Exercise 19: Gross Anatomy of the Brain and Cranial Nerves

Objectives:

- To identify the listed brain structures on a model, sheep brain dissection, or diagram and to state their functions
- Describe the composition of grey and white matter
- Locate the listed functional areas of the human cerebral hemispheres
- Define gyri, fissure, and sulci
- Identify the three meningeal layers and state their functions
- Discuss the formation, circulation, and drainage of cerebrospinal fluid
- Know the function of the arachnoid villi and dural sinuses
- Know the cranial nerves by number and name; know the functions of each cranial nerve.

Identify the following structures in bold on human models and/or sheep brains. Know the other structures on a diagram and give functions of all structures listed. Identify the 4 major divisions of the brain and their principal parts. Give the functions of each area/structure as appropriate. The best way to learn these structures is to highlight them on the diagrams on pp. 202, 203, 204, 207, 209, & 210 before coming to class and use the diagram as a “key” to the models.

Activity 1: Identifying External Brain Structures (use the following list and figs 19.2 - 4, p. 281 – 284)

Cerebral Hemispheres
- longitudinal fissure
- frontal lobe
- parietal lobe
- lateral sulcus
- temporal lobe
- occipital lobe
- Central sulcus
- Precentral gyrus
  - Broca’s Area
- Postcentral gyrus
  - Wernike’s Area

Diencephalon
- Olfactory bulbs
- Optic nerves
- Optic chiasma
- Pituitary gland (hypophysis)
- Mammillary bodies
Brain Stem
  Cerebral peduncles
  Pons
  Medulla oblongata
  Desiccation of pyramids

Cerebellum
  vermis
Corpora quadrigemina
  Superior colliculi
  Inferior colliculi

Activity 2: Identifying Internal Brain Structures (use the following list and fig. 19.4, p. 284)

Cerebral Hemispheres
  Corpus callosum
  Fornix
  Septum pellucidum
  Anterior commissure
  Posterior commissure
  Basal nuclei
    Caudate nucleus
    Amygdaloid nucleus
    Lentiform nucleus
      putamen
      globus pallidus
    Corona radiata

Diencephalon
  Thalamus
  Intermediate mass
  Interventricular Foramen
  Hypothalamus
  Infundibulum
  Pituitary gland
  Mammillary bodies
  epithalamus
    pineal body

Brain Stem
  Corpora quadrigemina (superior and inferior colliculi)
  Pons
  Medulla oblongata

Cerebellum
  Arbor vitae
Ventricles (also know the flow of CSF, see attached flow chart)
Lateral ventricles
Third ventricle
Fourth ventricle
interventricular foramen
cerebral aqueduct
median aperture
lateral aperture
choroid plexus

Be able to ID the meninges of the brain on a diagram. Include these in the flow of CSF.

Dissection: Sheep brain (pp. 214 – 218)
Do the dissection after reviewing with the models. You do not have to do the frontal section of the brain.
**Activity 3: Identifying and Testing the Cranial Nerves** (Table 19.1, pp. 290-91)

You must know your cranial nerves (their name, number (Roman numeral), what cranial foramen they pass through, function, and how you test for their function (What do abnormal responses to tests indicate?)). You must also know if they are considered motor, sensory, or both sensory and motor. An EXCELLENT way to learn this is by flashcards!! I have also included a chart below.

<table>
<thead>
<tr>
<th>Cranial Nerve</th>
<th>Name</th>
<th>Function</th>
<th>Region served</th>
<th>Test</th>
<th>Disorder</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Sensory</td>
<td>Olfactory mucosa; sense of smell</td>
<td></td>
<td>anosmia</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Sensory</td>
<td>Retina of the eye</td>
<td></td>
<td>anopia</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>Motor*</td>
<td>Eyelids; 4 of 6 of the extrinsic eye muscles; lens and iris</td>
<td></td>
<td>diplopia, ptosis, strabismus</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>Motor*</td>
<td>Superior oblique muscle of the eye</td>
<td></td>
<td>diplopia, strabismus</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>Both</td>
<td>Sensory innervation of the face; muscles of mastication</td>
<td></td>
<td>tic douloureux</td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td>Motor*</td>
<td>Lateral rectus muscle of the eye</td>
<td></td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>VII</td>
<td>Both</td>
<td>Taste, anterior 2/3 of the tongue; facial expression; saliva and tear glands</td>
<td></td>
<td>Bell’s palsy</td>
<td></td>
</tr>
<tr>
<td>VIII</td>
<td>Sensory</td>
<td>Vestibular div: equilibrium Cochlear div: hearing</td>
<td></td>
<td>vertigo, ataxia, nystagmus, tinnitus</td>
<td></td>
</tr>
<tr>
<td>IX</td>
<td>Both</td>
<td>Pharyngeal muscles; taste post 1/3 of tongue</td>
<td></td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>Both</td>
<td>Abdominal &amp; thoracic viscera</td>
<td></td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>XI</td>
<td>Motor*</td>
<td>Trapezius and sternocleidomastoid</td>
<td></td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>XII</td>
<td>Motor*</td>
<td>Intrinsic and extrinsic tongue muscles</td>
<td></td>
<td>--</td>
<td></td>
</tr>
</tbody>
</table>

* all motor nerves will contain proprioceptive fibers. This is NOT included in the major function of the nerve.
Flow of Cerebrospinal Fluid:

Choroid Plexuses
(from each of the ventricles)

Lateral ventricles

Interventricular foramen

Third ventricle

Cerebral aqueduct

Fourth ventricle

Median and lateral apertures

Subarachnoid space

Arachnoid villi

Dural Sinuses

Central canal of spinal cord

Filum terminale

Venous blood supply

Ependymal cells + capillaries