

THE EFFECTS OF DRUGS

Before a doctor selects a drug to be used in the treatment of a sick person, he or she carefully weighs the benefits and the risks. Obviously, the doctor expects a positive result from the drug – a cure for the condition or at least the relief of symptoms. At the same time, the doctor has to consider the risks, since all drugs are potentially harmful, some of them considerably more so than others.

Reaction time

Some drugs can produce rapid and spectacular relief from the symptoms of disease. Glyceryl trinitrate frequently provides almost immediate relief from the pain of angina; other drugs can quickly alleviate the symptoms of an asthmatic attack. Conversely, some drugs take much longer to produce a response. It may, for example, require several weeks of treatment with an antidepressant drug before a person experiences maximum benefit. This can add to anxiety unless the doctor has warned of the possibility of a delay in the onset of beneficial effects.

Adverse effects

The adverse effects of a drug (also known as side effects or adverse reactions) are its undesired effects. When drugs are taken, they are distributed throughout the body and their effects are unlikely to be restricted just to the organ or tissue we want them to affect. Other parts of the body contain receptor sites like those the drug is targeting. In addition, the drug molecule may fit other, different receptors well enough to activate or block them too.

For example, anticholinergic drugs, given to relieve spasm of the intestinal wall, may also cause blurred vision, dry mouth, and retention of urine. Such effects may gradually disappear as the body becomes used to the drug. If they persist, the dose may have to be reduced, or the time between doses may need to be increased. Reducing the dose will often reduce the severity of the adverse effect for those effects that are called “dose-related”.

PLACEBO RESPONSE

The word placebo – Latin for “I will please” – is used to describe any chemically inert substance given as a substitute for a drug. Any benefit gained from taking a placebo occurs because the person taking it believes that it will produce good results.

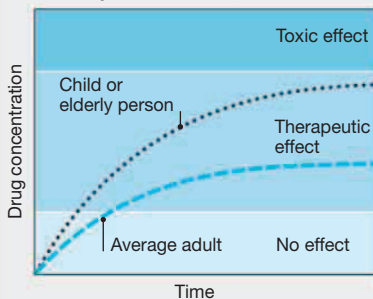
New drugs are almost always tested against a placebo preparation in clinical trials as a way of assessing the efficacy of a drug before it is marketed. The placebo is made to look identical to the active preparation, and the volunteers are not told whether they have been given the active drug or the placebo. Sometimes the doctor is also unaware of which preparation an individual has been

DOSE AND RESPONSE

People respond in different ways to a drug, and often the dose has to be adjusted to allow for a person’s age, weight, or general health.

The dose of any drug should be sufficient to produce a beneficial response but not so great that it will cause excessive adverse effects. If the dose is too low, the drug may not have any effect, either beneficial or adverse; if it is too high, it will not produce any additional benefits and may produce adverse effects.

Wide therapeutic window

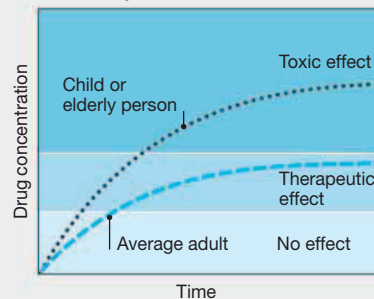


Dosage of drugs with a wide therapeutic window can vary considerably without altering the drug’s effect. The effect is greater in children and the elderly.

The aim of drug treatment is to achieve a concentration of drug in the blood or tissue that lies between the minimum effective level and the maximum safe concentration. This is known as the therapeutic window (or range).

For certain drugs, such as digitalis drugs, the therapeutic window is quite narrow, so the margin of safety/effectiveness is small. Other drugs, such as penicillin antibiotics, have a much wider therapeutic window.

Narrow therapeutic window



Dosage of drugs with a narrow therapeutic window must be carefully calculated to achieve the desired effect without toxicity. Children or the elderly experience toxic levels earlier.

Adverse effects of some drugs can be quite serious. Such drugs are given because they may be the only treatment for an otherwise fatal disease. But all drugs are chemicals, with a potential for producing serious, toxic reactions. Some adverse effects seem not to be dose-related, and where the effect appears on first use and is unexpected, the phenomenon is called idiosyncrasy. People are genetically different and, as a result, their response to drugs differs, perhaps because they lack a particular enzyme or because it is less active than usual. For this reason, not everybody suffers even the “common” adverse effects; but, occasionally, a new adverse

effect, due to a rare and unsuspected genetic variation, will be discovered only after the drug has been taken by a large number of people.

Other adverse effects that are not dose-related are allergic reactions. These reactions do not usually appear on the first exposure to the drug but on a subsequent occasion. The symptoms are similar to those caused by other allergens and, in extreme cases, may cause anaphylactic shock (see p.512).

Beneficial vs. adverse effects

In evaluating the risk/benefit ratio of a prescribed drug, the doctor has to weigh the drug’s therapeutic benefit to the sick person against the possible adverse effects. For example, such side effects as nausea, headache, and diarrhoea may result from taking an antibiotic. But the possible risks of the drug’s side effects will certainly be considered acceptable if the problem is a life-threatening infection requiring immediate medical treatment. On the other hand, such side effects would be considered unacceptable for an over-the-counter drug for the relief of headaches.

Because some people are more at risk from adverse drug reactions than others (particularly those who have a history of drug allergy), the doctor normally checks whether there is any reason why a certain drug should not be prescribed (see Drug treatment in special risk groups, p.20).