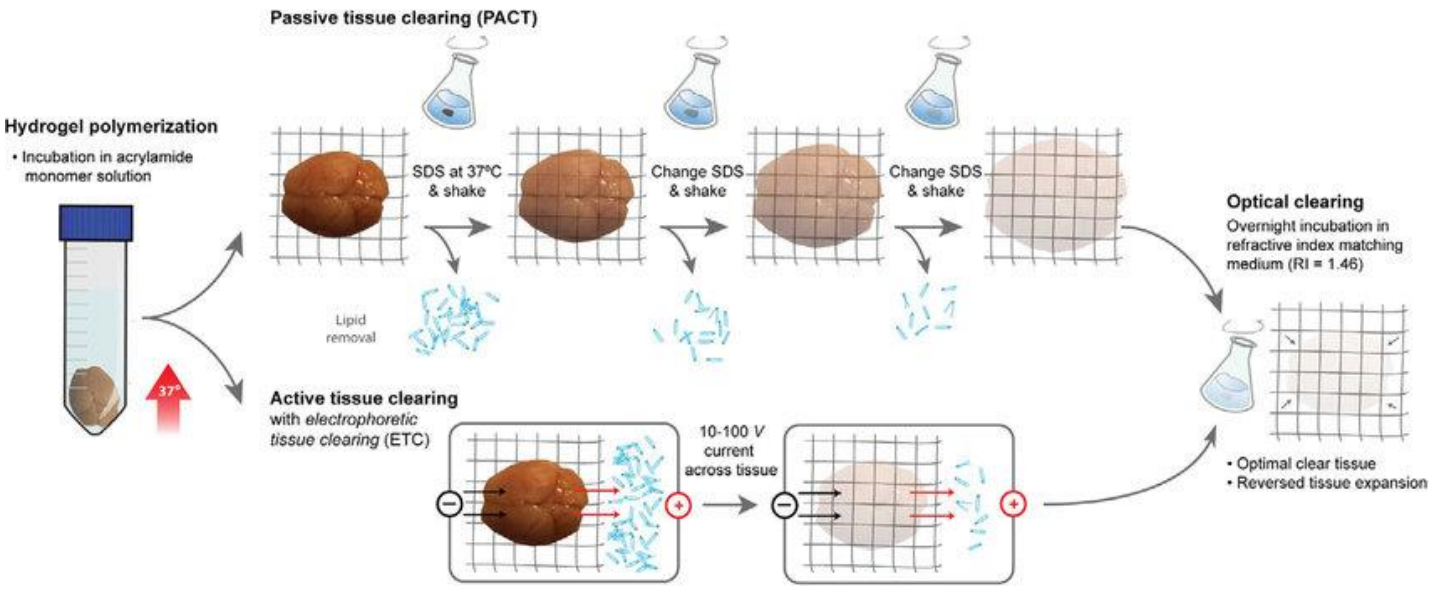
5.2 Dehydration

Dehydration removes water from tissues using gradually increasing concentrations of alcohol.



5.3 Clearing

During clearing, alcohol is replaced by a solvent that renders the tissue transparent and prepares it for embedding.



5.4 Embedding

Embedding involves infiltrating the tissue with paraffin wax to provide support for sectioning.

5.5 Sectioning

Thin sections are cut from the embedded tissue using a microtome.

5.6 Staining

Staining enhances tissue contrast and allows differentiation between cellular components.

5.7 Mounting

Mounting preserves stained sections by covering them with a glass coverslip.

6. Conclusion

Histology provides essential knowledge about the microscopic organization of tissues and organs. Through proper tissue preparation and advanced microscopic techniques, histology supports medical education, research, and clinical diagnosis.