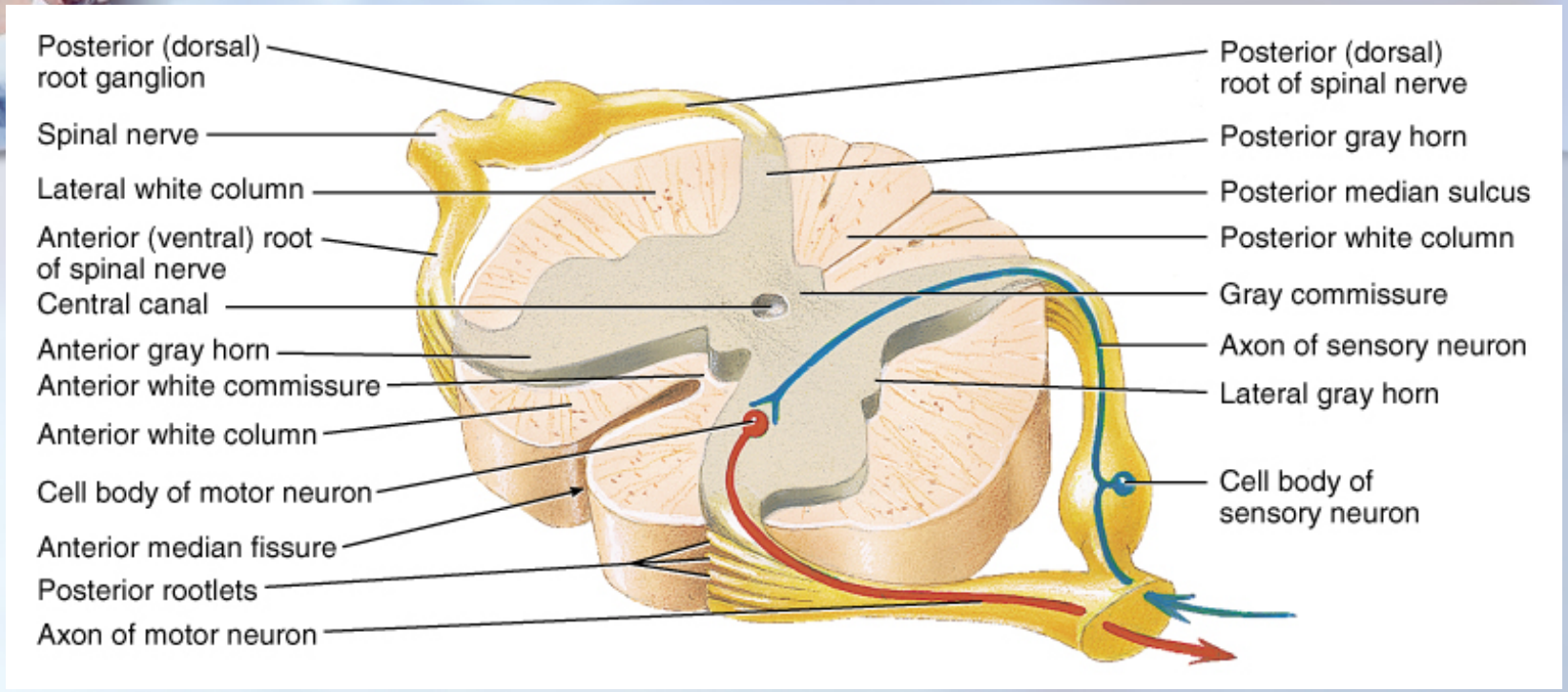
THE NERVOUS SYSTEM

HEADING

VOCABULARY

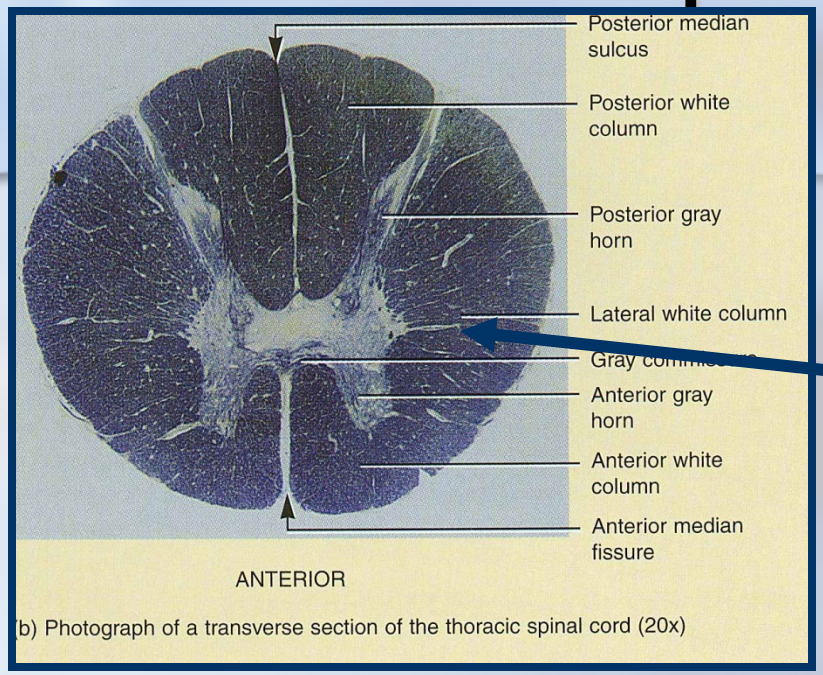
IMPORTANT INFO

Spinal Cord & Spinal Nerves



- Spinal nerves begin as roots
- Dorsal or posterior root is incoming sensory fibers
  - Dorsal Root Ganglion (swelling) = cell bodies of sensory nerves
- Ventral or anterior root is outgoing motor fibers

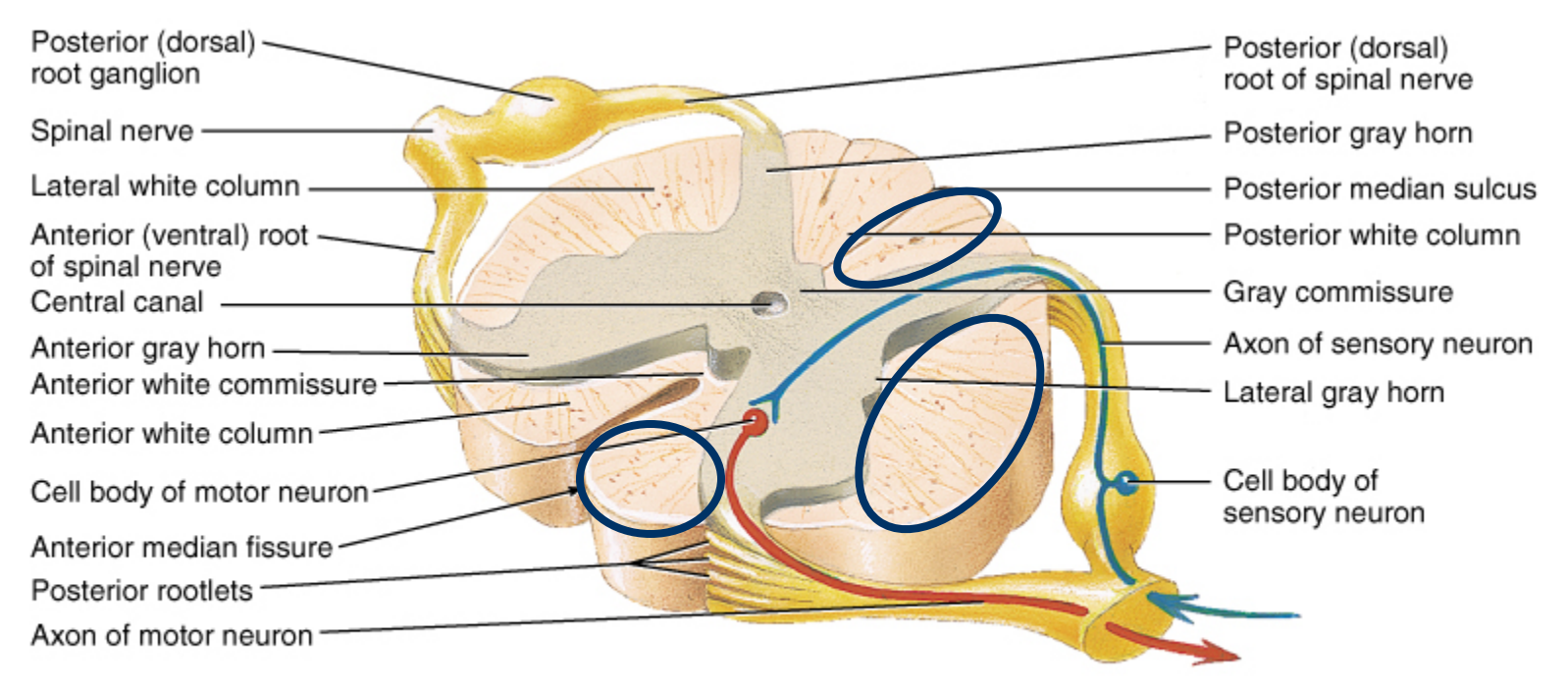
Gray Matter of the Spinal Cord



Note: colors in reverse due to staining of tissue

- Gray matter is shaped like the letter H or a butterfly
  - contains neuron cell bodies, unmyelinated axons & dendrites
  - paired dorsal and ventral gray horns
  - lateral horns only present in thoracic spinal cord
  - gray commissure crosses the midline
- Central canal continuous with 4th ventricle of brain

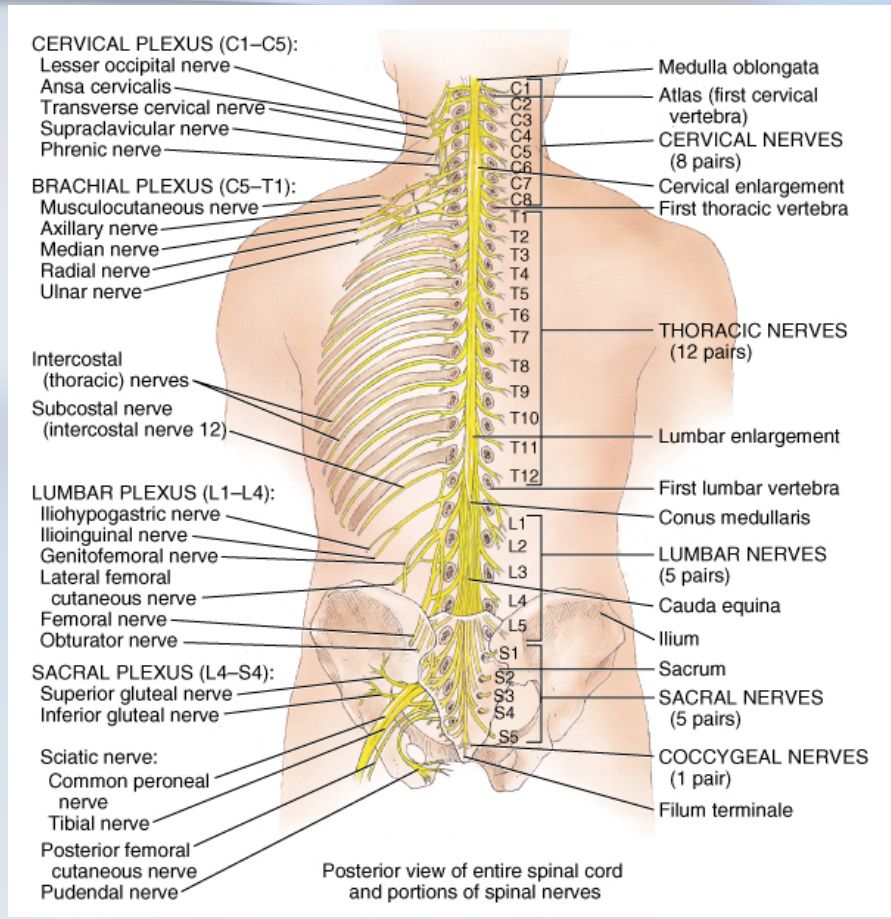
White Matter of the Spinal Cord



- White matter covers gray matter
- Anterior median fissure deeper than Posterior median sulcus
- Anterior, Lateral and Posterior White Columns contain axons that form ascending & descending tracts

Spinal Nerves

- 31 Pairs of spinal nerves
- Named & numbered by the cord level of their origin
  - 8 pairs of cervical nerves (C1 to C8)
  - 12 pairs of thoracic nerves (T1 to T12)
  - 5 pairs of lumbar nerves (L1 to L5)
  - 5 pairs of sacral nerves (S1 to S5)
  - 1 pair of coccygeal nerves
- Mixed sensory & motor nerves



Posterior view of entire spinal cord and portions of spinal nerves

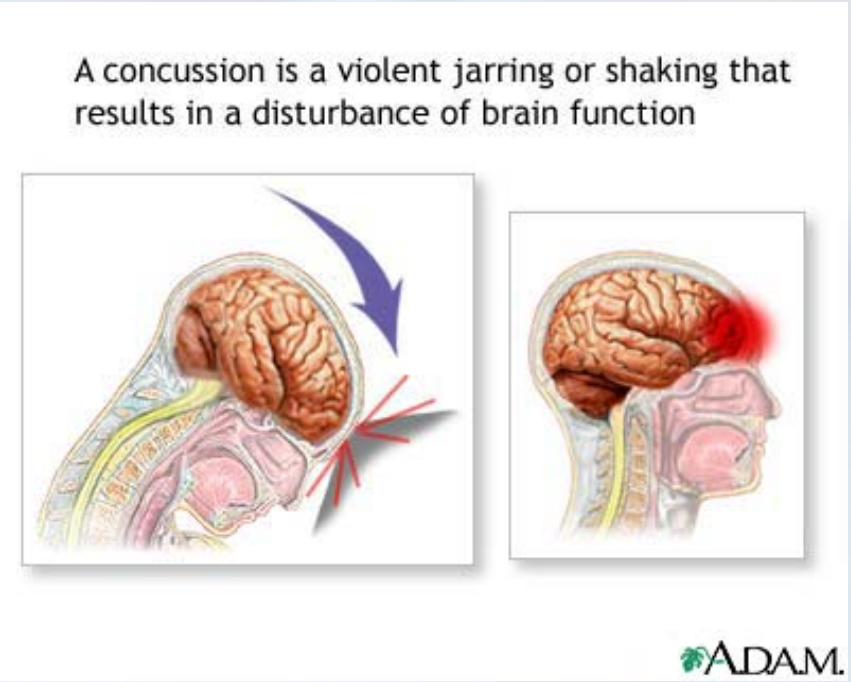
Disorders

- **Neuritis**
  - inflammation of nerves
  - caused by injury, vitamin deficiency or poison
- **Shingles**
  - infection of peripheral nerve by chicken pox virus
  - causes pain, skin discoloration, line of skin blisters
- **Poliomyelitis**
  - viral infection causing motor neuron death and possible death from cardiac failure or respiratory arrest

Shingles

A.D.A.M.

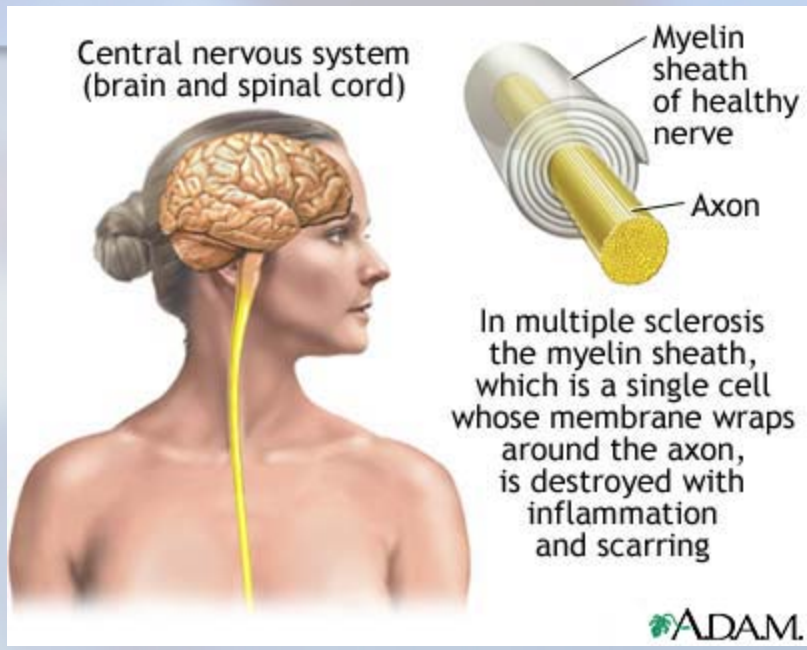
Brain Injuries

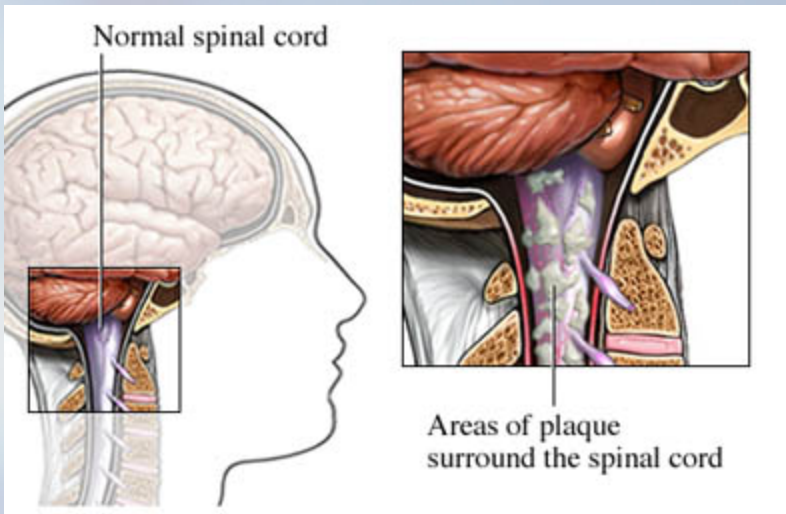


- **Causes of damage**
  - **displacement or distortion of tissue at impact**
  - **increased intracranial pressure**
  - **infections**
  - **free radical damage after ischemia**
- **Concussion---temporary loss of consciousness**
  - **headache, drowsiness, confusion, lack of concentration**
- **Contusion--bruising of brain (less than 5 min unconsciousness but blood in CSF)**
- **Laceration--tearing of brain (fracture or bullet)**
  - **increased intracranial pressure from hematoma**

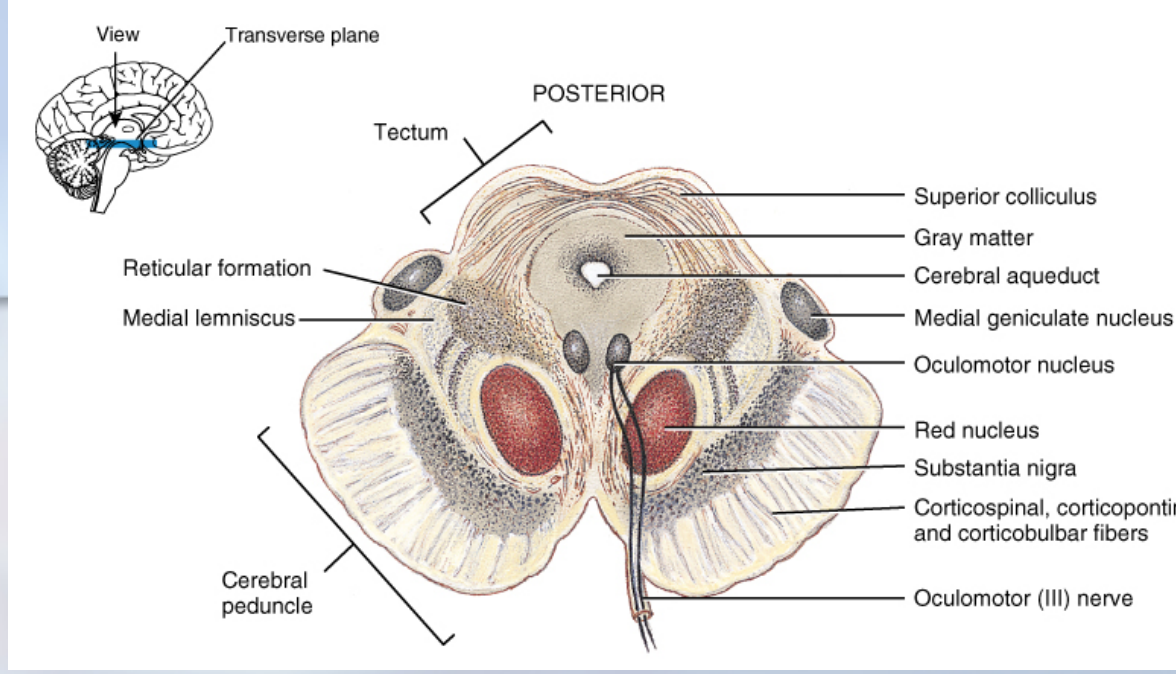
Multiple Sclerosis (MS)

- **Autoimmune disorder causing destruction of myelin sheaths in CNS**
  - **sheaths becomes scars or plaques**
  - **1/2 million people in the United States**
  - **appears between ages 20 and 40**
  - **females twice as often as males**
- **Symptoms include muscular weakness, abnormal sensations or double vision**
- **Remissions & relapses result in progressive, cumulative loss of function**



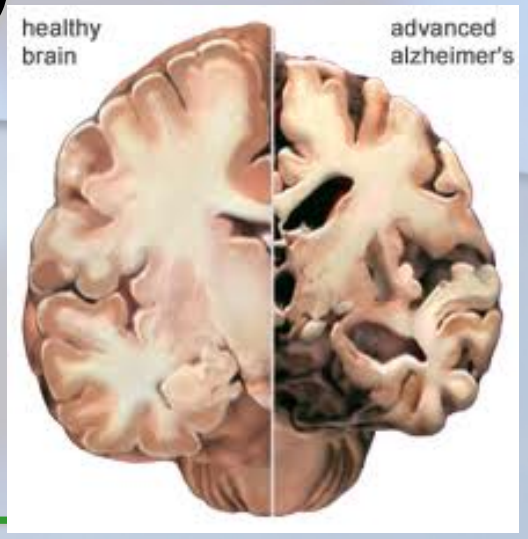


Parkinson Disease



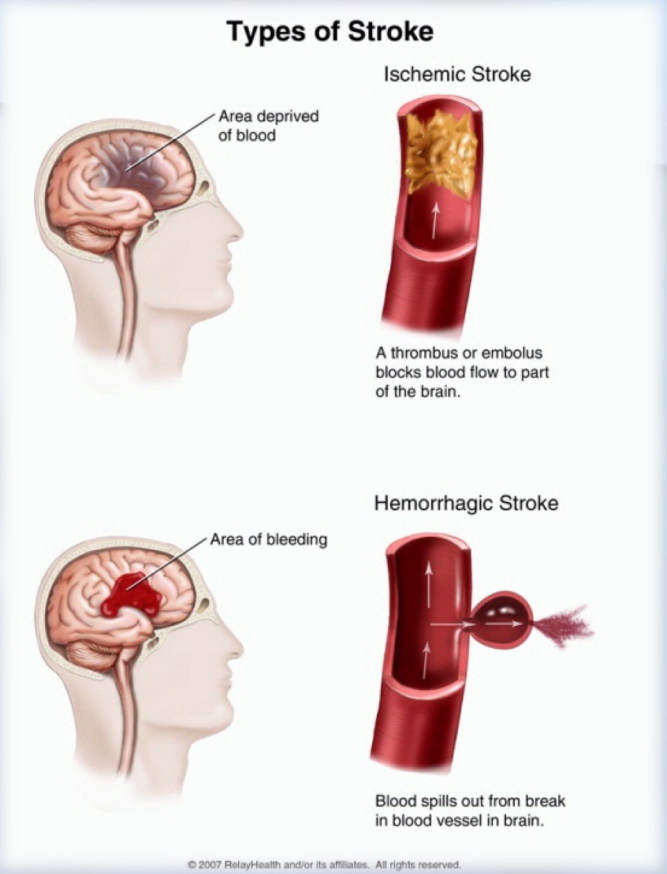
- **Progressive disorder striking victims at age 60**
- **Environmental toxins may be the cause**
- **Neurons from the substantia nigra do not release enough dopamine onto basal ganglia**
  - **tremor, rigidity, bradykinesia (slow movement) or hypokinesia (decreasing range of movement)**
  - **may affect walking, speech, even facial expression**
- **Treatments**
  - **drugs to increase dopamine levels, or to prevent its breakdown, surgery to transplant fetal tissue or removal of part of globus pallidus to slow tremors**

Alzheimer Disease (AD)



- Dementia = loss of reasoning, ability to read, write, talk, eat & walk
- Afflicts 11% of population over 65
- Loss of neurons that release acetylcholine
- Plaques of abnormal proteins outside neurons
- Tangled protein filaments within neurons
- Risk factors -- head injury, heredity
- Beneficial effects of estrogen, vitamin E, ibuprofen & ginko biloba

Cerebrovascular Accident (CVA)



- Third leading cause of death after heart attacks & cancer
- 2 types of Strokes
  - Ischemic due to decreased blood flow
  - Hemorrhagic due to rupture of blood vessel
- Risk factors
  - high blood pressure, high cholesterol, heart disease, diabetes, smoking, obesity, alcohol
- Tissue Plasminogen Activator (t-PA) used within 3 hours of onset will decrease permanent disability

Aphasia

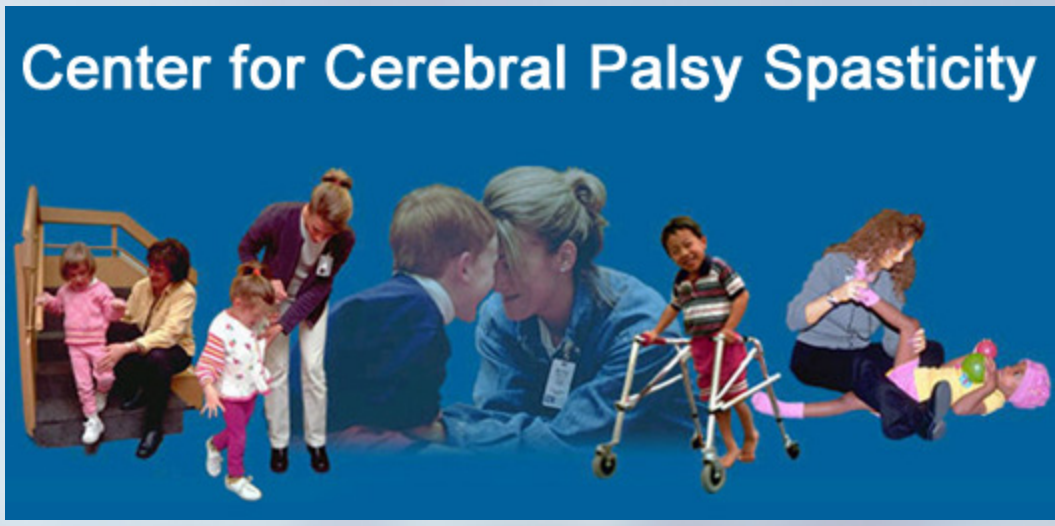
- Language areas are located in the left cerebral hemisphere of most people
- Inability to use or comprehend words = aphasia
  - Nonfluent Aphasia = inability to properly form words
    - know what want to say but can not speak
    - damage to Broca's speech area
  - Fluent Aphasia = faulty understanding of spoken or written words
    - Word Deafness = an inability to understand spoken words
    - Word Blindness = an inability to understand written words
      - damage to common integrative area or auditory association area
  - http://youtu.be/QEWmgmT8rUA

Epilepsy

- 2ND most common neurological disorder
  - affects 1% of population
- Characterized by short, recurrent attacks initiated by electrical discharges in the brain
  - lights, noise, or smells may be sensed
  - skeletal muscles may contract involuntarily
  - loss of consciousness
- Epilepsy has many causes, including;
  - brain damage at birth, metabolic disturbances, infections, toxins, vascular disturbances, head injuries, and tumors

Cerebral Palsy

- Loss of motor control and coordination
- Damage to motor areas of the brain
  - infection of pregnant woman with rubella virus
  - radiation during fetal life
  - temporary lack of O2 during birth
- Not a progressive disease, but irreversible

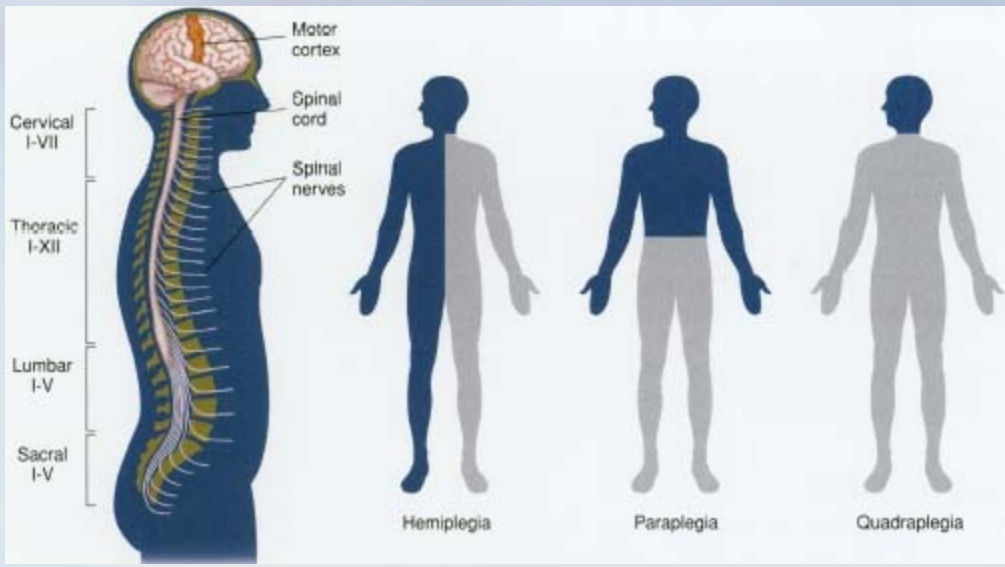


Tertiary Syphilis

- Sexually transmitted disease caused by bacterium *Treponema pallidum*.
- Third clinical stage known as tertiary syphilis
- Progressive degeneration of posterior portions of spinal cord & neurological loss
  - loss of somatic sensations
  - proprioceptive impulses fail to reach cerebellum
- People watch their feet while walking, but still uncoordinated and jerky

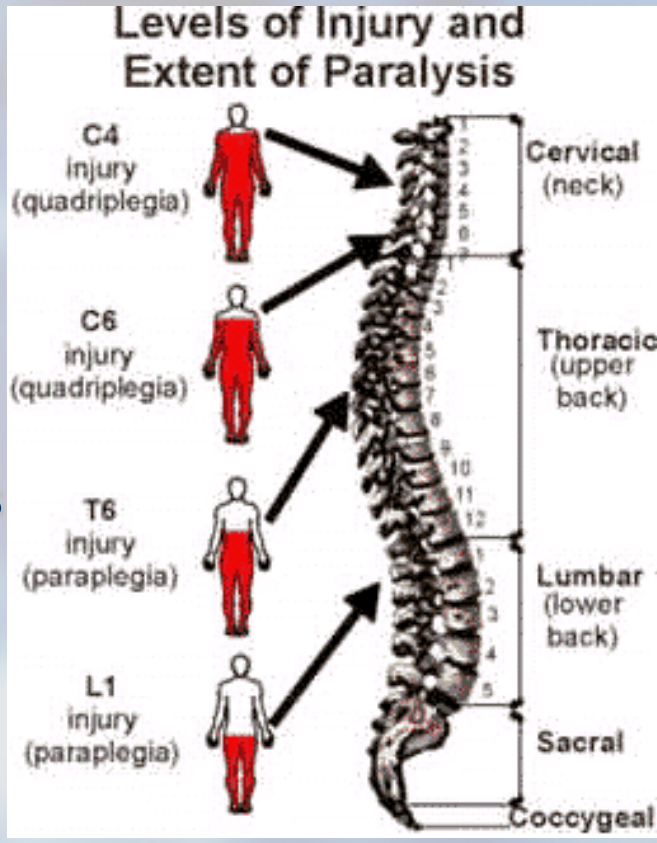
Paralysis

- **Flaccid Paralysis = damage lower motor neurons**
  - no voluntary movement on same side as damage
  - no reflex actions
  - muscle limp & flaccid
  - decreased muscle tone
- **Spastic Paralysis = damage upper motor neurons**
  - paralysis on opposite side from injury
  - increased muscle tone
  - exaggerated reflexes

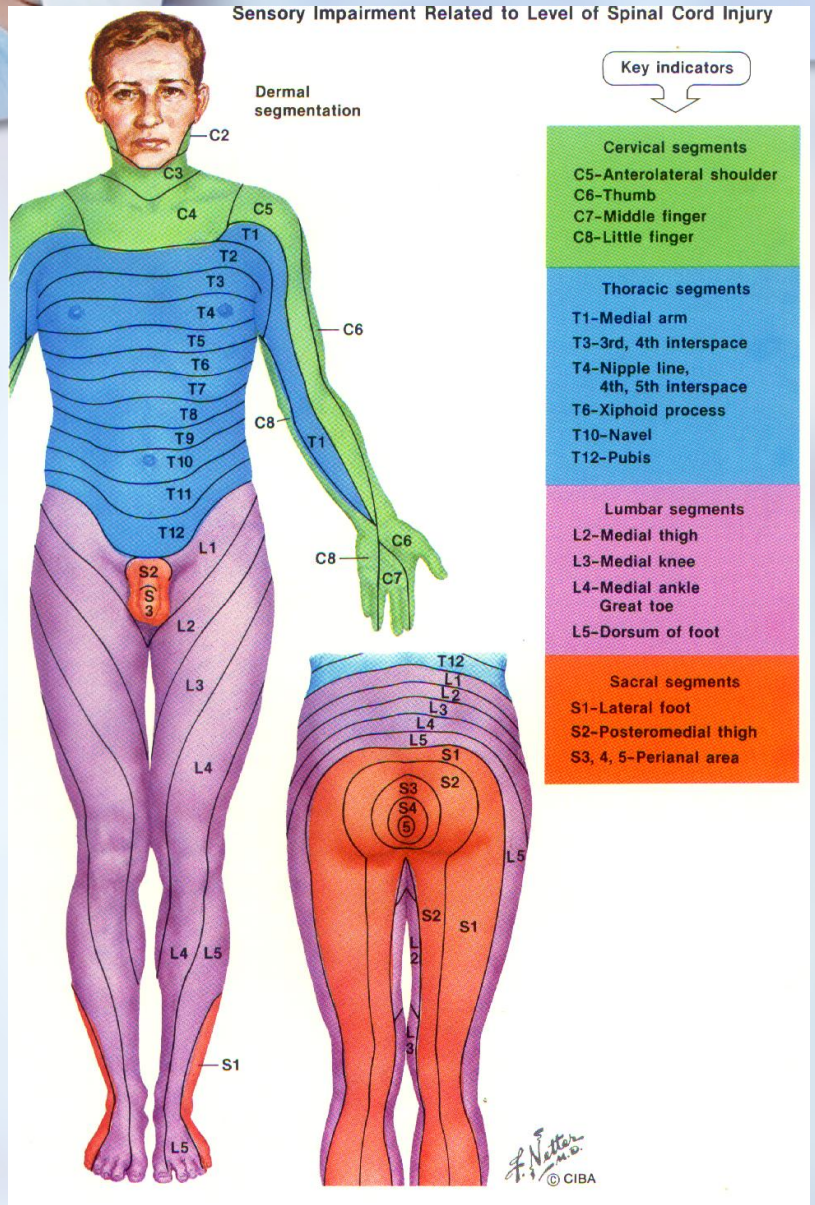


Spinal Cord Injury

- Damaged by tumor, herniated disc, clot or trauma
- Complete Transection is cord severed resulting loss of both sensation & movement below the injury
- Paralysis
  - Monoplegia is paralysis of one limb only
  - Diplegia is paralysis of both upper or both lower
  - Hemiplegia is paralysis of one side
  - Quadriplegia is paralysis of all four limbs
- Spinal Shock is loss of reflex function(Areflexia)
  - slow heart rate, low blood pressure, bladder problem
  - reflexes gradually return

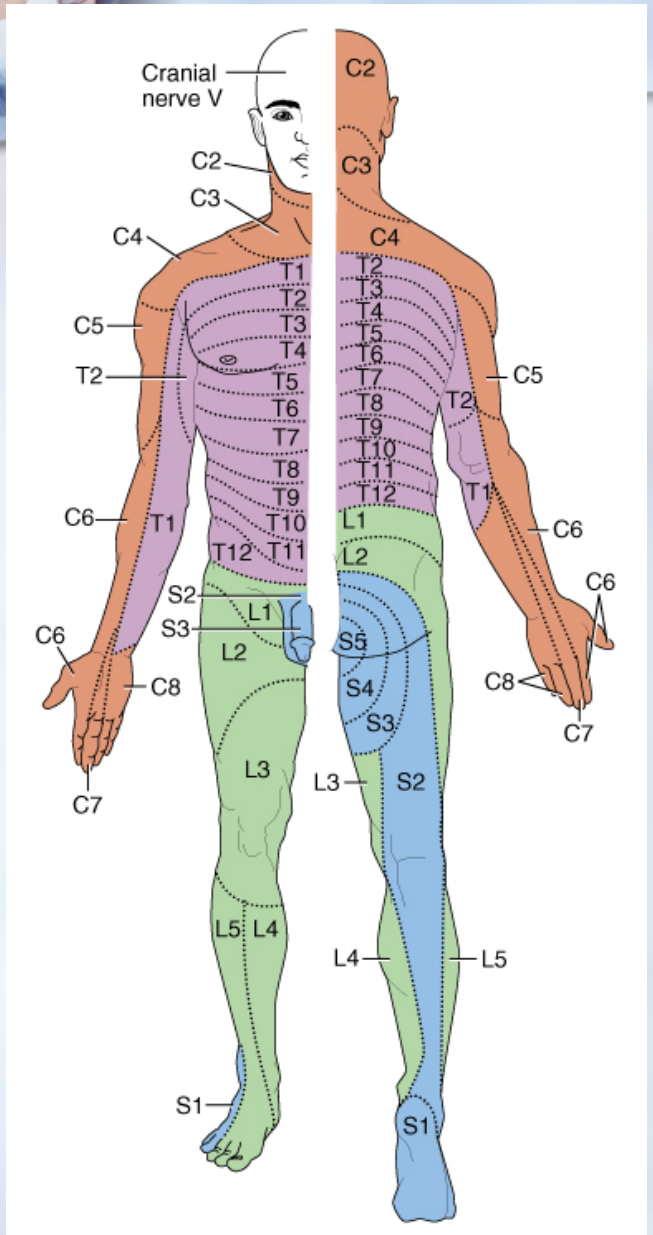


Dermatomes & Myotomes



- Each spinal nerve contains both sensory & motor nerve fibers
- Dermatome
  - area of skin supplied by one spinal nerve
  - overlap prevents loss of sensation if one damaged
  - sensory anesthesia requires 3 spinal nerves to be blocked
- Skin on face supplied by Cranial Nerve V

Dermatomes



- Damaged regions of the spinal cord can be distinguished by patterns of numbness over a dermatome region
- Infusing local anesthetics or cutting roots must be done over 3 adjacent spinal nerves.
- Spinal cord transection
  - injury that severs the cord
  - loss of sensation & motor control below the injury