Learning unit: Pharmacodynamics

Impact of the learning unit:

Knowledge of general pharmacological principles is essential for further study of pharmacology and individual pharmacotherapeutic groups. It makes it easier for students to understand special chapters in pharmacology, to understand and then to anticipate possible drug interactions at the level of pharmacodynamics and to estimate possible risks while co-administering drugs.

Important terms

- pharmacodynamics
- mechanism of action
  - specific
  - non-specific
  - receptor
  - non-receptor
- receptor theory
  - affinity (potency)
  - intrinsic activity (efficacy)
  - receptors
    - according to signal transmission
      - ligand-gated ion channels
      - G-protein coupled receptor
      - receptor kinases
      - intracellular (nuclear) receptors
    - according to synaptic localization
      - autoreceptors
      - homoreceptors
      - heteroreceptors
  - ligand
    - agonist
      - full
      - partial
      - inverse
    - antagonist
  - antagonism
    - competitive
    - non-competitive
    - reversible
    - irreversible
    - chemical
    - physiologic
  - allosteric modulation
  - second messengers
  - translocation of receptors

- up regulation
- down regulation
- internalisation of receptors

dose
- single, daily, maximum daily
- threshold, sub-threshold
- effective, toxic, lethal

dose-response curves

spare receptors

change in effect after repeated administration
- desensitisation
- tolerance
- tachyphylaxis
- rebound phenomenon

synergism
- summation, potentiation
  - one-sided, double-sided

Learning outcomes

Student knows basic types of mechanisms of drug action and explains the receptor theory of drug action.
Student knows the general principles of drug action at the level of organism, organs and molecular level.
Student will explain the practical implications of different mechanisms of drug

Student explains the concepts of full, partial agonism and inverse agonism; competitive, non-competitive, reversible, irreversible antagonism.
Student describes the dependence of the effect of the drug on the dose size, can draw dose-response curves.
Student explains the types of doses - single, daily, maximum daily, sub-threshold, threshold, toxic, lethal dose.
Student will describe the function of autoreceptors, homoreceptors and heteroreceptors.
Student knows possible consequences of repeated drug administration - can explain the concepts of tolerance, tachyphylaxis, up regulation, down regulation, internalisation of receptors.

Study materials:

Rang & Dale's Pharmacology, 8th edition, 2016, chapters 2, 3 and 4

Study materials for courses aVLFA0721p and aVLFA0721c.

Exam questions

General pharmacology: 17. Nonspecific mechanisms of drug action – examples of drugs, 18. Receptor theory of drugs mode of action, 19. Synergism and antagonism in drug effect (pharmacokinetics, pharmacodynamics), 20. Dose – response curves, types of doses, drug anamnesis, patient‘s adherence, 21. Specific modes of drug action – target structures, examples of drugs