GYTOPLASMIC INCLUSONS

Prominent among inclusions serving as storage depots are spheric ,

1- **lipid droplets**, which differ in appearance depending upon the type of histologic preparation.
2- **Glycogen granules** are inclusions that are PAS-positive in light microscopy and appear in electron micrographs as rosettes of electron-dense particles.
Both lipid droplets and glycogen granules lack a limiting membrane.
3- **Pigments** The most common pigment in the body, besides hemoglobin of red blood cells is melanin, manufactured by melanocytes of the skin and hair, pigments cells of the retina and specialized nerve cells in the substantia nigra of the brain. These pigments have protective functions in skin and aid in the sense of sight in the retina but their functions in neurons is not understood completely. Furthermore, cardiac tissue and central nervous system neurons shows yellow to brown pigment called lipofuscin, some believed that they have lysosomal activity. Melanin is a brownish pigment widely distributed in vertebrates, often found in electrodense, membrane- limited granules termed melanosomes. It is particularly abundant in epidermal cells and in the pigment layer of the retina.
4- **Crystals** Crystalline inclusions have long been recognized as normal constituents of certain cell types such as Sertoli cells and Leydig cells of the human testis, and occasionally in macrophages.[4] It is believed that these structures are crystalline forms of certain proteins which is located everywhere in the cell such as in nucleus, mitochondria, endoplasmic reticulum, Golgi body, and free in cytoplasmic matrix.

NUCLEUS

Nuclei vary appearance from tissue to tissue and cell to cell, but they generally have a:

- **Nuclear envelope**
- **Nucleoplasm**
- **Chromatin**
- **One to several nucleolus**.

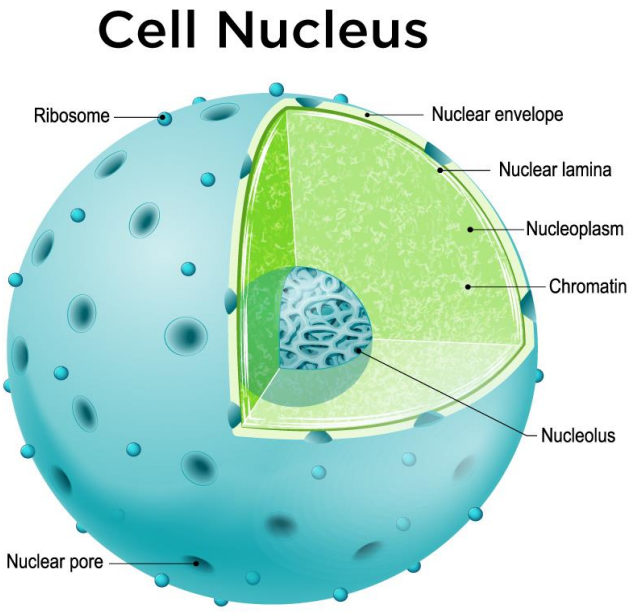
NUCLEUS

The **cell nucleus** (pl. **nuclei**; from Latin *nucleus* or *nuculeus*, meaning *kernel* or *seed*) is a membrane-bound organelle found in eukaryotic cells. Eukaryotic cells usually have a single nucleus, but a few cell types, such as mammalian red blood cells, have no nuclei, and a few others including osteoclasts have many. The main structures making up the nucleus are the nuclear envelope, a double membrane that encloses the entire organelle and isolates its contents from the cellular cytoplasm; and the nuclear matrix, a network within the nucleus that adds mechanical support.

The cell nucleus contains nearly all of the cell's genome. Nuclear DNA is often organized into multiple chromosomes – long stands of DNA dotted with various proteins, such as histones, that protect and organize the DNA. The genes within these chromosomes are structured in such a way to promote cell function. The nucleus maintains the integrity of genes and controls the activities of the cell by regulating gene expression.

Because the nuclear envelope is impermeable to large molecules, nuclear pores are required to regulate nuclear transport of molecules across the envelope. The pores cross both nuclear membranes, providing a channel through which larger molecules must be actively transported by carrier proteins while allowing free movement of small molecules and ions.

Movement of large molecules such as proteins and RNA through the pores is required for both gene expression and the maintenance of chromosomes. Although the interior of the nucleus does not contain any membrane-bound subcompartments, a number of nuclear bodies exist, made up of unique proteins, RNA molecules, and particular parts of the chromosomes. The best-known of these is the nucleolus, involved in the assembly of ribosomes.



Nuclear envelope

The envelope is perforated by many nuclear pores, each of which has a diameter of about 70 mm and is bounded by:

- 8 globular subunits called annular proteins, which present all octagonal appearance in some preparations.
- Each pore is covered by a proteinaceous diaphragm that is thinner than the envelope.

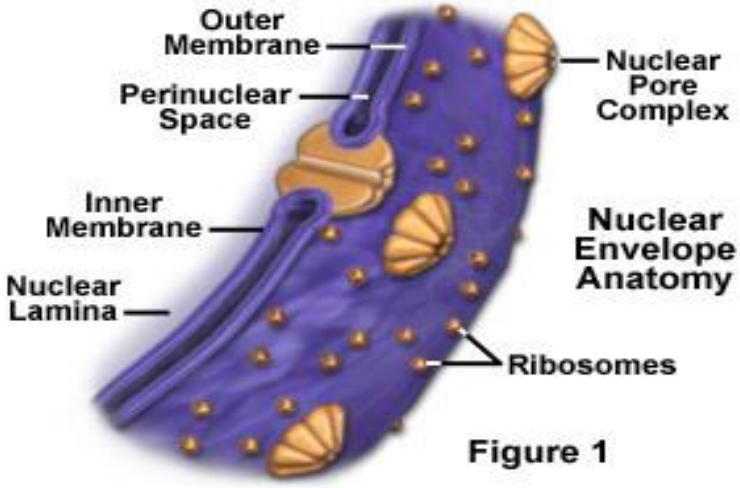


Figure 1

PORES The pores provide a channel on for the movement of important molecules betweenthe nucleus and cytoplasm.

These molecules include nucleic acids synthesized in the nucleus and used in the ectoplasm (mRNA, rRNA, (RNA) and proteins synthesized in the cytoplasm and used in the muckets (histones, polymerases).

NUCLEOPLASM

The nucleoplasm is the matrix in which the other intranuclear components are embedded. It is composed of enzymatic and nonenzymatic proteins, metabolites, bons, and water. It includes the nuclear matrix- a fibrillar "nucleokeletal" structure that appears to bind certain hormone receptors-and newly synthesized DNA.

NUCLEAR CHROMATIN

Nuclear chromatin is an intensely basophilic substance consisting of DNA and associated histone and nonhistone proteins. Nuclei containing highly coiled chromatin, termed heterochromatin, stain darkly with basic dyes.

Chromatin is a complex of DNA and proteins. It is responsible for the characteristic basophilia of the nucleus. The densely staining material is highly condensed chromatin called heterochromatin and the lightly staining material is a dispersed form called euchromatin.

The chromosomes, the most highly condensed form of chromatin, are visible during mitosis. In females, only one X chromosome (either of the 2) is used by each cell. The inactive X chromosome is often visible as a clump of heterochromatin termed sex chromatin, or the Barr body. In most cells, the Barr body is attached to the inner surface of the surface the nuclear envelope. In a neutrophilic leukocyte, it May paper as a Drumstick- shaped appendage of the lobated nucleus.

NUCLEOLUS

During interphase (between mitoses), each nucleus usually has at least one or 2 intensely basophilic body called a nucleolus. Nucleoli are the synthesis sites for most ribosomal RNA (rRNA) . The nucleolus disappears in preparation for mitosis and reappears after mitosis is completed.

The term chromonema is used by light microscopists to refer to a threadlike basophilic substructure of the nucleolus, The nucleolonema contains 2 rRA-rich components distinguishable by electron microscopy.

- The pars fibrosa consists of densely packed ribonucleoprotein fibers, 5-10 nm in diameter. These fibers consist of the newly synthesized primary transcripts of the rRNA genes and associated proteins.
- The pars granulosa Nucleolus contains dense granules, Foote 15-20 om in diameter, that represent maturing ribosomal Sublunits during assembly for export to the cytoplasm.