

# Essential Clinical Pharmacology

## Program Lessons

### An Overview

#### Pharmacokinetics

- Traversing the Cell Membrane
- Absorption
- Distribution
- Metabolism
- Excretion

#### Pharmacodynamics

- Clinical Effects
- Mechanism of Action
- Drug-Receptor Interactions
- Types of Agonists
- Types of Antagonists

#### Therapeutic Drug Levels

- Measuring Pharmacokinetics
- Measuring Pharmacodynamics
- Achieving the Steady State

#### Adverse Effects

- Causes of Adverse Effects
- Classifying Adverse Effects

#### Drug Interactions

- Pharmacokinetic
- Pharmacodynamic

#### Drug Delivery

- Routes of Drug Administration
- Drug Forms
- Drug Formulations
- Drug Dosing

Clinical pharmacology is one of the most important and complex subjects in medicine. A strong foundation in the key principles of clinical pharmacology is essential for pharmaceutical and biotech professionals to understand and effectively discuss the pharmacokinetics, mechanism of action, efficacy and safety of their products.

*Essential Clinical Pharmacology* provides an animated and interactive approach to mastering the fundamental topics of clinical pharmacology.

**Receptor-associated effector molecules**

- enzyme → metabolic reaction (A, B)
- ion channel → flow of ions (Na<sup>+</sup>, K<sup>+</sup>, Cl<sup>-</sup>, Ca<sup>2+</sup>)
- gene regulatory protein → protein synthesis
- structural protein → cell shape/movement

**Location of receptors**

- water soluble
- lipid soluble
- Intracellular Receptor
- Membrane Receptor
- binding site
- effector site
- cytoplasm
- nucleus

**Nature of receptors**

endogenous signal molecule

receptor

physiological effect in tissue or organ

**KEY POINTS**

- In the normal functioning of the body, endogenous signal molecules (eg, hormones, neurotransmitters, and growth factors) activate receptors located on the cell membrane or inside the cell.
- Activation of cell receptors initiates biochemical events that alter the physiology of the cells, which leads to a physiological effect in a tissue or an organ.
- Activated receptors typically initiate their effects through the actions of effector molecules, such as enzymes, ion channels, gene regulatory proteins, and structural proteins.
- Most receptors are located in the cell membrane; some are inside the cell.
- Both water- and lipid-soluble molecules can bind to and activate membrane receptors, but only lipid-soluble molecules can readily penetrate the cell membrane to activate intracellular receptors.

**EXAMPLE**

Acetylcholine is an endogenous signal molecule that stimulates nerve transmission by binding to receptors on ion channels on the membranes of nerve cells.

Steroids, whether endogenous molecules or exogenous drugs, are sufficiently lipid soluble to penetrate the cell membrane and bind to intracellular receptors.

**LOOK BACK** – Lipid-soluble drugs are able to dissolve in and rapidly traverse the lipid bilayer of a cell membrane.  
Pharmacokinetics, Traversing the Cell Membrane

**LOOK AHEAD** – Factors that influence the binding of a drug to a receptor and the ensuing physiological effects include selectivity, affinity, coupling efficiency, and the number of receptors.  
Pharmacodynamics, Drug-Receptor Interactions

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