

BRAIN AND NEURONS

Anatomy of a Neuron

dendrites - the branching structure of a neuron that receives messages (attached to the cell body)

Soma - the cell body of the neuron; it contains the nucleus

nucleus - the organelle in the cell body of the neuron that contains the genetic material of the cell

axon terminals - the hair-like ends of the axon

axon - the long extension of a neuron that carries nerve impulses away from the body of the cell.

myelin sheath - the fatty substance that surrounds and protects some nerve fibers

node of Ranvier - one of the many gaps in the myelin sheath - this is where the action potential occurs

Schwann's cells - cells that produce myelin - they are located within the myelin sheath.

Terminal Button - Knobby ends of the axon. Releases NTs. Does not touch the dendrite of the post-synaptic neuron's dendrites.

Synapse - the gap between the sending neuron and the receiving neuron. (microscopic space)

Intraneuronal Communication

Resting potential... -70mv

Threshold... -50mv

Action Potential... ion channels open allowing Na⁺ to rush in (all-or-nothing)

Negative after-potential... K⁺ flows out

Absolute Refractory

Relative Refractory

Types of Neurons

Sensory (or afferent) neurons: send information from sensory receptors (e.g., in skin, eyes, nose, tongue, ears) TOWARD the central nervous system.

Motor (or efferent) neurons: send information AWAY from the central nervous system to muscles or glands.

Interneurons: send information between sensory neurons and motor neurons. Most interneurons are located in the central nervous system.

Neurotransmitters

Acetylcholine (ACh): Muscular contractions, Found in the hippocampus...memory,

Dopamine (DA): Movement, attention, learning

Epinephrine/norepinephrine (NE): Alertness, Fear and anxiety

Endorphins: Mediate pain at receptor sites.

Serotonin (5-HT): Mood, mental arousal, sleep regulation. Inhibits dreaming

GABA

Glutamate

Nervous system

Central NS (brain and spine)

Peripheral NS

Afferent Pathways (sensory to CNS)

Efferent Pathways (CNS to effectors/muscles and glands)

Somatic (skeletal)

Autonomic (involuntary)

Sympathetic Division (stress, expends energy)

Parasympathetic Division (conserves energy)

Frontal Lobe

planning, thinking, decision making, Higher thought processes, Judgement, Primary motor cortex: control all voluntary movement in body

Parietal Lobe

Somatosensory Cortex: all sensations of skin and muscles

Temporal Lobe

auditory processing - auditory cortex, understanding speech, listening to music

Occipital Lobe

visual processing - visual cortex, primarily contralateral from optic chiasma

Broca's Area

L- frontal lobe, producing speech/ speaking, Broca's Aphasia

Wernicke's Area

L- temporal lobe, understanding spoken language, Wernicke's aphasia

Association Areas - everything else

Cerebral Cortex**Hindbrain**

Medulla Oblongata

Pons

Cerebellum

Midbrain

Reticular Activating System (Reticular Formation)

Forebrain

Limbic System

Thalamus

Hypothalamus

Basal Ganglia

Cerebral Cortex

Brainstem**Medulla**

Breathing, Heart rate regulation, Swallowing, digestion

Pons

Relay station for brain, Works with Reticular formation: Sleep/ Arousal

Cerebellum

Any fine folds; large surface area, Muscle movement & muscle tone, Balance, Some learning & memory

Reticular formation:

Being awake and alert, mental arousal

Limbic System

Plays an important role in both memory and emotion

Amygdala

Discrimination of objects and emotion

Hippocampus

Storage of memories

Thalamus

Important relay station sensory information. Sends info to cortex

Basal ganglia

Starting and stopping voluntary movements, Gross motor control

Hypothalamus

Monitors eating, drinking, and sex, directs pituitary gland, Fight/flight, Temperature control

TELENCEPHALON

Cerebral Hemispheres

DIENCEPHALON

Thalamus

Hypothalamus

MESENCEPHALON (MIDBRAIN)

Tectum (superior and inferior colliculi which function in reflexive movements of the head and eyes to sudden visual and auditory stimuli, respectively.)

Tegmentum (core of the tegmentum is the reticular formation.)

METENCEPHALON

Pons

Cerebellum

MYELENCEPHALON

Medulla Oblongata

Spinal Reflex/ Reflex Arc

Brain rx and Imaging

Ablation
Deep Lesioning
ESB
EEG
Angiogram
CT Scan
MRI Scan
PET Scan

Endocrine System

Pituitary
Pineal Gland
Thyroid Gland
Adrenal Gland
Pancreas
Ovaries/Testes