Basic Principles of Neuropharmacology

* Can be defined as the study of drug that alter processes controlled by the nervous system.
* Neuropharmacology can be devided into two broad categories;

1. Peripheral nervous system drugs.
2. Central nervous system (CNS) drugs.

The Neuropharmacology drugs constitute a large and important family of therapeutic agents.

These drugs are used to treat conditions that range from depression to epileps, to hypertension, to asthma.

As a rule, if we want to understand the effects of drug on a particular physiologic processes, we must first understand the processes itself.

* There are three steps in the processes by which the neuron influences the behavior of the post synaptic cell;

1. Conduction of an action potential along the axon of the neuron.
2. Release of neurotransmitter moleculer from the axon terminal
3. Binding of transmitter moleculer to receptor on the post synaptic cell.



* Post Synaptic Cell :
* Neuron
* Muscle cell
* Cell within asecretory gland
* As a result of transmitter-receptor binding , aserios of events is initiated in the postsynaptic cell, leading to change in that cells behavior.
* ( If postsynaptic cell is another neuron, it may increase or decrease it’s firing rate; if the cell is part of muscle it may contract or relax and if the cell is glandular, it may increase or decrease its rate of secretion)

The steps in synaptic Transmission

1. Synthesis
2. Storage
3. Release
4. Receptor binding
5. Termination



Termination

**5a- Reuptake 5b- Enzymatic degradation**

**5c- diffusion**

Multiple Receptor types and Selectivity of Drug action

* Many Neuropharmacologic agents display a high degree of selectivity.
* This selectivity is posible because the nervous system works through multiple types of receptors to regulate the organs under its control.



**More types of receptor we have to work with the greater our chance of producing selective drug effects.**

Nervous System

**CNS ---- Brain, Spinal cord**

**Peripheral N.System ---------- Somatic motor system**

**(controls movement of voluntary muscles), Autonomic N.System**

**Para symathetic N.S,Symapathic N.S**

**The Autonomic N.S has Three Principle Functions;**

1. **Regulation of the heart**
2. **Regulation of secretory glands ( Salivary, gastric, sweat, bronchial glands)**
3. **Regulation of smooth muscles (muscles of the bronchi, blood vessels, urogenital system and G.I tract).**

**Principle Function of the Parasympathetic S.**

* **The Parasympathetic nervous system performs seven regulatory function that have particular relevance to drugs specifically stimulation of appropriate.**
* **Parasympathetic N. cause**
* **Slowing of heart rate**
* **Increased gastric secretion**
* **Emptying of the bowel**
* **Focusing of the eye for near vision**
* **Constriction of the pupil**
* **Contraction of bronchial smooth muscle.**

Principle Function of the Sympathetic Nervous System

* Regulation of the cardiovascular system
* Regulation of body temperature
* Implementation of the “fight-or-flight” reaction.

Primary receptor types

* There are two basic receptors associated with the peripheral nervous system, that is ;
* Cholinergic Receptors
* Adrenergic Receptors

Cholinergic Receptors

* Cholinergic Receptors:- are defined as receptors that mediate responses of Acetyl choline.
* Cholinergic Receptors include two types of receptors which are;

1. Nicotinic receptors:- These receptors are present in all autonomic ganglia and neuromuscular junction (skeletal muscle)
2. Muscarinic receptors:- These receptors are present in all organs inervating by Parasympathetic Post ganglia and also present in sweat glands.

Adrenergic receptors

* Are defined as receptors that mediate responses to epinephrine (Adrenaline) and nor epinephrine.

Subtypes of cholinergic and Adrenergic receptors

* There are three major subtypes of cholinergic receptors referred to as nicotinicN , nicotinicM ,  and muscarinic.
* There are four major subtypes of adrenergic receptors referred to as alpha 1, alpha 2, beta 1 and beta 2.

Autonomic Drugs:

1. Cholinergic drugs 2. Adrenergic drugs.

* Cholinergic drugs define as the agents that influence the activity of cholinergic receptors.
* The Cholinergic drugs have both therapeutic and toxicologic significance.

Cholinergic drugs act in two paths:

1. Directly: directly acting agents, bind directly to cholinergic receptors and act like acetyl Choline.
2. Indirectly: indirectly acting, Inhibit “acetyl Choline Esterase”

There are Category Representative drug

Muscarinic agonists Bethanechal

Muscarinic antagonists Atropine

Ganglionic stimulating agents Nicotine

Ganglionic blocking agents Mecamy lamine

Neuromuscular blocking agents d- Tubocurarine

succinylcholine

Cholinesterase inhibitors Neostigmine

**Life cycle of acetyl choline**

