

Basic Principles of Histology

Histology: is a term derived from the Greek word Histos , meaning tissue , and Logia, meaning the study or knowledge , literally , it refers to the knowledge or **science of tissue** , both plant and animal.

What does the term “Histology” encompass today ?

Anatomy can be subdivided into that which is visible to the naked eye gross anatomy and that which can be seen only with the aid of microscope microscopic anatomy the latter can be further subdivided into **organology** (the study of organs) , **Histology** (tissues) , and **cytology** (cells). Today the term “Histology” is used loosely to include all **subdivisions** of microscopic anatomy and it is in this sense that term is used here. Histology thus involve the study not only of tissues but of individual cells and organ systems. And since **histology refers to the study of cells , tissue , and organ , it embraces a study of function as well as of structure**. Thus , a study of histology not only complements the study of gross anatomy ; it also provides a structural basis for the study of physiology , the correlation between structure and function.

Acknowledge of the normal is a necessary prelude to the study of the abnormal (pathology) , which deals with the alterations in structure and function of the body and of its organs , tissues and cells caused by disease. Hence , the study of histology is fundamental within the medical and dental curriculum.

Methods of study

Steps needed to make and study a histological section:-

- 1- **Fixation** to prevent postmortem decomposition, preserve the structure and intensify subsequent staining. (e.g. buffered isotonic sol of 4% formaldehyde, formalin & glutaraldehyde).
- 2- **A-Embedding** the tissue in a block of wax or plastic, or resins.
B-Freezing of the material to a firm mass.
- 3- **Cutting** into thin sections on a microtome, 1-150 μm thickness for light microscopy (LM) 30 – 60 nanometers (nm) for electron m (EM).
- 4- **Mounting** of section on a glass slide or metal grid.
- 5- **Staining** of the section with one or more reagents.

For light microscopy, the removal of surplus stain and water and steps involved in holding a thin glass coverslip to the section with a mounting medium having a refractive index close to that of glass.

- 6- **Observation** and recording by means of the microscope and notes, photomicrography projection drawing, labelled sketches , counting , and reconstructions.

Units of measurement used in Light and electron microscopy Units:

Micron / Micrometer (μm) = 10^{-6} m ; = 0.001 mm.

Nanometer (nm) (millimicron) (m μ) = 10^{-9} m.

1 meter = 1000 (mm) millimeter.

1 mm = 1000 (μm) micron (micrometer).

1 μm = 1000 (nm) nanometer.

1 nm = 10Ao (Angstrom).

General Histological Principles and Primary Tissues

Components of the body:

The body is composed of three different elements:-

- 1- **Cells:** each cell being a discrete entity and bound by a membrane that “isolates” it from its environment.
- 2- **Intercellular or extracellular substance:** materials that lie between cells to support and nourish them.
- 3- **Body fluids:** including blood , confined within the vascular system ; tissue or intercellular fluid , located between and around cells and in which there is a free exchange between blood and intracellular fluid ; and lymph , draining tissue fluid back to the venous system by fine tubes.

These fluid components usually are lost during tissue preparation and thus not seen in histological sections , with the exception of formed elements (cells) of the blood.

Intercellular material primarily is responsible for the firmness of tissues and two main types are recognized in histology. The formed or fibrous types include material called **collagen** (the white fibrous tissue that is found in meat ,for example , and that is tough to chew) and **elastin**, that largely is responsible for the elasticity of tissue.