

Pharmacology

Pharmacology and pharmacy

The words 'pharmacy' and 'pharmacology' are often confused. They may sound the same, but they are not.

- Pharmacology is about understanding drugs, what they do and what happens to them in the body. People that do this work are pharmacologists.
- Pharmacy is about medicines, many of which contain a therapeutic drug, and knowing about their preparation, dispensing and safe and effective use. People that do this work are pharmacists.



Figure 1 Pharmacologist working in a laboratory.

Pharmacokinetics and pharmacodynamics

Pharmacology can be divided into two main areas:

- Pharmacokinetics is about what the body does to a drug. It is the study of the effects of biological systems on the drugs: absorption, distribution, metabolism, and excretion of chemical compounds from the biological systems. It also includes toxicity studies.
- Pharmacodynamics is the study of what a drug does to the body – how it affects chemical reactions and chemical pathways – and what it does to micro-organisms such as bacteria in the body. It is concerned with the way a drug interacts with receptors in the body.

Pharmacodynamics also describes relationship between the concentration of a drug and its pharmacological effect.

An example: aspirin

The difference between pharmacokinetics and pharmacodynamics can be illustrated using aspirin. The chemical name for aspirin is 2-ethanoyloxybenzoic acid (old name: acetylsalicylic acid).

- The pharmacokinetics¹ of aspirin

Aspirin is a weak organic acid. It is absorbed mainly in its unionised form in the stomach and upper small intestine. It is metabolised and the metabolites are excreted. The main metabolite is 2-hydroxybenzoic acid (salicylic acid).

- The pharmacodynamics of aspirin

Aspirin inhibits the action of an enzyme. The effects it has on the body include:

- anti-inflammatory – reduces pain, stiffness and swelling caused by inflammation;
- analgesic – alleviates pain;
- antipyretic – lowers body temperature during fever.

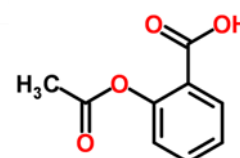


Figure 2 The molecular structure of aspirin.

¹ See *Pharmacokinetics*.

Administering drugs

Drugs may be administered in different ways. Here are some of the main methods.

- Oral administration: tablets, capsules and liquids taken by mouth into the gastrointestinal (GI) tract.
- Nasal, ocular and otologic administration: nasal spray, eye drops or ear drops.
- Intravenous administration: injections and drips into the bloodstream.
- Inhalation: inhaling fine powders or sprays through the mouth.
- Topical administration: creams, ointment, lotions and balms applied to the skin.



Figure 3 Different ways to administer a drug.

Gastrointestinal (GI) tract

In an adult male human, the GI tract is about 5 m long. It has several components which, in sequence, are:

- the oesophagus;
- the stomach;
- the small intestine;
- the large intestine.

Many drugs are administered orally. They pass through the gastrointestinal tract, being absorbed and undergoing chemical reactions as they do so. Where this happens depends on various factors, including the pH of the different regions of the GI tract.

The time taken for a drug to pass through the GI tract depends on several factors. Typically, for a Western diet, it takes about 4 to 5 hours after a meal for the stomach contents to start to empty into the intestines. Emptying of the small intestine takes a similar time and transit through the large intestine takes 30 to 40 hours.

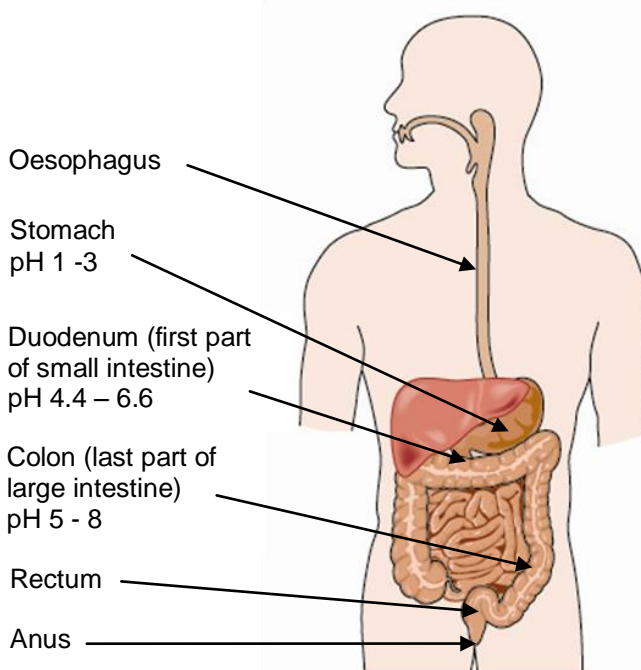


Figure 4 The gastrointestinal (GI) tract.

Finding out

Find examples of medicinal drugs that are usually taken by the methods described in *Administering drugs* above.