Cellular Theory of Life:
“All life is produced from cells & all life is derived from the division of cells” Rudolf Virchow

Cell: Basic Functional & Structural unit of:

🌟 Simplest structure capable of performing:

1. Unicellular Life: Single cell capable of:

2. Multi-cellular Life: Cooperative groups of cells function as:

☞ Highly specialized cells divide:
☞ Regardless of specialization; ALL cells have a:

- 2 Cell Types:

  1. Prokaryotic Cell “Prokaryote”
     * Pro = before; Karyote = Kernel (nucleus)
  2. Eukaryotic Cell “Eukaryote”
     * Eu = True; Karyote = kernel (nucleus)

Prokaryote:

- Genetic material located in region of cell
  - ALL

Eukaryote:

- Genetic material located in cell structure
  - Single cells:
  - Multicellular:
Basic Cellular Structure

A. Cell (Plasma) Membrane:

- Physically separates:
  - Allows cell to:

B. Cytoplasm: “Cellular Contents”

- ALL contents within the cells:
  1. Cytosol:
     - Consists of:
       a. 70% - 90%:
       b. Dissolved:
  2. Organelles:
     - Specialized:

C. Organelles: “Little Organs” or “Cell Workers”

- Sub-cellular Structures performing:
  1. Nucleus: “Control Center”
     - Confines / protects:
       - DNA (Deoxyribonucleic Acid)
       - Function of DNA:

• Problem with DNA confinement:
  - Instructions cannot:
    - Cell “workers” are:

• Solution for Confinement:
  - Nuclear pores or holes:
→ DNA instructions are:
  ✔ Temporary copies:
  ➡ RNA is small & can:
  ✫ Instructions NOW available to:

2. **Ribosomes** : *“Protein Factories”*

  • Receive and read nuclear instructions:
    ✫ Function:
    ✫ Protein significance:
      ✔ Proteins =

3. **Endoplasmic Reticulum (ER)**  *“Membrane Mass”*

  • **2 Types of Endoplasmic Reticulum** :
    a. **Rough ER** : *“Looks Rough”*
      ✫ Ribosomes attached to:
      ➡
      ✫ Rough ER function:
        ➡ ”Subway” : transport :
        ➡ Modifies proteins into :
        ie : **Stomach Cells** : Produce :
          ➡ High concentration of :
    b. **Smooth ER** : *“Looks Smooth”*
      ✫ NO Ribosomes :
      ✫ Function :
        • **Hormones & Lipids**
        ie : **Sex organs** (ovaries & testes) Produce large quantities of :
          ➡ Contain increased amounts of :

4. **Golgi Apparatus** :  *“Protein Modifier”*

  ✫ Function : Modifies and customizes:
  ➡ Directs to correct:
  ➡ ER sends protein packages :
    ✫ Cell package =
    ➡ Golgi : Modifies, **packages & sends** out :
    ie : Axillary Sweat Glands :
• Excrete “sweat” vesicles to cell surface

5. **Mitochondria** : “Cell’s Power House”

- **Function** :
  - “Refine” stored: *Carbohydrates, Protein, Fats*
  - Into **USABLE** *Cellular energy* :
    - (Adenosine Tri-Phosphate)
  - *Muscle cells* : High concentration of :

6. **Lysosome** : Lyse = “split” ; soma = “body”

   “Cell’s Digestive System”

- Vesicle of :
- *Immune Cells* : High concentration of :

7. **Chloroplast** : Plant Structure “Light Capturing”

- **Function** :
  - Light energy converted into :
    - *photo* = “light” ; *synthesis* = “build”
    - \( CO_2 + H_2O \rightarrow Glucose \ (C_6H_{12}O_6) \)

8. **Cell Wall** : Rigid outside covering around cell

- **Function** :
  - Who has one:
    - AKA:

**Cell (Plasma) Membrane** :

- **Composition** : 2 layers of :
  - **Lipid** :
  - Membrane *separates* :
    - **Lipids and water** :
  - Non-Polar or “Uncharged” region

- **Repels** :
  - **Forms** :
  - **MEMBRANE** : Inhibits movement of :
• **Permeable (passing) Particles:**
  a. • CO₂, O₂, Urea
  b. • ie: Steroids, Cholesterol, Fats

• **Impermeable (restricted) Particles**
  a. • Proteins, carbohydrates (glucose)
  b. • Na⁺, Cl⁻, K⁺, Ca²⁺, HCO₃⁻, H₂O

**Question:** How do cells allow important particles into & out of the cell?

**Answer:** Cells create:

* Membrane Proteins form channels
  → Allow access to impermeable particles

• Cells create “Select” what has access
  → Cells regulate their:
  → Maintain:

**Applications:**

✓ Diabetes: Glucose channels don’t open

**Study Questions:**
1. What is the structural and functional unit of life?
2. What is the difference between unicellular and multicellular organisms?
3. What are prokaryotic cells? Are they unicellular or multicellular? Do they have genetic material? Do they have a nucleus or a nucleoid?
4. What are eukaryotic cells? Are they unicellular or multicellular organisms? Do they have genetic material? Do they have a nucleus or a nucleoid?
6. What molecules comprise the permanent copy of genetic material? What is the temporary copy of genetic material called? How does the temporary copy of genetic material exit the cell?
7. Which organelle confines and protects the permanent copy of genetic material? What organelle confines the genetic material?
8. What are the functions of the: ribosomes, rough endoplasmic reticulum, and golgi apparatus (hint proteins)?
9. What is the function of the smooth endoplasmic reticulum? What cells in your body would have a lot of smooth ER?
10. What is the function of the mitochondria? What is ATP? Why do all cells need ATP?
11. Muscle cells contract (actively move) – using a lot of energy. Which organelle do you think muscle cells would
have in relatively high concentrations?

12. Our immune cells function to “eat” foreign cells which invade our bodies. Which organelle do you think an immune
cells would have high numbers.

13. What is the function of the chloroplast?

14. What is the general function of the cell wall? What kind of cells have cell walls?

15. What surrounds and defines the boundary of all cells? What molecule comprises the majority of this structure?

16. Why are cell membranes described as being selectively permeable?

17. What type of particles can pass through the membrane? What types of particles can NOT pass through the
membrane? Explain why.

18. How do cell particles which are either too big or charged move through the membrane in order to get in or out of
the cell? As explained in class, describe why we refer to diabetes as a channel disease.

19. Why do you think medications delivered though the skin must be in creams and ointments (oils & fats) ?

20. Draw the structure of a general cell. Label the parts and provide a brief description of the function.