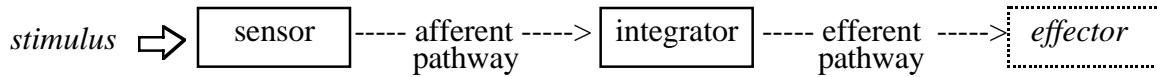


Lecture Outline – Nervous System

I. Functions - integration & control (typically associated with rapid and/or short term activities)

A. Basic Functional Model:



B. Functional Components

1. Sensor (receptor) - detects stimuli (changes) in the external and internal environment and relay to integrative centers
2. Afferent (sensory) communication line
3. Integrator (located within the CNS) - interprets incoming sensory information and coordinate appropriate responses
4. Efferent (motor) communication line
3. Effector (a muscle or a gland) – produces an action or effect (often opposing the original stimulus)

II. Cellular Components:

- A. Neurons (nerve cell): functional cell, responsible for all transmission and integration
- B. Neuroglial Cells: helper cells that nourish & protect the neurons (may assist with transmission)

III. Neurons

A. General Structure

1. Cell Body (Soma, Perikaryon)
 - a. nucleus (with nucleolus)
 - b. Nissl bodies – both fixed (RER) and free ribosomes
2. Dendrites
3. Axon
 - a. axolemma - with membrane channels
 - b. axoplasm
 - c. axon hillock (and initial segment)
4. Axon Terminal branches
 - a. Telodendria
 - e. axon terminals (synaptic terminals, boutons, knobs) - with neurotransmitter filled vesicles
5. Myelin
6. Nerve Impulse
 - a. Graded Potential
 - b. Action Potential - an all-or-none, self propagating, non-decremental, depolarization followed by repolarization
6. Synapse - the junction between two cells (neuron:neuron, neuron:muscle, neuron:gland)
 - a. Electrical Synapses (very rare)
 - b. Chemical Synapses
 - i. presynaptic cell vs. postsynaptic cell
 - ii. synaptic cleft

- iii. axon terminal
 - vesicle (w/ neurotransmitter)
 - presynaptic membrane
- iv. postsynaptic membrane
 - receptor

B. Neuron Types

1. Structural Divisions (anatomical)
 - a. Multipolar (most common, primarily motor neurons and interneurons)
 - b. Unipolar (primarily sensory neurons)
 - c. Bipolar (rare, retina and olfactory epithelium)
2. Functional Divisions (physiological)
 - a. Afferent (sensory) - transmits information to the CNS (from a sensor)
 - b. Efferent (motor) - transmits information from the CNS (to an effector)
 - c. Interneuron (association neuron) - transmits information within the CNS (fully in CNS)

IV. Neuroglia

A. Peripheral NS

1. Schwann cells

B. Central NS

2. Oligodendrocytes
3. Astrocytes
4. Microglia
5. Ependymal Cells

V. Major Anatomical Divisions of the Nervous System

A. Central Nervous System (CNS)

1. Brain
2. Spinal Cord
3. Organization of Neurons
 - a. Nuclei: clusters of cell bodies within the central nervous system (gray matter)
 - b. Tracts: bundles of axons within the central nervous system (white matter)

B. Peripheral Nervous System (PNS)

1. Nerve Structure
 - a. Coverings
 - i. Epineurium - encloses the nerve
 - ii. Perineurium - encloses fascicles (bundles of axons) within the nerve
 - iii. Endoneurium - encloses individual axons (nerve fibers)
2. Organization of Neurons
 - a. Ganglia: clusters of cell bodies within the peripheral nervous system (gray matter)
found as part of the dorsal spinal roots (sensory neurons) and collateral ganglia (of the autonomic nervous system)
 - b. Nerves: bundles of axons (nerve fibers, white matter) that make up the bulk of the peripheral nervous system (nerves = bundles of axons)

IV. Major Functional Divisions of the Nervous System

A. Sensory (afferent) – transmits information from the periphery (sensory structures) to the CNS

1) General (somatic or somasthetic)

- a. Cutaneous (exteroceptors)
- b. Visceral (interoceptors)
- c. Proprioceptors

2) Special Senses

B. Motor (efferent) – transmits information from the CNS to the periphery (effectors)

1) Somatic Nervous System: conscious division of sensory and motor nervous system

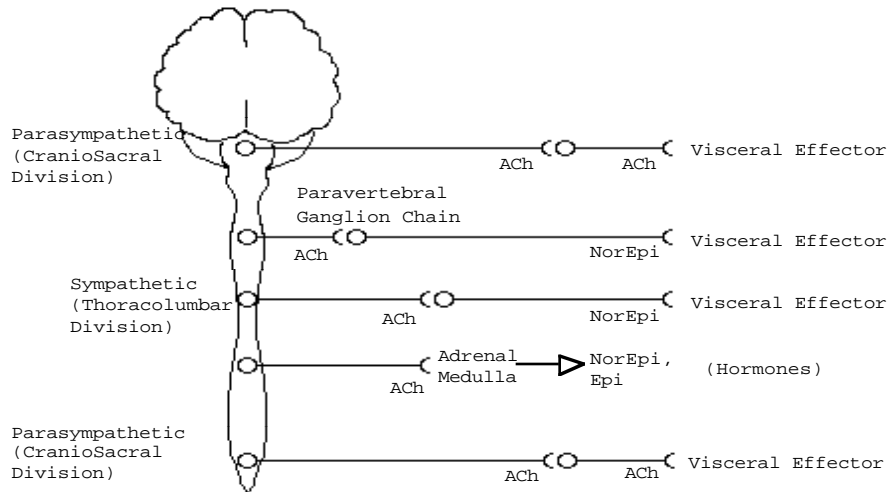
2) Autonomic Nervous System: unconscious division of the motor nervous system

a. Sympathetic Autonomic Nervous System (SANS): prepares body systems for stressful situations (i.e. fight or flight response)

- i. Preganglionic Neuron
- ii. Paravertebral Ganglion Chain (sympathetic chain)
 - white ramus communicantes
 - gray ramus communicantes
- iii. Collateral Ganglia
- iv. Postganglionic Neurons

b. Parasympathetic Autonomic Nervous System (PANS): returns body systems to normal restful conditions (i.e. rest and digest)

- i. Preganglionic Neuron
- ii. Postganglionic Neurons



IX. Additional Key Terms

agonist	antagonist	cortex	excitatory	fissure	ganglia
gyrus	inhibitory	myelin	nerve	nucleus	presynaptic
postsynaptic	potential	sulcus	tract	tone	