

3A Neural Processing the Endocrine System

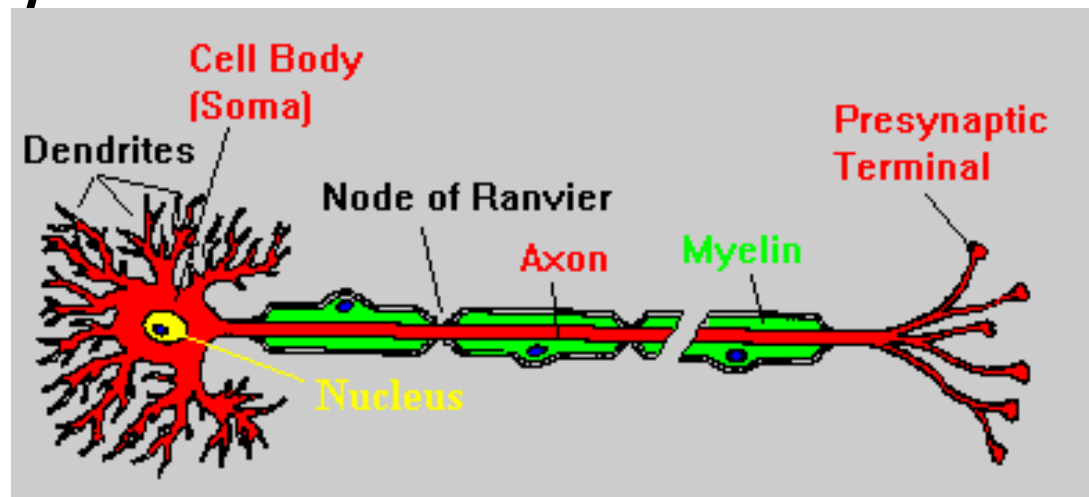
Biological Bases of Behavior

Neurons

- Nerve Cells
- Sensory neurons-carry messages from the body's tissues and sensory organs inward to the brain and spinal cord for processing
- Motor neurons-the brain and spinal cord send instructions out to the body's tissues
- Between the two, information is processed in the brain's internal communication system: inter-neurons

A Motor Neuron

- Dendrites-receive info and conduct it toward the cell body
- Axon-passes the message to other neurons or to muscles or glands
- Axons-speaks, dendrites-listen
- Diagram



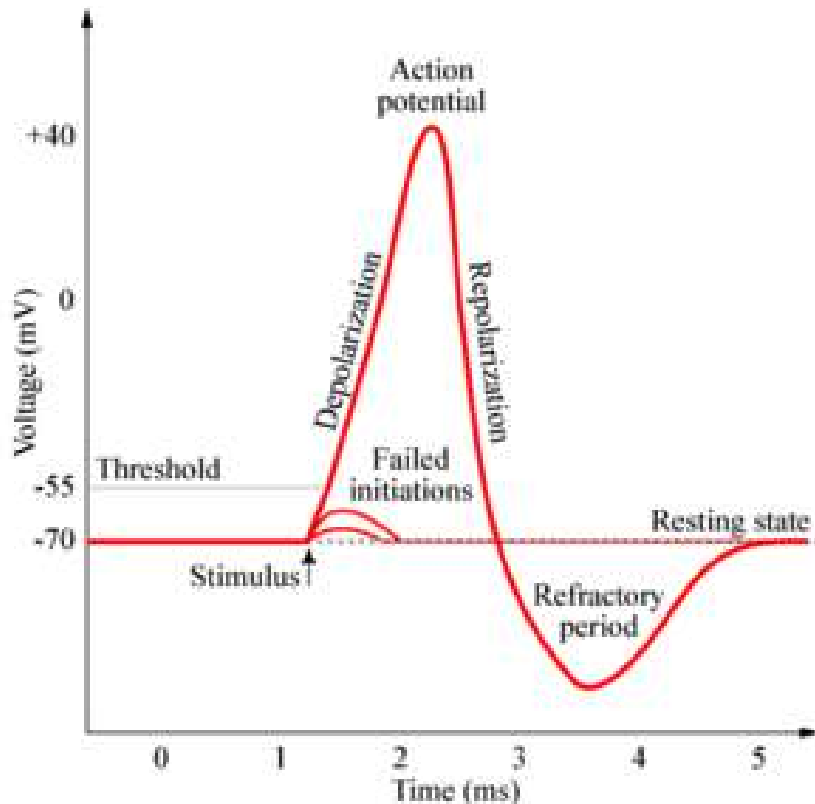
Myelin sheath

- Insulates the axon of some neurons and helps speed their impulses
- Laid down up to about age 25, neural efficiency, judgment, and self-control grow
- If it degenerates multiple sclerosis results: eventual loss in muscle control
- Without it, neurons would not communicate thus can't move

Action potential

- A neural impulse travels at a speed ranging from 2 miles per hour to 200 or more. Much slower than brain activity (milliseconds)
- A neural impulse; a brief electrical charge that travels down the axon
- Toilet Example

Action potential



- **Threshold**-the level of stimulation required to trigger a neural impulse
- **Depolarization**-positive charges flood through the membrane. This causes the axon's next channel to open and so on
- **Repolarization**-movement of positive charged ions outside the cell. Return membrane to negative
- **Refractory period**-the amount of time it takes for an excitable membrane to be ready for a second stimulus once it returns to its resting state
- **Resting period**-positive outside/negative inside state

Neurons

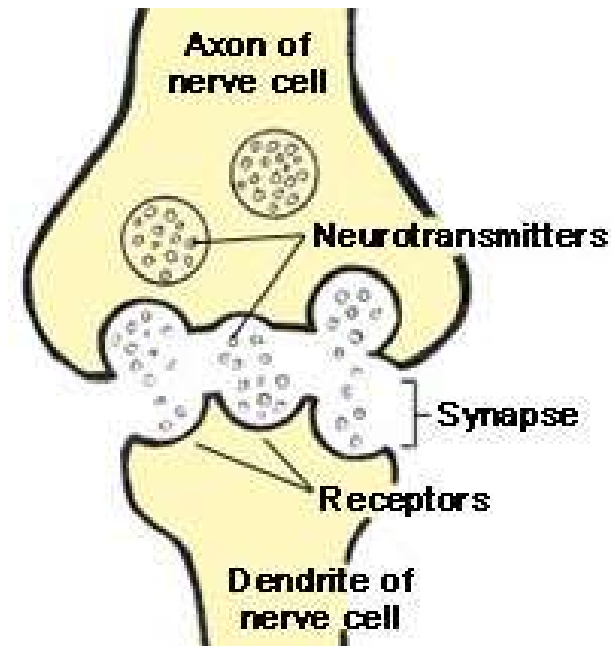
- Generates electricity: positive and negative charges
- The fluid interior of a resting axon has an excess of negatively charged ions, while the fluid outside has more positively charged ions
- Sodium-potassium pump (+ in, pumps back out after action potential)
 - Passing through membrane

Neurons

- Excitatory: like pushing a neurons accelerator
- Inhibitory: like pushing its break
- When the excitatory minus the inhibitory exceed a minimum intensity (threshold) the signals trigger an action potential
- Can't increase the neurons strength or speed.
- How can we distinguish a slap rather than a tap?

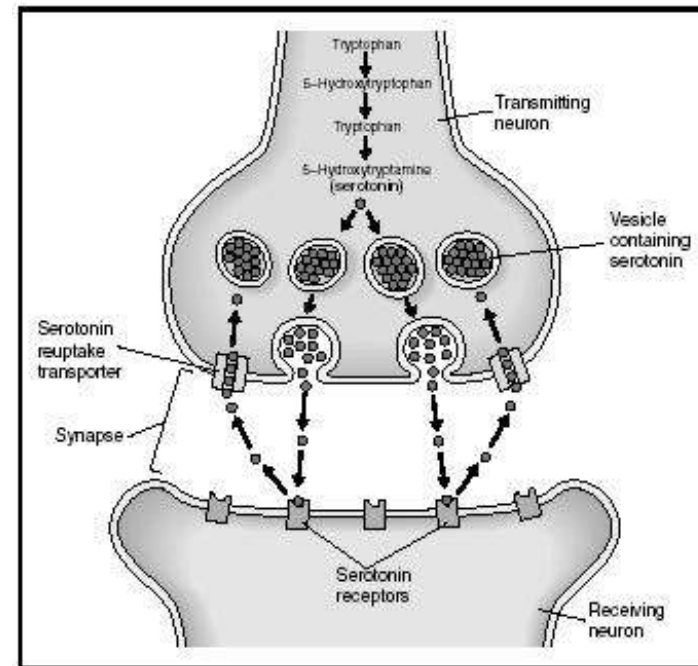
How Neurons Communicate?

- Synapse gap: the gap between the sending axon to the receiving dendrite
- When the action potential reaches the end of the axon it triggers the release of chemical messages, called neurotransmitters
- The neurotransmitters travel across the synapse to another neuron



How Neurons Communicate?

- The neurotransmitters influence whether a neuron will generate a neural impulse
- In the process, a reuptake period occurs, the sending neuron reabsorbs the excess neurotransmitters
- *Send messages to be happy or sad, to move or stay, can function differently (tip of iceberg)



How Neurotransmitters Influence Us

- The functions of the neurotransmitter depends on which part of the brain it acts upon
- Our body release several types of NT similar to morphine in response to pain or exercise
- Releases endorphins “runners high”
- Table 3A.1: Neurotransmitters and their functions

How Drugs and Chemicals Alter Neurotransmission

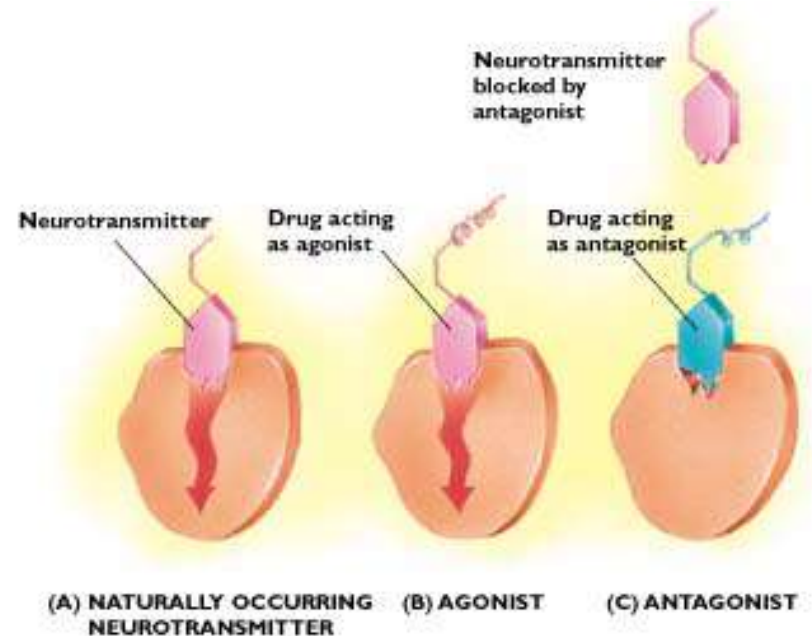
- Drugs and other chemicals affect brain chemistry at synapses often by amplifying or blocking a NT activity
- Some opiate drugs produces a temporary high amplifying normal sensations (heroin)
- When the drug is withdraw the brain may be deprived of any opiate causing intense discomfort

How Drugs and Chemicals Alter Neurotransmission

- In healthy people, chemicals are balanced to produce normal experiences. Taking illegal or non-prescribed drugs disrupts this balance, causing abnormal levels of energy, emotion, and sensory experience

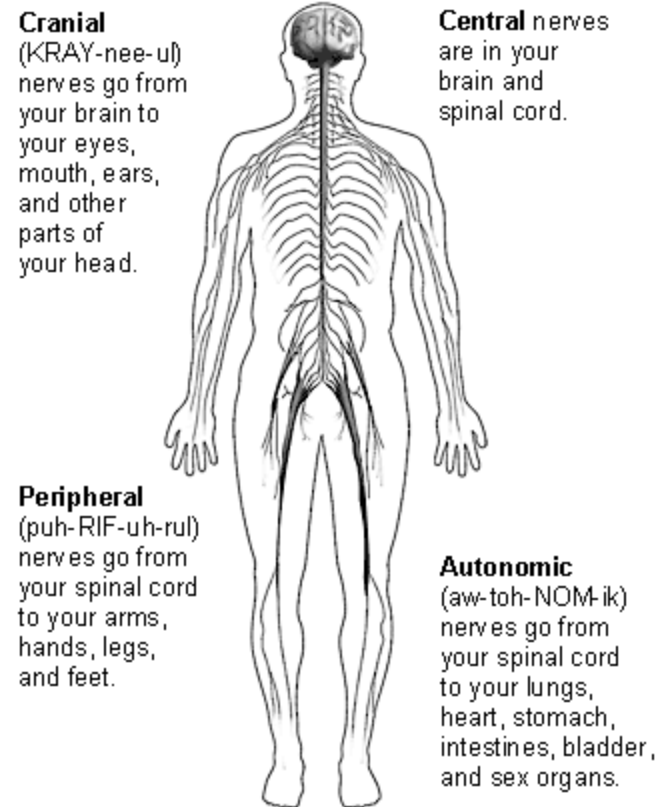
How Drugs and Chemicals Alter Neurotransmission

- An agonist molecule may be similar enough to a neurotransmitter to bind to its receptor and mimic its effects (some opiate drugs-morphine)
- Antagonists also bind to receptors but their effect is to block a NT function (Curare (poison))



The Nervous System

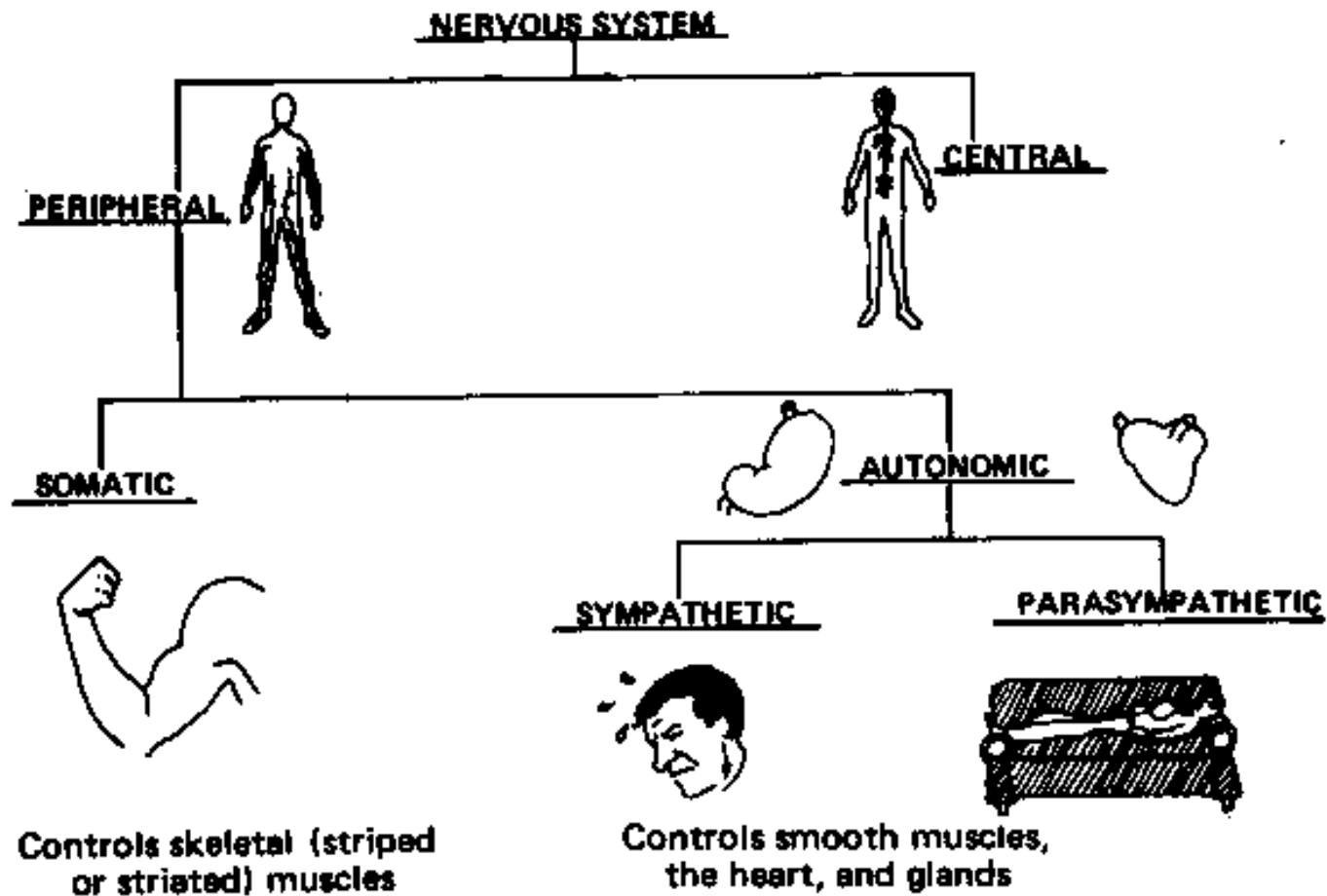
- The nervous system (electrochemical communications network) consists of our central nervous system (the brain and spinal cord) and the peripheral nervous system (the sensory and motor neurons that connect to the rest of the body)
- Nerves: bundled axons that form neural cables connecting the central nervous system with muscles, glands, and sense organs



The Peripheral Nervous System

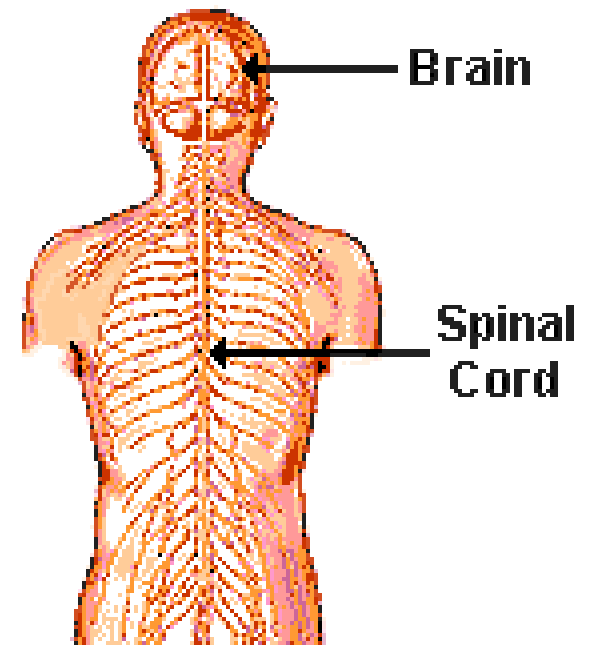
- Somatic & Autonomic
- Somatic: enables voluntary control of our skeletal muscles (bell to leaving class)
- Autonomic: controls our glands and the muscles of our internal organs (heartbeat) (measured in psych tests)
 - Sympathetic nervous system: arouses and expends energy (AP exam: accelerate heartbeat, etc)
 - Parasympathetic nervous system: it conserves energy as it calms you (lowering heartbeat)
 - The balance make an opponent process and thus create homeostatis

Nervous System



The Central Nervous System

- The spinal cord is an information highway connecting the peripheral nervous system to the brain
- The neural pathway governs our reflexes, our automatic responses to stimuli, illustrate the spinal cord's work
- Pain reflex: interneuron's make reflexes happen (candle example)



Spinal Cord

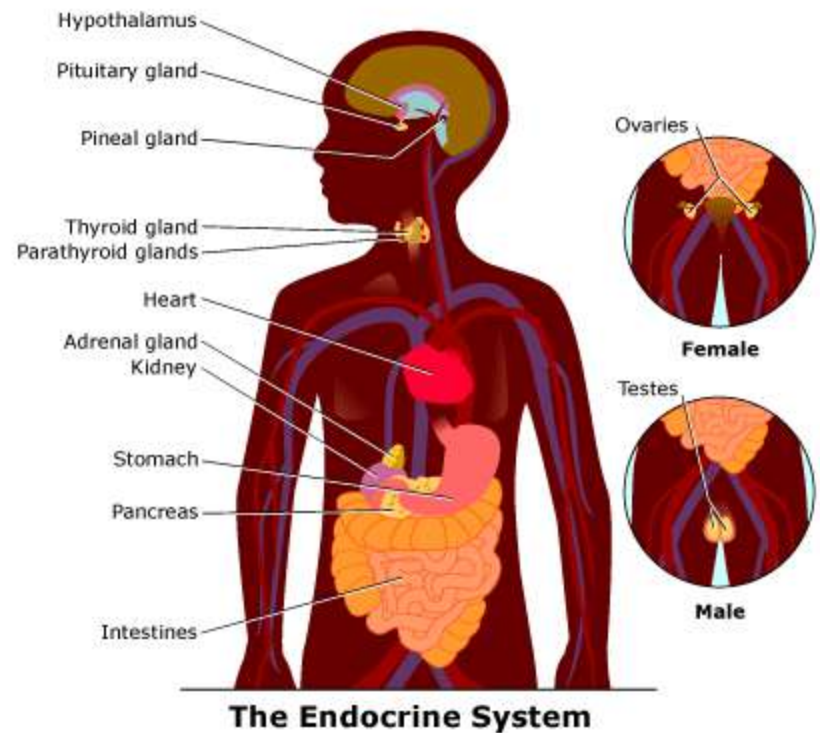
- Information travel to and from the brain by way of the spinal cord
- If your spinal cord was severed you would not feel pain or pleasure from your paralyzed body below
- Reflexes enable us to respond to stimuli to prevent harm. The spinal cord is a brain itself, having the ability to process danger before the brain has to do so.

The Endocrine System

- The system glands secrete hormones that travel through the bloodstream and affect other issues
- When they act on the brain, they influenced our interest in sex, food, and aggression

The Endocrine System

- Some hormones are chemically identical to NT
- Similar to nervous system
- Endocrine messages take longer to travel from the gland to the target tissue through the bloodstream

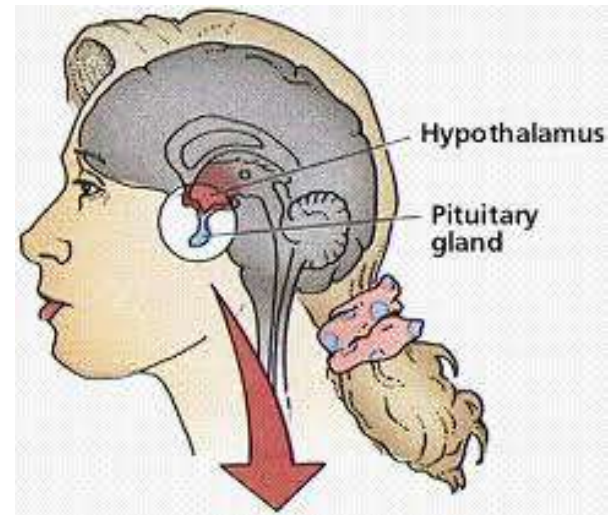


The Endocrine System

- Tend to outlast the effects of neural messages
- Example: feeling upset vs. thinking about it
- In a moment of danger the automatic nervous system orders the adrenal gland to release epinephrine and norepinephrine (fight or flight response)
- Increase heart rate, etc, but our hormones and feelings last a while

The Endocrine System

- Most influential endocrine gland is the pituitary gland
 - It releases hormones that influence growth and also influenced the release of hormones by other endocrine glands
 - A master gland: whose master is the hypothalamus



The Connection between the Endocrine and Nervous system

- The nervous system directs endocrine secretions, which then affect the nervous system
- Conducting and coordinating this orchestra is what we call the brain