

GENERALIZED ANIMAL CELL

- A cell is the basic living, structural and functional unit of the body.
- A generalized cell is a composite that represents various cells of the body.
- Cytology is the science concerned with the study of cell.
- The principal parts of a cell are the plasma (cell) membrane, cytosol, organelles, and inclusions.
- The Plasma (cell) membrane surrounds the cell and separates it from other cells and the external environment.
- It is composed primarily of phospholipids and proteins. The proteins are integral and peripheral.

- The membrane's selectively permeable nature restricts the passage of certain substances. Substances can pass through the membrane depending on their lipid solubility, size, electrical charges, and the presence of channels and transporters.
- Phagocytosis is the ingestion of solid particles. It is an important process used by some white blood cells to destroy bacteria that enter the body.
- Pinocytosis is the ingestion of fluid. In this process, the fluid becomes surrounded by a pinocytic vesicle.
- Receptor-mediated endocytosis is the selective uptake of large molecules and particles (ligands) by cells.

- The semifluid intracellular fluid is termed cytosol. Cytosol is composed mostly of water plus proteins, carbohydrates, lipids, and inorganic substances.
- Cytoplasm includes the cytosol, all organelles (except the nucleus) and inclusions.
- Organelles are specialized structures in the cytosol that have characteristic appearances and functions.
- They play specific roles in cellular growth, maintenance, repair and control.
- Usually the largest organelle, the nucleus, controls cellular activities and contains the genetic information.

- Most body cells have a single nucleus; some (red blood cells) have none, whereas others (skeletal muscle cells) have several.
- Parts of the nucleus include the nuclear envelope, nucleoli, and chromosomes.
- Chromosomes consist of subunits called nucleosomes that are composed of DNA (genetic material) and histone proteins. The various levels of DNA packing are represented by nucleosomes, chromatin fibers, loops, chromatids, and chromosomes.

Ribosomes

- Ribosomes are tiny granules consisting of ribosomal RNA and ribosomal proteins.
- Free ribosomes float in the cytosol and have no attachments to other organelles; other ribosomes attach to endoplasmic reticulum.
- Functionally, ribosomes are the sites of protein synthesis.

Endoplasmic Reticulum

- The ER is a network of membrane-enclosed channels that connects with the nuclear membrane.
- Rough (granular) ER has ribosomes attached to it. Smooth (agranular) ER does not contain ribosomes.
- The ER transports substances, stores newly synthesized molecules, synthesizes and packages molecules, detoxifies chemicals, and releases calcium ions involved in muscle contraction.

Golgi Complex

- The Golgi complex consists of several stacked, flattened membranous sacs (cisterns) referred to as cis, medial and trans.
- The principal functions of the Golgi complex are to process, sort and deliver proteins and lipids to the plasma membrane, lysosomes and secretory vesicles.

Lysosomes

- Lysosomes are membrane-enclosed vesicles that are formed by the Golgi complex and contain digestive enzymes.
- They are found in large numbers in white blood cells, which carry on phagocytosis.

- Lysosomes function in intracellular digestion, digestion of wornout organelles (autophagy), digestion of cellular contents (autolysis) during embryological development, and extracellular digestion.

Peroxisomes

- Peroxisomes are similar to lysosomes but smaller.
- They contain enzymes (for example, catalase) that use molecular oxygen to oxidize various substances.

Mitochondria

- Mitochondria consist of a smooth outer membrane and a folded inner membrane surrounding the interior matrix. The inner folds are called cristae.

- The mitochondria are called powerhouses of the cell because they produce most of a cell's ATP.

The Cytoskeleton

- Together, microfilaments, microtubules, and intermediate filaments form the cytoskeleton.
- The cytoskeleton provides organization for chemical reactions and assists in transporting chemicals and organelles through the cytosol.

Flagella and Cilia

- These cellular projections have the same basic structure and are used in movement.
- If projections are few (typically occurring singly or in pairs) and long, they are called flagella. If they are numerous and short, they are called cilia.

- The flagellum on a sperm cell moves the entire cell. The cilia on cells of the respiratory tract move foreign matter trapped in mucus along the cell surfaces toward the throat for elimination.

Centromere and Centrioles

- The dense area of cytoplasm containing the centrioles is called centrosome. Centrosomes serve as centres for organizing microtubules in interphase cells and the mitotic spindle during cell division.
- Centrioles are paired cylinders arranged at right angles to one another that play a role in the formation and regeneration of flagella and cilia.

Cell inclusions

- Cell inclusions are chemical substances produced by cells. They are usually organic and may have recognizable shapes.

- Examples of cell inclusions are melanin, glycogen and triglycerides.

Normal Cell Division

- Cell division is the process by which cells reproduce themselves. It consists of nuclear division (mitosis or meiosis) and cytoplasmic division (cytokinesis).
- Cell division that results in an increase in the number of body cells is called somatic cell division and involves a nuclear division called mitosis plus cytokinesis.

Somatic Cell Division

- Before mitosis and cytokinesis, the DNA molecules, or chromosomes, replicate themselves so the same chromosomes can be passed on to the next generation of cells.

- A cell between divisions carrying on every life process except division is said to be in interphase, which consists of three phases G_1 , s and G_2 .
- Mitosis is the replication and distribution of two sets of chromosome into separate and equal nuclei; it consists of prophase, metaphase, anaphase and telophase.
- Cytokinesis usually begins in late anaphase and ends in telophase.
- A cleavage furrow forms the cell's metaphse plate and progresses inward, cutting through the cel to form two separate portions of cytoplasm.

Reproductive Cell Division

- Gametes contain the haploid chromosome number and most somatic cells contain the diploid chromosome number.
- Meiosis is the process that produces haploid gametes. It consists of two successive nuclear divisions called reduction division (meiosis I) and equatorial division (meiosis II).
- During reduction division, homologous chromosomes undergo synapsis (pairing) and crossing over, the net result in two haploid daughter cells that are genetically unlike each other and unlike the parent cell that produced them.
- During equatorial division, the two haploid daughter cells divide to form four haploid cells

