

## **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<sup>+</sup> to rush in (all-or-nothing)

Negative after-potential... K<sup>+</sup> 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