Notes for Friday October 4, 2002

Outline
Blood-Brain-Barrier
Cerebrospinal fluid
Brain stem
Cerebellum
Diencephalon
Cerebrum

**Please refer to Table 14.1 for a summary of functions of principal parts of the brain**

Blood-Brain-Barrier
- Tight junctions between endothelial lining capillaries
- Astrocytes (neuroglia) => control permeability
- physical & chemical barrier between blood & neuronal tissue => protects brain from harmful substances in blood

Exceptions
- Portions of hypothalamus & pineal gland
- Capillaries that supply choroid plexuses

Cerebrospinal Fluid (Fig. 14.3 & 14.4)
- Produced in the choroid plexuses of the four ventricles
- Formed by filtration of blood plasma across capillaries & ependymal cells (neuroglia) => blood-CSF barrier
- Composition different from plasma
- Circulates thru’ ventricles, subarachnoid space & central canal (in spinal cord)
- Drains out thru’ arachnoid villi into sagittal dural sinus => venous circulation (Fig. 14.4)
- CSF is produced at the same rate it is reabsorbed to maintain constant pressure.
- Abnormalities in CSF flow (tumor, inflammation) can cause increase in pressure => HYDROCEPHALUS

Functions of CSF
- Mechanical protection – provides buoyancy
• Chemical protection
• Supply of nutrients and removal of wastes
• Slightly different composition compared to plasma

**Brain Stem**

**Medulla oblongata**

• Continuation of spinal cord into brain
• 5 pairs of cranial nerves (VIII-XII) extend (remember VAGUS & VESTIBULOCOCHLEAR)
• Decussation of Pyramids
• Autonomic reflexes integrated in cardiovascular center & medullary rhythmicity area
• Autonomic reflexes: vomiting, sneezing & coughing

**Pons (bridge)**

• 4 cranial nerves (V-VIII) extend
• Helps medulla in the control of breathing

**Midbrain**

• Extends from the pons to the diencephalon
• Reflex centers for visual and auditory stimuli

**Cerebellum**

• Controls subconscious movements in skeletal muscle
• Controls coordination, posture and balance
• Damage to cerebellum = Ataxia

**Diencephalon (through brain)**

• Thalamus: main relay station for sensory impulses (e.g. pain, touch, temperature) on the way to the cerebrum from PNS

**Hypothalamus** *(hypo = under)*
• Controls and integrates autonomic nervous system (ANS)
• Intermediary between nervous system & endocrine system by secreting regulating hormones
• Regulation of emotional and behavioral patterns
• Thirst and hunger centers
• Regulation of body temperature
• Key role in maintaining homeostasis

**Epithalamus**
• Pineal gland: - secretes hormone melatonin – helps maintain body’s biological clock

**Cerebrum (higher brain)**
• Largest region of the brain
• Processes most of the sensory and motor information
• Centers for learning and intelligence, conscious thoughts and intellectual functions
• Left & right hemispheres
• Cerebral cortex = outer layer of gray matter
• Many folds (gyri) increases surface area
• Cerebral white matter = 60% of cerebrum
• Corpus callosum connects two hemispheres
• Each hemisphere has four lobes:
  - **frontal lobe**: voluntary control of skeletal muscle
  - **parietal lobe**: conscious perception of touch, pressure, vibration, pain, temperature and taste
  - **occipital lobe**: conscious perception of visual stimuli
  - **temporal lobe**: conscious perception of auditory and olfactory stimuli
• All lobes integrate and process sensory information and process and initiate motor responses

**Split brain concept**
• Left hemisphere controls right side of body & vise versa
• LH associated with numerical, computational skills
• RH associated with music, arts, creativity and imagination

**Brain waves**

• Generated by millions of nerve impulses
• Electroencephalogram = EEG
• Study normal brain function
• Diagnose brain disorders