

Anatomy and Physiology Note – Ambition Health Loksewa Center

Cell & Tissue

- **Human Anatomy**- is the basic medical science dealing with the structure of the human body.
- **Physiology**:-is the part of science dealing with the function of different body organs.
- **'Anatomy' is Greek word which means "to cut off".**
- First study of anatomy was done by: Hippocrates (Father of medicine)
- Father of Anatomy: Herophilus (Greek Physician)
- Father of Modern Anatomy: Andreas Vesalius (Belgian physician)

Cell

- The structural and functional unit human body is: Cell
- Cell was first discovered by Robert Hoek in 1665.

Two types of cell:

- Eukaryotic cell: Found in human, animals, plants and other multicellular organisms.
- Prokaryotic cell: Found in bacteria and blue green algae.

- The average size of human cell is 20-30 μm .
- Study of cell: Cytology
- Largest cell: Ovum [130 μm]
- Smallest cell: Sperm [65 μm]
- Longest cell: Neuron or nerve cell
- The cell does not divide: Neuron or nerve cell
- The most regenerative cell: Blood cell (2nd: Liver cell)
- The only one cell of the body having flagella: Sperm
- The cell containing highest number of mitochondria: Liver cell
- Non-nucleated cells: RBCs & Platelets
- Human body develops from a single cell called "Zygote".
- Zygote is formed by the fusion of an ovum and a spermatozoon.
- Cells contain 80% water, known as cytoplasm. (Intracellular fluid - ICF)
- Intracellular fluid (ICF) balances the internal environment of cells.
- The process of maintaining constant internal environment is called Homeostasis.

PARTS OF CELL

- 1) Cell membrane, 2) Cytoplasm 3) Nucleus.

NUCLEUS

- Nucleus was discovered by **Robert Brown** in 1831.
- Genetic material is found in Nucleus, known as **DNA (Deoxyribonucleic acid)**.
- Ribonucleic acid (**RNA**) helps in **Protein synthesis**.

CELL MEMBRANE

- Cell is covered by a semi-permeable membrane called: Cell membrane or plasma membrane
- Thickness of cell membrane: 7.5 – 10 nm (Nanometer)
- Cell membrane consists of two layers of Phospholipids with proteins and sugars embedded in them.

Cytoplasm

- Cytoplasm contains
- a. **Cytoplasmic matrix**: Water, amino acids, fatty acids, carbohydrates, salts etc.

b. Cytoplasmic Organelles: Nucleus, Mitochondria, Golgi body, Endoplasmic Reticulum (ER), Ribosomes, Lysosomes, Centrioles etc.

c. Cytoplasmic inclusions: Non- living organs (Vacuoles, oil droplets)

RIBOSOMES

- Ribosomes are composed of Ribonucleic acid (RNA) and protein. They synthesize proteins.
- Most important organ inside the cytoplasm is: Mitochondria.
- Mitochondria is responsible for cellular respiration. (Break down of glucose in presence of oxygen to release ATP)
- The type of metabolism process is called Glycolysis. (Break down of glucose)
- Hence, mitochondria is also known as "Power house of the cell".

ENDOPLASMIC RETICULUM

- Endoplasmic Reticulum synthesizes:
- Protein, fatty acid, hormone, detoxify drugs.

LYSOSOMES

- Lysosomes digest or break down material that comes inside the cell.
- Lysosome sometimes engulfs self and breaks down the cell, so it is called "**Suicide bag**" or "**Atom bomb**" of the cell.

GOLGI APPARATUS

- Golgi apparatus stores protein temporarily, secretes hormones, enzymes, etc.

CHROMOSOME

- Total number of chromosomes **in human body: 46**
 - 22 pairs (44): **autosomes**
 - 1 pair (2): **sex chromosomes**, vital role in sex determination of the fetus.
- Sex chromosomes in sperm: X or Y
- Sex chromosomes in ovum: X only
- Number of chromosome in sperm is: 23
(22+X or 22+Y)
- Number of chromosome in ovum is: 23
(22+X)
- Number of chromosome in zygote: 46
(44+XX or 44+XY)
- Human body develops from a single cell — the zygote.
- Chromosomes are most stainable part in the cell.

Chromosomal Disorders

Chromosomal disorders are of mainly two types:

Autosomal

Sex chromosomal

- **Down's Syndrome (Trisomy 21)** is the **most common autosomal disorder**.
- Hemophilia, color blindness are sex-linked recessive disorders.
 - (Female is carrier and male is sufferer.)
- Sickle-cell anemia is an autosomal recessive disorder.

Mast Cells and Immune Cells

- Mast cells have IgE antibody receptors and are responsible for allergy and pathology of bronchial asthma.
- Mast cells -are immune cells found in connective tissues all over the body, containing heparin and histamine.
- Plasma cells are derived from B lymphocytes; they produce antibodies.
- Fibroblast synthesizes collagen fibers, which helps to control bleeding and wound healing.
- Macrophage is derived from monocyte, found in tissues, responsible for phagocytosis.

Cell Division

Two types of cell division occur in human body:

1. Mitosis (equational) or somatic cell division)
 2. Meiosis (reductional or germinal cell division)
- Mitosis occurs in both somatic and reproductive cells (sperm and ovum).
 - Meiosis occurs only in reproductive cells.
 - Mitosis cell division was studied by Walter Flemming in 1878.
 - In Mitosis & Meiosis-II: Number of chromosomes in daughter cells remains same/equal.
 - In Meiosis-I: Number of chromosomes in daughter cells remains half.
 - Cell Cycle
 - The period between two cell divisions is known as the cell cycle.
 - The cell cycle or cell division cycle is the series of events that takes place in a cell, causing it to divide into two daughter cells.
 - The time to complete one cycle of cell division: Cell cycle.