Cytology

Cell are the structural unit of all living organisms . there are two fundamental different type of cell :

a- **Prokaryotic** (Gr . pro , before + karyon , nucleus) cell are found only in bacteria . these cell a small (1-5 m long) , typically have a cell wall outside the plasma lemma , and luck the nuclear envelope separating the genetic material (DNA) from other cellular constituents .

b- **Eukaryotic** (Gr . eu , good + karyon , nucleus) cell are larger and have distinct nucleus surrounded by nuclear envelope .

Cell components :

The cell is composed of two basic part : cytoplasm and nucleus . individual cytoplasmic components are usually not clearly distinguishable in common hematoxylin and eosin-stained preparation , the nucleus , however , appears intensely stained dark blue or black .

1- Cytoplasm

The cytoplasm is composed of matrix , or cytosol , in wich are embedded the organelles , the cytoskeleton , and deposit of carbohydrate , lipid , and pigments .

Plasma membrane (plasma lemma) :

The outermost component of the cell , separating the cytoplasm fro its extracellular environment . it composed of phospholipid , cholesterol , proteins , and chains of oligosaccharides covalently linked to phospholipid and protein molecules , it act as selective barrier that regulates the passage of

certain materials into and out of the cell and facilitates the transport of specific molecules .

Cell organelles

Mitochondria

Are spherical or filamentous organelles 0.5 – 1 m wide that can attain a length of up to 10 m . they tend to accumulate in part of cytoplasm at which the utilization of energy is more intense , such as the apical end of ciliated cells , in the middle piece of spermatozoa , or at the base of ion-transferring cells .

Ribosomes

Are small electron dense particles , about 20*30 in size . they are composed of four type of (rRNA) and almost 80 different proteins .

There are two classes of ribosome . one class is found in prokaryotes , chloroplasts , and mitochondria . the other is found in eukaryotic cells . both classes of ribosomes are composed of two different sized subunits .

Endoplasmic reticulum

An anastomosing network of intercommunicating channel and sacs formed by continuous membrane , which encloses the space called a cisterna . in sections , cisterna appear separated , but high resolution microscopy of whole cells reveals that they are continuous . this membrane system is called the endoplasmic reticulum . there are two type of endoplasmic reticulum (rough and smooth) .

Golgi complex (Golgi apparatus)

The Golgi complex completes post translation modification and package and place an address on products that have been synthesized by the cell . this organelle is composed of smooth membrane limited cisternae .

Lysosomes

Are membrane limited vesicles that contain large variety of hydrolytic enzymes (more than 40) whose main function is intracytoplasmic digestion . lysosomes are particularly abundant in cell exhibition phagocytic activity (e.g. macrophages , neutrophilic leukocyte).

Secretory vesicles

Are found in those cell that store a product unit it release is signaled by metabolic , hormonal , or neural message (regulate secretion) . these vesicles are surrounded by a membrane and contain a concentrated form of the secretory product . secretory vesicles containing digestive enzymes are referred to as zymogen granules .

Cytoskeleton

The cytoplasmic cytoskeleton is a complex network of microtubules , actin filaments (microfilaments) , and intermediate filament . these structural proteins provide for the shaping of cell and also play an important role in the movement of granules and intracytoplasmic vesicles . the cytoskeleton also participates in the movement of entire cells .

Mitochondria

Tubular structure found in cytoplasmic processes called cilia and flagella . mitochondria are variable in length , and individual tubules can

attain lengths of several micrometers . occasionally , arms or bridges are found linking two or more tubules .

Cilia and flagella

Are motel processes , covered by cell membrane with highly organized microtubules core . ciliated cells typically possess a large number of cilia , each about 2-3 mm in length . flagella cell have only one flagellum , with length close to 100 mm . in human , the spermatozoa are the only cell type with flagellum . the main function of cilia is to sweep fluid from the surface of cell sheets . both cilia and flagella possess the same core organization .

2- The cell nucleus

The nucleus contains a blueprint for all cell structure and activities , encoded in the DNA of the chromosomes . it also contains the molecular machinery to replicate its DNA and to synthesize and process the three type of RNAa ribosomal (rRNA) , messenger (mRNA) , and transfer (tRNA) . the numerous protein molecules needed for the activities of nucleus are imported from the cytoplasm .

The nucleus frequently appears as around or elongated structure , usually in the center of cell . its main component are the nuclear envelope , chromatin , nucleolus and nuclear matrix . the size and morphological features of nuclei in a specific normal tissue tend to be uniform . in contrast , the nuclei in cancer cell have an irregular shape , variable size and typical chromatin patterns .

Nuclear envelope

Electron microscope show that the nucleus surrounded by two parallel membrane separated by a narrow space called the perinuclear cisterna .

together , the paired membrane and the intervening space make up the nuclear envelope .

Chromatin

Two type of chromatin can be distinguished with both light and electron microscopes hetrochromatin , which is electron dense , appears as coares granule in the electron microscope and as basophilic clumps in the light microscope . euchromatin is the less coiled portion of the chromosomes , visible as finely dispersed granular material in the electron microscope and as light stained basophilic areas in the light microscope .

Nucleolus

Is a spherical structure that is rich in rRNA and protein . it is usually basophilic when stained with hematoxylin and eosin . as seen with the electron microscope .