

9/8 Chapter 4 Lecture notes

Terms to know:

Pharmacokinetics- study of the 'fate' / 'movement' of substances administered to the body

Pharmacology- study of effects of drugs on behavior

Administration:

- Intravenous- fast, precise, direct access to the brain
 - Drug abuse, adrenaline
- Intraperitoneal- fast indirect access to brain
 - Chemotherapy
- Intramuscular- slower, direct access, has to be absorbed by blood vessels
 - Vaccines, antibiotics (commonly distributed in the buttocks or shoulder)
- Subcutaneous- slow absorption (fat tissue) indirect
 - Insulin
- Oral- easy, delayed (has to go through stomach, intestines, and liver)
 - aspirin
- Sublingual- easy for humans to bypass digestive system capillaries of the tongue
 - Steroids
- Intrarectal- slow, bypass the stomach
 - Suppositories
- Inhalation- fast, easy, requires volatile substances
 - Nasal decongestant, drugs of abuse
- Topical- fast, local (skin mucous..)
 - Nasal, eye (herpes, glaucoma) eardrops
- Intracerebral- bypass the BBB, local (specific brain area)
 - Mostly used for research
- Intracerebralventricular- bypass the BBB, global effect
 - Used in emergency cases

Kinetics of Absorption:

- Study of the effect on some specific brain areas, movement through the BBB
- Lipid- soluble (such as heroine) substances pass the BBB water soluble substances (such as morphine) do not.
- **Effectiveness:**
 - Response curve- dose
 - Linear curve- if the effect was proportionate to the amount of drugs
- **Affectiveness:**
 - Affinity
 - Drugs may have the same end-results, but may vary in effectiveness

Different sites of action:

- Morphine: analgesic, inhibits pain-perception neurons
- Aspirin: analgesic, suppress 'chemical signal' from damaged cells to the nervous system

Margin of Safety:

- Drugs have multiple effects at different concentrations
- A high margin of safety is better than a low margin of safety for drugs
- Therapeutic Index= measure of drug safety

LD ← Lethal dose

ED ← effective dose

- Higher TI is safer! (if the TI=3 that means it only takes 3 pills to kill someone)

Drug misuse/abuse

- Long term effects of drugs
 - The more frequent you use a drug the less effective it becomes
 - Tolerance: need more drugs, compensatory mechanism counteracting the effect of the drug
 - Withdrawal: symptoms- compensatory mechanism alone, opposite behavior/emotions.
 - Sensitization: Effect increases with repeated use
 - Effects can be psychological- placebo effect

How do drugs work?

- Agonist- opens receptors
- Antagonist- blockers

Neurotransmitters:

Goal: release postsynaptic potentials (EPSP/IPSP)

- The main families of neurotransmitters:
 - Amino Acids
 - Acetylcholine(ACh)
 - Monoamines
 - Neuropeptides

Amino Acids:

Glutamate-

- Synthesis: from protein in food
- Found Where? Everywhere in CNS
- Receptors:
 - Always Excitatory
 - Ionotropic for Na⁺
 - Ionotropic for Na⁺ and Ca²⁺
 - Metabotropic glutamate receptor
- Psychopharmacology:
 - NMDA- involved in learning and memory
 - AP5 blocks the glutamate binding site on NMDA receptors

- Alcohol blocks NMDA receptors
- PCP blocks NMDA and calcium entry in cell

GABA

- Synthesis: from glutamate
- Found where? In CNS
- Receptors:
 - always inhibitory
 - Ionotropic for Cl⁻ (GABA-a)
 - Metabotropic for K⁺ (GABA-b)
- Psychopharmacology:
 - Controls spread of excitation (epilepsy, seizures)
 - Muscimol opens & biculline blocks GABA-a
 - Benzodiazepines opens GABA-a

Glycine

- Synthesis: found in sugar cane, endogenous production unknown, non-essential
- Found where? Mainly spinal chord
- Receptors: always inhibitory, Ionotropic for Cl⁻
- Psychopharmacology:
 - Prevents excessive muscle contraction
 - Tetanus- bacteria produces a chemical that blocks glycine release