

1 Introduction to pharmacology

Pharmacology is the scientific study of the properties of drugs and their interaction with living organisms, including viruses.¹ The term ‘drug’ is in common usage for any chemical used to treat disease or for recreational purposes. Strictly speaking, the term describes any chemical that is used to change the activity of a living cell.

Pharmacology has two main branches: **pharmacodynamics** and **pharmacokinetics**. Pharmacodynamics is the study of the interaction of drugs with cells. It can be thought of as how the drug affects the body. Pharmacokinetics is the study of how the body handles the drug, including how it is absorbed and distributed among the various compartments of the body, how long it remains in the body in a therapeutically effective form, and how it is metabolised and excreted. Pharmacology also embraces the study of adverse reactions to drugs, drug–drug interactions and the consequences of drug overdose. Pharmacology also covers toxicity of chemicals.

Clinical pharmacology is devoted mainly to the choice and use of drugs to prevent and treat disease and to the consequences of drug misuse. Clinical pharmacology is nowadays becoming more and more involved in the socio-economic implications of clinical drug use. An example of this is the relatively new science of **pharmacovigilance**, which is concerned with the follow-up of drug use, and **pharmacoeconomics**, which examines the economic implications of prescribing and dispensing increasingly more expensive treatments.

Drugs may originate from natural sources or be synthesised. Digoxin, for example, was originally extracted from the foxglove, *Digitalis purpurea*, but is now synthesised. Once a drug is identified as a possible treatment for a specific condition, it undergoes an intensive battery of tests to determine its mechanism of action, its potency, its specificity of action and its safety for the patient. The drug’s fate in the body is studied, as well as its effects on the tissues and organs. Its possible teratogenicity (ability to harm the unborn embryo or fetus) is also investigated. Once a suitable dose and formulation are decided upon, the drug undergoes rigorously controlled clinical trials, and if it passes all tests it may be licensed for use in patients. Clinical pharmacology encompasses all aspects of the drug’s use in patients, both before and after licensing.

Modern clinical pharmacology involves the expertise not only of doctors, but also of nurses and pharmacists, who are involved in the choice of drug, and dosage and administration, especially in hospitals. In outlying districts and in developing countries, the pharmacist and nurse are often the only immediate resource for patients, both for advice and for the monitoring of, for example, adverse drug reactions and patient compliance. Pharmacists have prescribed some remedies for hundreds of years. Nurses, both in hospital and in the community, are now prescribing certain drugs and need pharmacological knowledge to underpin their use of drugs for patients and to treat, for example, adverse reactions and overdose.

