

Pharmacodynamics

'*Pharmacodynamics* deals with the study of the mechanics of drug action. It monitors the dependence of the effect of the drug on its quantity.

The effect depends on the "physico-chemical properties of the drug" and its ability to bind to target structures (receptors, enzymes,...).

- **General pharmacodynamics** = description of the generally valid regularities of the effects of substances and their mechanisms.
- **Special pharmacodynamics** = description of the effects of specific groups or individual drugs.

Pharmacokinetics studies the movement of drugs in the body. In clinical practice, pharmacokinetic knowledge is mainly used to calculate drug dosages and to estimate drug levels in "inaccessible" areas (e.g. cerebrospinal fluid, synovial fluid...).

Pharmacokinetics and its use in clinical practice

Drug dosage calculation

Dosage calculation is a more common application of pharmacokinetics. It is usually already supplied by the manufacturer of the medicine, the doctor only needs the calculation in special situations – for example, in case of reduced kidney function.

The amount absorbed into the organism "M" is related to the dose "D" and the bioavailability "F":

$$M = F \cdot D$$

An important quantity is the 'distribution volume V_d ', **which can be determined, for example, by parenteral administration of a dose of 'D and subsequent measurement of the concentration in plasma after stabilization (c_{ss}):**

$$V_d = \frac{D}{c_{ss}}$$

The quantity characterizing the excretion is **clearance CL**, which is related to the **plasma half-life $t_{1/2}$** , respectively, with the 'elimination constant ' k_e ' as follows:

$$CL = k_e \cdot V_d = \frac{V_d \ln 2}{t_{1/2}}$$

It is important to calculate the **shock (saturation) dose D_{SAT}** , which must be given at the first administration, if we want to quickly achieve the desired plasma **concentration $C < sub > SS$** , and **maintenance doses D_U** at the specified **dosing interval T'** :

$$D_{SAT} = \frac{c_{ss} \cdot V_d}{F}$$

$$D_U = \frac{c_{ss} \cdot CL \cdot T}{F}$$

The pharmacodynamic and toxicological properties of the substance also play an important role in estimating the dosage schedule. Sometimes, for example, a loading dose cannot be used due to a low therapeutic index, other times the dose must be carefully titrated due to significant variability in pharmacokinetics or due to the activation of compensatory mechanisms.

Concentration estimate

Pharmacokinetic models can be used to estimate time-dependent concentrations in otherwise inaccessible body compartments. Everything depends on the quality of the model used and its identification, i.e. the correct choice of parameters. In common practice, we are usually satisfied with stating that, for example, "*The concentration in the cerebrospinal fluid is 30% of the plasma concentration*".

Links

Related Articles

- [Basic Pharmacokinetic Parameters Affecting Steady-State Drug Level](#)
- [Physico-chemical basis of pharmacokinetics](#)
- [Mathematical description of pharmacokinetic processes](#)

External links

- [Pharmacodynamics \(Czech Wikipedia\)](#)