General introduction

pharmacology, branch of medicine that deals with the interaction of drugs with the systems and processes of living organisms, in particular, the mechanisms of drug action as well as the therapeutic and other uses of the drug.

Pharmacology research is also a critical component in the development of modern 'personal medicine'.

There are many sub-specialties within the general discipline of pharmacology. Pharmacodynamics is the study of the effects of drugs on biological systems and specifically addresses the chemical properties and physiological and behavioral effects of drugs arising from their interaction with molecular targets such as receptor proteins or enzyme systems. In contrast, pharmacokinetics is the study of what biological systems do to the drug and encompasses investigations of drug absorption, distribution, biotransformation and excretion, essential information for the design of drug treatment schedules in different patient populations and experimental animals, and for the prediction of drug-drug interactions that may enhance or compromise the effectiveness and safety.

Pharmacology works on:

- discover new medicines to help fight diseases
- improve their effectiveness and reduce unwanted side effects
- understand why people have different responses to medicines, and why some work better for some people than others
- understand why some drugs cause addiction

What do pharmacologists do?

Pharmacologists are scientists who study how new medicines work. This is different to a pharmacist, who is a licensed health professional who prepares, dispenses and advises about medicines that are already available.

Pharmacology Overview

Often confused with pharmacy, pharmacology is a separate discipline in the health sciences. Pharmacology is the study of how a drug affects a biological system and how the body responds to the drug. The discipline encompasses the sources, chemical properties, biological effects and therapeutic uses of drugs. These effects can be therapeutic or toxic, depending on many factors. Pharmacologists are often interested in *therapeutics*, which focuses on the effects of drugs and other chemical agents that minimize disease, or *toxicology*, which involves the study of adverse, or toxic, effects of drugs and other chemical agents. Toxicology can refer to both drugs used in the treatment of disease and with chemicals that may be present in household, environmental, or industrial hazards.

Pharmacology has two major branches:

- **Pharmacokinetics**, which refers to the absorption, distribution, metabolism, and excretion of drugs
- **Pharmacodynamics**, which refers to the molecular, biochemical, and physiological effects of drugs, including drug mechanism of action

In simple terms, pharmacodynamics is what the drug does to the body, and pharmacokinetics is what the body does to the drug.

A major contribution of pharmacology has been the advancement of knowledge about the cellular receptors with which drugs interact. The development of new drugs has focused on steps in this process that are sensitive to modulation. Understanding how drugs interact with cellular targets allows pharmacologists to develop more selective drugs with fewer undesirable side effects.

The field of pharmacology is at the forefront of some of the most exciting developments in modern medicine, including:

- Personalized precision medicine and gene therapy through genomic and proteomic approaches
- Regenerative pharmacology to optimize development of bioengineered tissues
- Computational and modelling approaches as drug discovery tools
- Nanotechnology-based approaches to fighting disease

Pharmacology integrates the knowledge of many disciplines, including medicine, pharmacy, nursing, dentistry, and veterinary medicine. The integrative nature of the field yields a diverse array of career opportunities in academic research, industry, government and regulatory affairs, tech transfer, patent law, science policy, and more.

What are side effects?

Side effects are unwanted, usually unpleasant, effects caused by medicines. Most are mild, such as a stomachache, dry mouth, or drowsiness, and go away after you stop taking the medicine. Others can be more serious. Sometimes a drug can interact with a disease that you have and cause a side effect. For example, if you have a heart condition, certain decongestants can cause you to have a rapid heartbeat.

What are drug allergies?

Drug allergies are another type of reaction. They can range from mild to life-threatening. Skin reactions, such as hives and rashes, are the most common type. Anaphylaxis, a serious allergic reaction, is less common.

How can I stay safe when taking medicines?

When you start a new prescription or over-the-counter medicine, make sure you understand how to take it correctly. Know which other medicines, foods, and supplements you need to avoid. Always talk to your health care provider or pharmacist if you have questions about your medicines.