

# Chapter 14 The Brain and Cranial Nerves 12/03/2014

## □ 14.1 Overview of the Brain

- Major Landmarks
  - Directional Terms
    - Rostral: towards the nose or toward the forehead
    - Caudal: Toward the tail or toward the spinal cord
  - Three Major Portions
    - Cerebrum: 83% of the brain's volume and consists of a pair of half globes called cerebral hemispheres
      - Each hemisphere is marked with gyri and sulci
        - **Longitudinal Fissure**: separate left and right hemispheres
      - **Corpus Callosum**: thick bundle of nerve fibers
    - **Cerebellum**: occupies the posterior cranial fossa inferior to the cerebrum
      - **Transverse cerebral fissure**: separates cerebellum from cerebrum
      - 10% of the volume but 50% of the nerves
    - **Brainstem**: all of the brain except for the cerebrum and cerebellum
      - Includes:
        - Diencephalon, midbrain, pons, and medulla oblongata
      - Brainstem ends at foramen magnum
- Gray and White Matter
  - **Gray Matter**: forms **cortex** (surface layer) over cerebrum and cerebellum
  - **White Matter**: surrounds deeper matter called **nuclei**

- Lies deep into gray matter
  - Composed of **tracts** (bundles of axons)
- Embryonic Development
  - Nervous system develops from ectoderm
    - First three weeks: **neural plate** forms and sinks to form **neural groove** with **neural folds** at each end
    - 26 days: **neural tube** forms
      - Fusion of neural folds
    - Neural tubes then forms **neural crest**
      - Gives rise to two inner meninges; most of PNS, and some structures in different systems
    - 4 week: forebrain, midbrain, and hindbrain are exhibited
    - 5 week:
      - forebrain divides into **telencephalon** (becomes cerebral hemispheres) and **diencephalon** (optic vesicles)
      - midbrain undivided: new name **mesencephalon**
      - hindbrain divides into **metencephalon** (becomes pons and cerebellum) and **myelencephalon** (becomes medulla oblongata)
- ◻ 14.2: Meninges, Ventricles, Cerebrospinal Fluid, and Blood Supply
  - Ventricles and Cerebrospinal Fluid:
    - Four Ventricles: internal chambers
      - **Two lateral ventricles**: form arc in each cerebral hemisphere
      - **Third Ventricle**: narrow median space inferior to corpus callosum
        - Connected to lateral ventricles by **interventricular foramen**
      - **Fourth Ventricle**: small triangular chamber between pons and cerebellum

- Connected to third ventricle by **cerebral aqueduct**
    - Forms **central canal** through medulla oblongata
  - **Choroid Plexus:** spongy mass of blood capillaries on walls of each ventricle
  - **Ependyma:** lines ventricles and canals and covers choroid plexus and produces cerebral spinal fluid
  - **Cerebral Spinal Fluid:** Liquid that fills ventricles and canals of the CNS and bathes external surfaces
    - 40% formed in subarachnoid space external to the brain; 30% by general ependymal lining; 30% by choroid plexus
    - production begins with filtering blood plasma
    - more sodium and chloride, but less potassium, calcium, and glucose than plasma
    - Flows because own pulse; beating of ependymal cilia; or rhythm from heart beat
    - CSF escapes through 3 pores
      - Median aperture and 2 lateral apertures
    - Reabsorbed by **arachnoid granulations** (protrude through dura mater into sagittal sinus)
    - Three Purposes
      - **Buoyancy:** same density as brain so there's no floating or sinking
        - 1,500 g without CSF; 50 g with CSF
      - **Protection:** protects from brain striking the skull when jolted
        - Concussions and shaking baby syndrome
      - **Chemical Stability:** rinses metabolic wastes from the nervous tissue and regulates chemical environment
- Blood Supply and Blood Barrier
  - Brain receives 15% of the blood; consumes 20% of oxygen and glucose
    - Because of high demand for ATP