Introducing Pharmacology (Part I)

1. What is Pharmacology?

The word **Pharmacology** comes from two Greek words:

- **Pharmakon**: meaning "drug" or "poison."
- **Logos**: meaning "study" or "knowledge."

In simple terms, pharmacology is the scientific study of how **chemical substances** interact with **living systems**. If you put a chemical into a cell, a tissue, or a human body, pharmacology asks: *What happens next?*

The Two Main Scopes

To study pharmacology, we divide it into two big "conversations" between the drug and the body:

1. **Pharmacokinetics (PK):** This is what the **body does to the drug**. It describes the journey of the drug through the body using the acronym **ADME**:
    - **A**bsorption (How it gets in)
    - **D**istribution (Where it goes)
    - **M**etabolism (How the body breaks it down)
    - **E**xcretion (How the body gets rid of it)
2. **Pharmacodynamics (PD):** This is what the **drug does to the body**. It studies the biological effects and the "mechanism of action" (how the drug actually works at the receptor level).

2. What is a "Drug"?

In a laboratory, we might call many things "chemicals," but in health sciences, a **drug** has a specific definition.

Formal Definition: A drug is any substance (other than food) that is used to prevent, diagnose, treat, or relieve symptoms of a disease or an abnormal condition.

A drug works by changing how a cell functions. It does **not** create new functions for a cell; it only moves the "volume knob" up or down on functions that already exist.

3. Drugs vs. Biologicals (Biologics)

As Biotechnology students, this distinction is very important for your career. Not all medicines are made the same way. We generally divide modern medicine into two categories: **Small Molecule Drugs** and **Biologicals**.

Feature	Small Molecule Drugs (Conventional)	Biologicals (Biologics)
Size	Small and simple molecules.	Large and complex mixtures.
Source	Almost produced by **chemical synthesis**. Sometimes by bacterial or fungal fermentation (antibiotics).	Produced in **living systems** (cells, bacteria, yeast).
Structure	Well-defined and easy to copy (Generics).	Very complex; hard to copy (Biosimilars).
Examples	Aspirin, Paracetamol, Ibuprofen.	Insulin, Vaccines, Monoclonal Antibodies.
Stability	Usually stable at room temperature.	Sensitive to heat and light (often need refrigeration).

4. Summary for Today

- **Pharmacology** is the study of drug-body interactions.
- **Pharmacokinetics** = Body ⟶ Drug.
- **Pharmacodynamics** = Drug ⟶ Body.
- **Drugs** are chemical compounds used to alter physiological functions.
- **Biologicals** are high-tech medicines derived from living organisms.