CHAPTER 3: NEURONS, SYNAPSE

The Synapse and Pharmacology

NEURONS

- Specialized cells for the reception, conduction, and transmission of electrochemical signals
- Many sizes and shapes

- There are about 100 billion neurons in the nervous system.
- Neurons are some of the longest-lived cells in the body.
- Neurons are irreplaceable.
- Neurons have huge appetites. About 25 percent of the calories that you take in every day are consumed by your brain's activity.

THE CLASSES OF NEURONS

UNIPOLAR NEURON

- These neurons have a single long axon that is responsible for sending electrical signals
- **AXON -** is a thin fiber that connects neurons (nerve cells) to that they can communicate. Neurons communicate via electrical impulses that trigger the release of "chemical messengers" called neurotransmitters.
- **Axon**: long, tube-like structure that carries the neural message to other cells

BIPOLAR NEURON

- Type of neuron that has two extensions (one axon and one dendrites). Many bipolar cells are specialized sensory neurons for the transmission of sense. As such they are part pf the sensory pathways for smell, sight, taste, hearing, touch, balance.
- **DENDRITES** - receive input from many other neurons and carry those signals to the cell body
- **Dendrites**: branch-like structures that receive messages from other neurons

MULTIPOLAR NEURON

- It constitute the majority of neurons in the central nervous system.
- They include motor neurons and interneurons/relaying neurons are most commonly found in the cortex of the brain and the spinal cord.
- These neurons can receive impulses from multiple neurons via dendrites. The dendrites transmit the signals through the neuron via an electrical signal that is spread

INTERNEURON

- Interneurons are the ones in between- they connect spinal motor and sensory neurons. As well as transferring signals between sensory and motor neurons.

Soma: the cell body of the neuron, responsible for maintaining the life of the cell.
Nucleus: it controls and regulates the activities of the cell.

NEURONAL TRANSMISSION

- The brain can translate these signals reading them like binary codes
- Organizing them by location, sensation, magnitude, & importance

Generating the Message : Neural Impulse

Action potential - name for the electrical charge generated by the ions which sends messages down the axon

Ions - transmit nerve signals, and contract muscles including the heart, etc.

Resting potential - the state of the neuron when not firing a neural impulse

Communication Between Neurons

- **Second Step** Sending messages between neurons is a chemical process
- **Synapse** -small gap or space between 2 neurons. Neurons never touch
- Because of the synaptic gap, the electrical impulse cannot cross the gap and a chemical process must take the message across the gap

Neurotransmitters

- Neurotransmitters are chemical messengers that your body can't function without. Their job is to carry chemical signals ("messages") from one neuron (nerve cell) to the next target cell.

Neurotransmitter	Involved in	Potential Effect on Behavior
Acetylcholine	Muscle action, memory	Increased arousal, enhanced cognition
Beta-endorphin	Pain, pleasure	Decreased anxiety, decreased tension
Dopamine	Mood, sleep, learning	Increased pleasure, suppressed appetite
Gamma-aminobutyric acid (GABA)	Brain function, sleep	Decreased anxiety, decreased tension
Glutamate	Memory, learning	Increased learning, enhanced memory
Norepinephrine	Heart, intestines, alertness	Increased arousal, suppressed appetite
Serotonin	Mood, sleep	Modulated mood, suppressed appetite

Psychopharmacology

- **Psychopharmacology** is the study of how drugs affect behavior. If a drug changes your perception, or the way you feel or think, the drug exerts effects on your brain and nervous system.
- **Psychoactive drugs** are substances that, when taken in or administered into one's system, affect mental processes, e.g. perception, consciousness, cognition or mood and emotions.

Example of Psychoactive Drugs

- Cocaine
- Nicotine
- Alcohol
- Caffeine
- Ecstasy

Effects of Psychoactive Drugs

- addiction
- worsening mental health issues
- problems with memory
- unintended weight loss
- lung damage from smoking
- complications in pregnancy
- increased or decreased blood pressure
- overdose