

Nervous System
BIO 42
Human Biology

Rosser Panggat, M.D.

Learning Objectives

- ✓ Identify and differentiate the two components of the nervous system
- ✓ Identify and differentiate the two components of the peripheral nervous system
- ✓ Identify and differentiate the two subdivisions of the ANS
- ✓ Identify the common neurotransmitters and action of each

Learning Objectives

- ✓ Describe the anatomy and covering of the brain
- ✓ Identify the four main parts of the brain and function

Nervous System

- The nervous system is the master controlling and communicating system in the body; every thought, action, and emotion begins here. It affects the total welfare of the body.

Nervous System

Central Nervous System (CNS)

Composed of

- ✓ Brain
- ✓ Spinal Cord

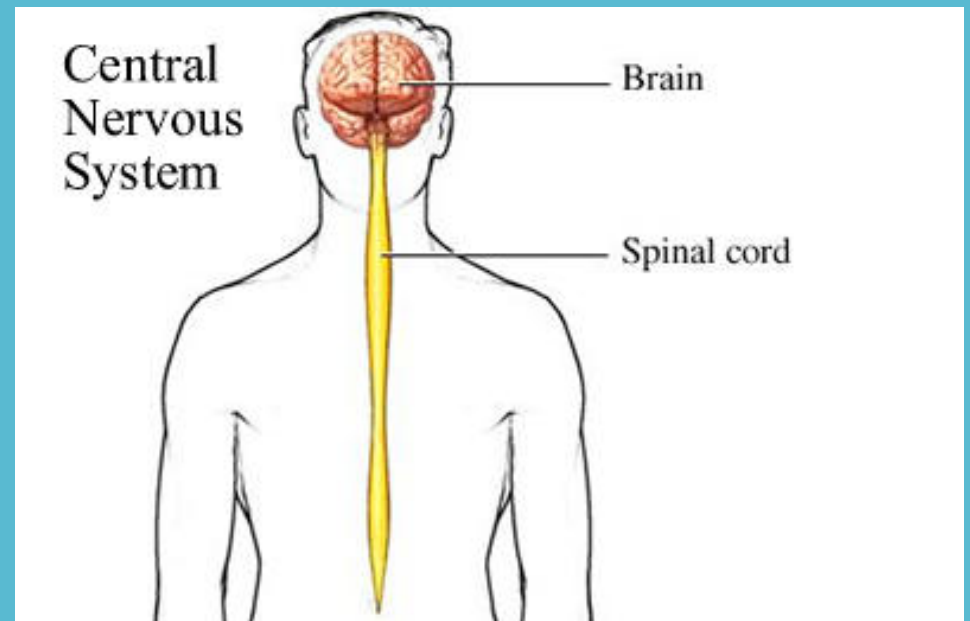
Peripheral Nervous System (PNS)

Composed of

- ✓ 12 Cranial Nerves
- ✓ 31 Spinal Nerves

Central Nervous System (CNS)

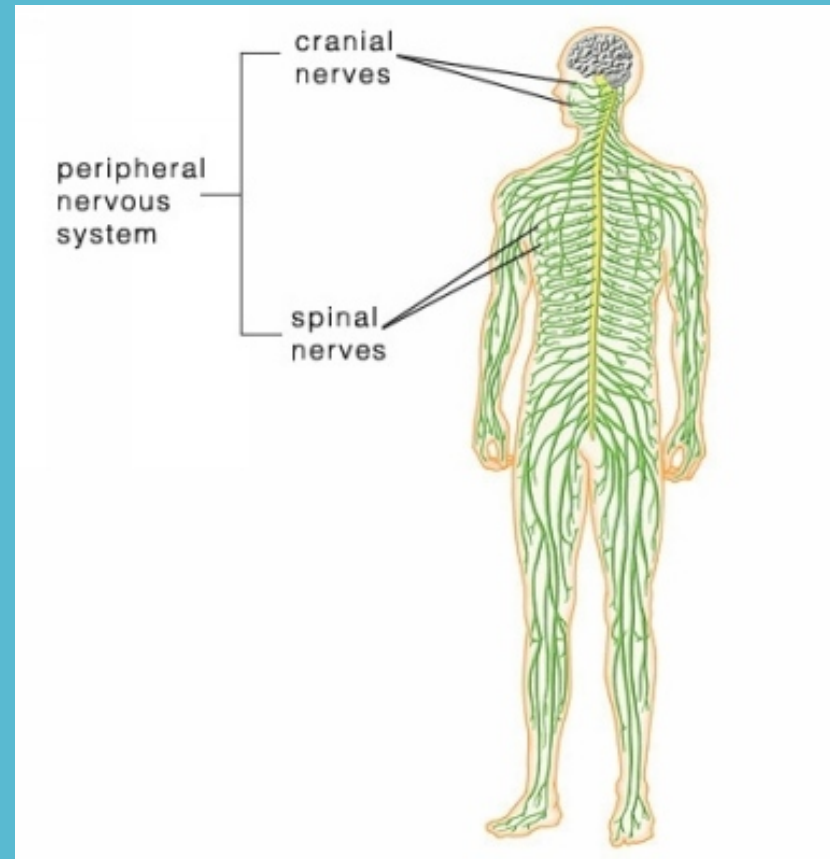
- ✓ Both encased in the axial skeleton and covered by meninges
- ✓ Main integrating center of the body



Nervous System

Peripheral Nervous System (PNS)

- ✓ Extends the CNS beyond the brain and spinal cord
- ✓ Consists of afferent (Away from the impulse, towards the CNS) and efferent (away from the CNS towards the impulse) neurons



Autonomic Nervous System (ANS)

- Part of the PNS
- Control system that governs your body's responses to subtle changes in homeostasis with involuntary, unconscious reactions
- Two subdivisions
 1. Sympathetic Nervous System
 2. Parasympathetic Nervous System

Sympathetic Nervous System

- ✓ Includes the nerves that control the body when it is actively moving and burning energy
- ✓ Also called the “fight or flight”
- ✓ Move quickly and expend energy

Parasympathetic Nervous System

- ✓ Responsible for digestion, energy storage, and relaxation
- ✓ Conserve and rest

Are you sympathetic or parasympathetic?

Sympathetic	Parasympathetic
High blood pressure (systolic and diastolic); may be low, if very chronic	Low systolic blood pressure
Fast heart rate (pulse)	Slow heart rate (pulse)
Dilated pupils	Constricted pupils
Tend toward dry mouth (may have difficulty swallowing)	Tend to have increased saliva
Cold, clammy hands and feet	Warm, dry skin (warm hands and feet)
Excess muscle tension	Relaxed muscles
Quick reflexes	Normal or slow reflexes
Anxiousness	Relaxed (tends not to worry)
Excessive sweating	Calm, even disposition
Lots of energy but poor stamina	Low to normal energy with a lot of stamina
Tendency to constipation	Very regular bowel habits
Food tends to "sit in the stomach"; can become queasy or nauseous easily	Can digest anything ("cast iron stomach")
Mind often races; always has to be doing something	May tend to be lazy or depressed
Women: Difficult to become sexually aroused	Women: Strong sex drive; become sexually aroused easily
Men: Difficult to get erection or weak erections	Men: Easily achieve strong erections; strong sex drive

Sympathetic vs. Parasympathetic?

Scenario



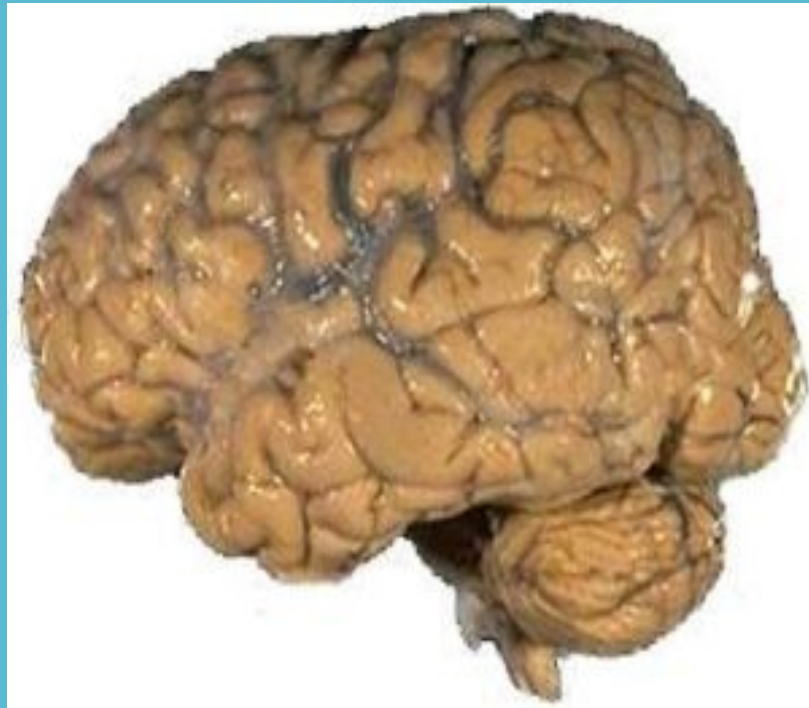
Common Neurotransmitters and effects

- Norepinephrine – attention, consciousness, control of body temperature (Sympathetic)
- Epinephrine – uncertain, but thought to be similar to Norepinephrine (Sympathetic)
- Acetylcholine – contracts muscles, causes glandular secretions (Parasympathetic)
- Serotonin – maintains emotional states, moods, and body temperature

Common Neurotransmitters and effects

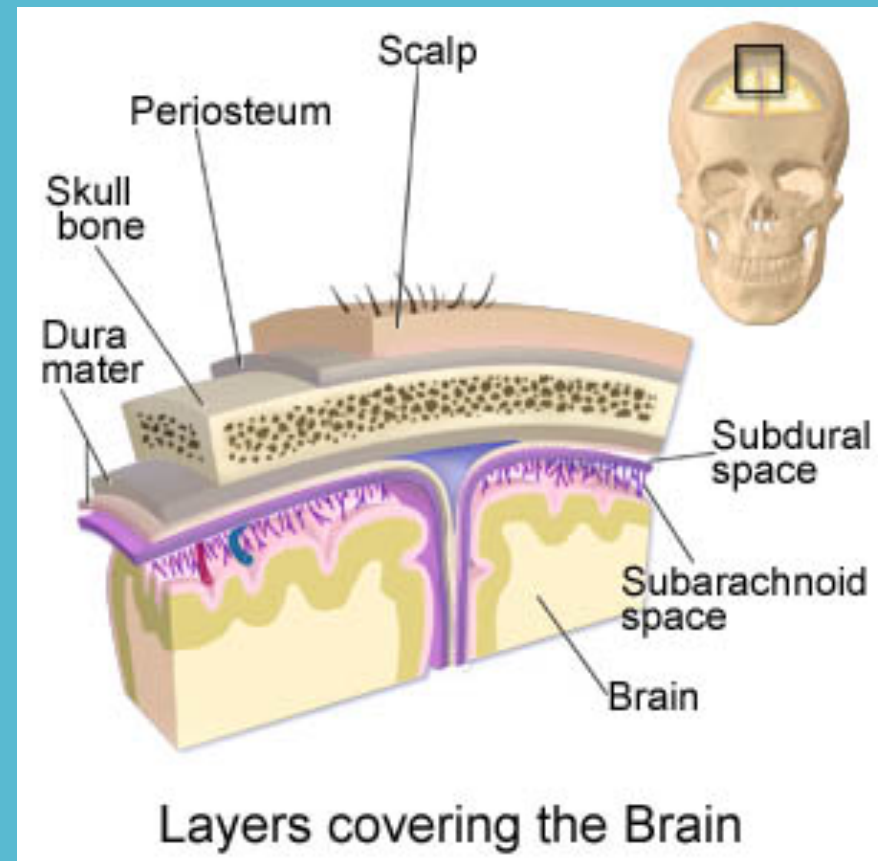
- Endorphins and enkephalins – pain control and behavioral effects

Brain



Protective coverings of the brain / Meninges

- ✓ Dura Mater
 - Thick and tough (outermost)
- ✓ Arachnoid Membrane
 - Allow fluid to flow between layers
- ✓ Pia Mater
 - Connective tissues and blood vessels (innermost)

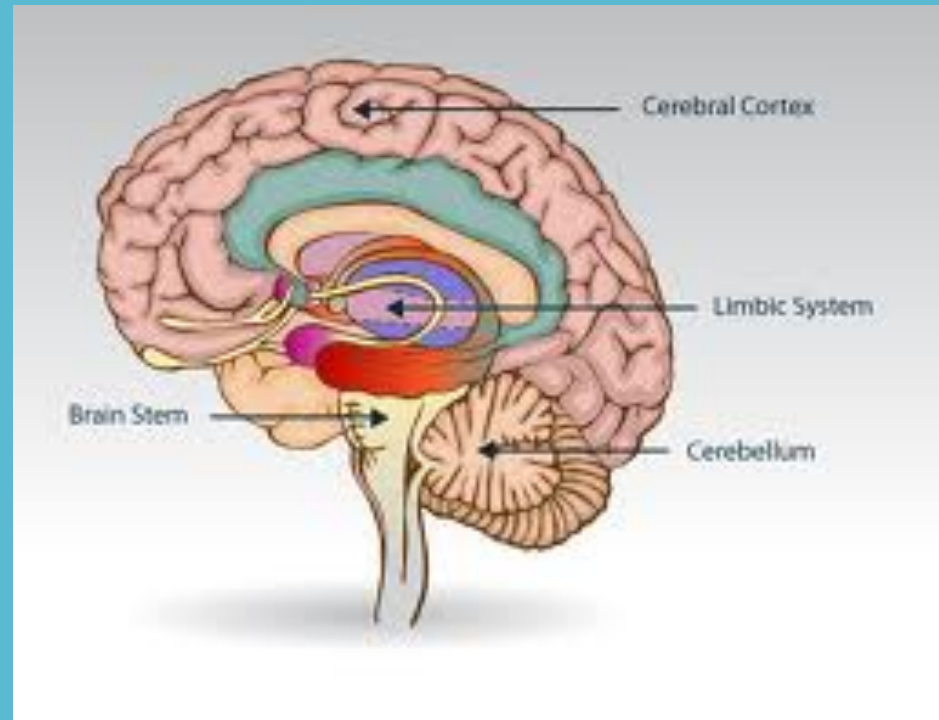


Cerebrospinal Fluid (CSF)

- Together with the meninges protect the CNS from the axial skeleton
- Provide a soft lining and cushion that nourishes and protects the neural structures

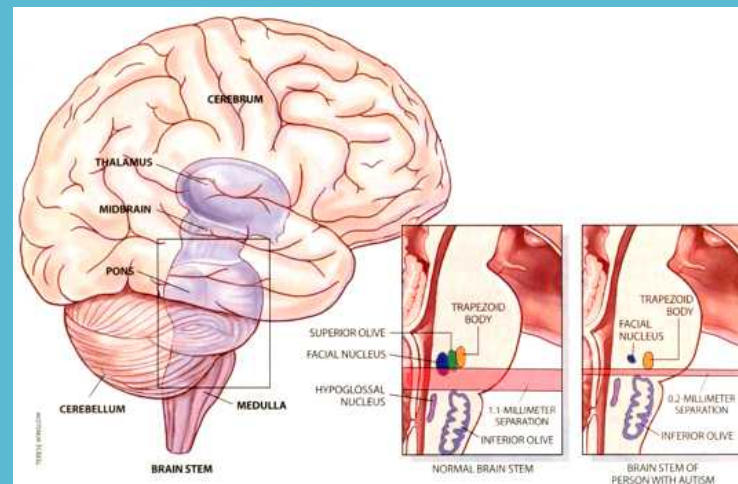
Four Main Parts of the Brain

- I. Brain Stem
- II. Diencephalon
- III. Cerebellum
- IV. Cerebrum



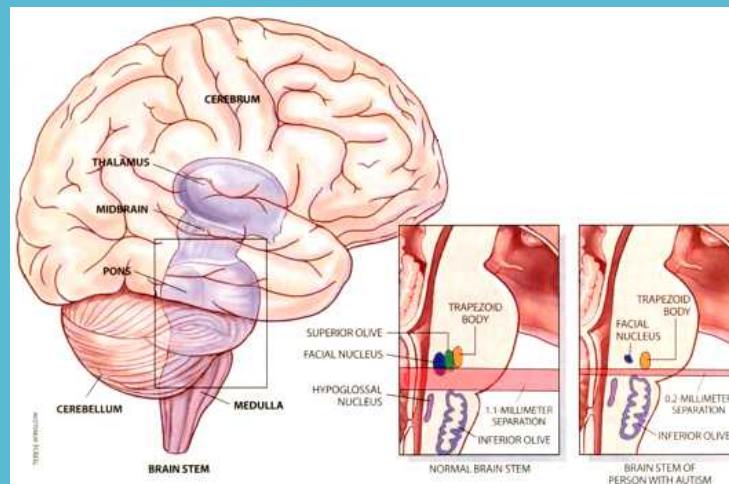
Brainstem

- Ancient root of life
- Contains vital centers that regulate heart rate, breathing and blood pressure
- Consist of :
 1. Midbrain
 2. Medulla oblongata
 3. Pons (respiration center)



Diencephalon

- Relay center
- Central portion of the brain
- Center for visual and auditory startle reflexes



Cerebellum

- Maintaining muscle tone and balance
- Fine tuning conscious and unconscious movements directed by the cerebrum
- Responsible for coordination

Cerebrum

- Central processing center
- Information processed, integrated and appropriate responses are generated

12 Cranial Nerves

- I. Olfactory
- II. Optic
- III. Oculomotor
- IV. Trochlear
- V. Trigeminal
- VI. Abducens
- VII. Facial
- VIII. Auditory/Vestibulocochlear
- IX. Glossopharyngeal
- X. Vagus
- XI. Accessory
- XII. Hypoglossal

Cranial Nerves and function

- Olfactory – smell
- Optic – vision
- Oculomotor – movement of the eye and proprioception
- Trochlear – movement of the eye
- Trigeminal – touch, pain, temperature and proprioception; chewing
- Abducens – movement of the eye and proprioception
- Facial – Facial expression, secretion of tear and saliva;taste
- Auditory/Vestibulocochlear – Equilibrium and hearing
- Glossopharyngeal – Taste, touch, pain on tongue; O₂,CO₂ and blood pressure levels;swallowing/speech

Cranial Nerves and function

- Vagus – Gastrointestinal movement and coughing
- Accessory – Head and shoulder movement
- Hypoglossal – tongue movement

References

- Ireland, K.A. (2011). *Visualizing Human Biology (3rd ed.)*. Danvers, MA: Wiley & Sons Inc