Neuropharmacology

- Is the scientific study of drug effects on the nervous system.
- Is an all encompassing term
- Is applied to ALL drugs that influence the nervous system
- Includes
  - Sensory systems
  - Motor systems
  - Cognitive functioning
  - Others

Some Terms and Definitions

- Psychopharmacology
  - Usually used to describe drug effects on psychological parameters such as emotion and cognition (Nestler)
- Psychotropic
  - Drugs that influence behavior
- Pharmacokinetics
  - Is the study of how drugs enter, are distributed, metabolized, and removed (excreted) from the body
- Pharmacodynamics
  - Is the study of what drugs do various structures in the body.

Pharmacokinetics

- Four variables to examine
  - How drugs enter the system
  - How drugs are distributed throughout the system
  - How drugs are metabolized in the system
  - How drugs are eliminated from the system.

How Drugs Enter the System

- Influences
  - How fast a drug reaches its target organ
  - Which structure(s) the drug influences
  - Risk of acquiring BBPs

Oral

- Slow onset of action
- Advantage
  - Easy to take
  - Low risk for BBPs
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Other Routes of Administration

• Faster routes (Seconds)
  • Respiratory (Nasal/Oral) Nicotine Cocaine
  • Intravenous (Venous system) Meth. Opiates
  • Intraarterial (Arterial system) Meth. Opiates
  • Problem – Risk of BBPs

• Slower routes (Minutes)
  • Intramuscular (muscle groups) Steroids
  • Subcutaneous (under the skin) Some Halluc.
  • Cutaneous (Dermal) Ach. Nerve Agents, Nicotine Patches

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Additional Medical/Scientific Routes

• Routes
  • Intraperitoneal (peritoneal-abdominal cavity)
  • Intracerebroventricular (cerebral ventricular)
  • Intracerebral (brain parenchyma)
  • Takes seconds or minutes
  • Can be dangerous
  • Minimal risk of BBPs due to sterile techniques used.

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How Drugs are Distributed in the Body

• Circulatory system
• Heart to
• Lungs to
• Heart to
• Body structures via arteries
• Arteries to smaller blood vessels
• Small blood vessels to Heart via veins
• Repeat

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Bioavailability

• Determines how much of a drug that actually reaches a target.
• Effects can depend on
  • Gastrointestinal loading (decreases absorption)
  • Liver metabolism (First Pass)
  • Binding to plasma proteins that makes the drug unavailable to the target
  • Cannot penetrate the Blood-Brain Barrier
  • Cannot penetrate other cell membranes

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Pharmacodynamics

• Generally is defined as effects of drugs on neurological systems.
• Can be associated with any system
  • Heart, Liver, Endocrine System, etc.
• Lots of issues influence pharmacodynamics
  • Amt of drug available
  • Past drug use - Tolerance
  • Drug Stability
    • How long a drug lasts in the body before it is metabolized
• Drug Consistency
  • Does it need metabolized before it can be used
    • L-Dopa vs. Dopamine

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Effects on Target Binding Site

• All drugs bind on some receptor site
• Causes some effect on the target site
• Creates some behavioral effect
  • Called Main Effect
• Also has other unintended effects
  • Called Side Effect
• Called Pharmacodynamics
Metabolism and Elimination of Drugs

- Can be removed many ways
- Breathing
- Sweat
- Feces
- Liver metabolism
  - Have specific enzymes that break down drugs to inactive compounds
- Can be influenced by
  - Liver disease
  - Other compounds that are present
    - Multiple drugs
    - Fluid levels
    - Other health effects

Kidneys

- Removes waste products from the blood
- Can be influenced by fluid levels and other compounds (salt)
- Also removes other drugs and products
  - BCPs and metabolites
  - Can cause problems in other organisms

Breathing, Sweat, Feces

- Removes trace amounts of some drugs
- Alcohol
  - Is removed multiple ways
  - Reason for breathalyzer

Conclusions

- Many variables can influence drugs in the body
- Is important for the clinician to be aware of them
  - Reason psychopharmacology is important
  - Reason medical exams are a important component for drug/alcohol treatment