Principles of Psychopharmacology pg77

Psychopharmacology- The study of the effects of the drugs on the nervous system as well as the behavior of the individual.

2 main characteristics of drug interaction

1) **Drug Effect** - Changes in an organism’s physiological process and behavior due to a substance. *(The what of the chapter)*

2) **Site of Action** - Where the biochemical process of the drug molecules interacting with the molecules in/on cells inside the body. *(The who of the chapter)*

   a) A drug would be ineffective if it could not reach its site of action.

Pharmacokinetics- The study of the movement and the process of substances entering the body. This focuses on 5 targeted areas.

An Angry Dog Might Explode - Administration_Absorption_Distribution_Excrete

Types of Administration pg78

**Types of Injections**

*Intramuscular*  
*Subcutaneous*  
*Intravenous*  
*Intradermal*

**Intravenous Injection - IV**

- When an injection is made directly into a vein. This allows direct access to the bloodstream, and thus the brain.
- The fast acting characteristic is a pro as it's immediate, but can also be a con as counteracting effects can be difficult to do.
- This type of injection is used on humans and animals

**Intramuscular Injection- IM**
- When an injection is made directly into a large muscle, and then will get absorbed by the many capillaries within the muscle.

**Subcutaneous Injection- SC**
- When an injection is made directly below the skin, this type of injection tends to be slow and prolonged.
- Can also inject a capsule under the skin for slow release.

**Intraperitoneal Injection- IP**
- When an injection is made into the space that surrounds the abdomen organs (including the stomach, liver, intestines, etc.) known as the Peritoneal Cavity.
- Often used on animals.
- This is also a rapid type of injection, and allows indirect access to the brain.

**Oral Administration**
- Intaking the substance by swallowing it, most common type of administration for humans.
- Delayed absorption
- Some drugs cannot be orally administered as the stomach acid would destroy them/ they would not get properly absorbed (ex: Insulin)

**Sublingual Administration**
- When a substance is absorbed by placing it under the tongue and having the capillaries absorb it.
- Only works with people
- Bypasses the digestive system
**Intrarectal Administration**  
-When a substance is put in the bum and absorbed by the capillaries.  
-Bypasses the digestive system  
-Mostly or humans, occasionally small animals

**Inhalation - Smokey Tokey**  
-When a substance is administered by inhaling it to the lungs.  
-Typically has rapid effects.

**Topical Administration**  
-When a substance is administered by placing it onto the skin and having it be absorbed by the surface of the skin.  
-This would include ointment, eyedrops,  

**Insufflation**- Substances being absorbed through the mucus lining in the nose; still technically TA. (Example: Nose spray, coke)

**Intracerebral Administration**  
-When an injection is made directly into the brain of an individual.  
-Could happen is the drug cannot pass the blood brain barrier (BBB)  
-Often occurs for research purposes

**Intracerebroventricular Administration**  
-When an injection is made directly into the ventricles  
-Often only for emergencies- not easy.

**Entry of Drugs into the Brain:**  
-The different route of administration only has an effect on how fast (or the rate) the drugs given to the organism reach the bloodstream, however the drug is not effective until it reaches its site of action.  

**Site of Action:** Where the drug interacts with a receptor. Receptors can be  
-If a drug affects behavior, it most likely has a site of action on the CNS.  
-When the site of action is located in the brain, then its rate is dependent on how lipid soluble the drug is.  
  -The brain-brain barrier (the BBB) is only for water-soluble molecules.  
Here, the water-soluble lipids go into capillaries in the CNS before entering the brain.  
-Drug has a bigger “rush” when it has a higher rate. (or is water soluble)

**Drug Effectiveness: pg80**
**Kinetic Absorption:** Study of the effect of specific brain areas; especially movement through the BBB

**Dose-Response Curve:** A system of measurement where the effectiveness of a drug are plotted against the individuals intake of the drug (that being milligram dose over kilogram of individual’s weight)

- Often two curves will be plotted, one with the positive effects and one of the negative effects.
- The space in between the two curves shows the Margin of Safety.

**Goal: Have a drug with a large margin of safety.**

**T.I-Therapeutic Index:** A method of measuring drug safety. The figure is determined by placing the LD over the ED. (How much extra of the drug it would take for the organism to overdose.)

**LD-Lethal Dose:** The amount of drugs it would take to have a toxic/negative effect on 50% of organisms given the drug.

**ED- Effective Dose:** The amount of drugs it would take to have an effect/positive effect on 50% of organisms given the drug.

EX: Valium’s T.I.~100 Barbiturates T.I~3

- Very easy to OD on Barbiturates, not easy on Valium.

**Goal: To have a drug with a large therapeutic index!!!!**

**Affinity and Drug Effectiveness:**

**Affinity:** The readiness for two molecules to join together; more specifically how the molecules of the drug bind with the receptor in the body.
- Drugs can have different strengths of affinities to different receptors in the body.

  **High Affinity**: The drug will produce effects at a low concentration- not that much drugs are needed to get a result.

  **Low Affinity**: The drug will produce effects at a high concentration- a good amount of drugs are needed to get a result.

**Goal**: A drug with a high affinity for therapeutic events and a low affinity for toxic events.

-Different drugs with the same site of action can have multiple effects, and each effect can have varying affinities.

**Effects of Repeated Administration pg81**

**Sensitization**: An increase in the effectiveness of a drug that is repeatedly taken. Drugs typically need time to become effective.

  EX: An SSRI

**Visa Versa**

**Tolerance**: A decrease in the effectiveness of a drug that is repeatedly taken. Occurs when the compensatory mechanisms counteract the effect of the drug.

  -Typically occurs with drug abuse

**Withdrawal Symptoms**: The effects of the body adjusting to no longer having a substance after prolonged and repeated use. Occurs when the compensatory mechanisms are alone.

  -Primarily the opposite effects of the drug.

-Because drugs have different effects, one area can develop a tolerance to the same drug that causes another area to become more sensitized.

**Placebo Effect**: When a drug has no specific physiological effect.

-Used to study the effects of a drug when compared to another group.

**Sites of Action: pg83**

-Most drugs affect synaptic transmission.

2 Main categories of What it does:

  1) **Agonist**: Drugs that help facilitate the effects of the drug. An Agonist *opens* the ion channels. Increase effect.
2) **Antagonists**: Drugs that inhibit or block the effects of the drug. An Antagonist *blocks* the ion channels. Decrease effect.

2 Main categories of *Where* it does:

1) **Direct**: When the drug attaches to the receptor where the neurotransmitter would typically go; blocking the neurotransmitter from bonding. This means there is competition to bond to the receptor.

2) **Indirect**: When the drug attaches to the receptor at its own designated site. Non-Competitive bonding.

**Effects on Destruction/Reuptake of Neurotransmitters**

After simulation the next step is to terminate.

Occurs in 2 ways

1) Process of reuptake- where the molecules are taken back through the terminal button

2) An enzyme destroys them
Amino Acids pg 92
-Some neurons secrete simple amino acids as a neurotransmitter.
-8 amino acids are determined neurotransmitters located in the CNS
-3 most common: Glutamate, GABA and Glycine

**Glutamate:**
Glutamate: The primary excitatory transmitter in the brain and spinal cord.
-Believed to be one of the firsts neurotransmitters, synthesized from proteins
AMPA-Ionotropic for NA+
NMDA-Ionotropic for NA+ and CA2+
Metabotropic glutamate receptor

-Too much can cause cell death.

**GABA**
Gaba: Always an inhibitory
-Synthesized from Glutamate, found all in the CNS
GABA A- Ionotropic for CL-
GABA B- Metabotropic for K+

-Controls the speed of excitatory response, used to treat seizures.

**Glycine**
Glycine: The main inhibitory in the Spinal Cord
-Synthesized from sugar cane and the endogenous production.
Inotrophic for CL-

-Prevent excessive muscle movement.