

ACTIVITY 7: NERVOUS SYSTEM HISTOLOGY, BRAIN, CRANIAL NERVES

OBJECTIVES:

- 1) **How to get ready:** Read Chapter 14 & 15 McKinley *et al.*, *Human Anatomy*, 4e. All text references are for this textbook. Read dissection instructions BEFORE you come to class.
- 2) Histology: Identify structures indicated on three different slides or images of nervous system tissue. Some of these structures are also visible on the classroom model of a neuron.
- 3) Human brain: Identify listed structures of the human brain on classroom models, the cranial meninges, and structures involved in cerebrospinal fluid circulation..
- 4) Human brain: Identify the 12 pairs of cranial nerves by name and number on a model and on the sheep brain.
- 5) Dissect a sheep brain and identify structures listed. **YOU MUST BRING GLOVES FOR THIS ACTIVITY.**
- 6) **Before next class:** Preview peripheral nervous system, eye and ear terms lists from SLCC Anatomy Laboratory website or your printed laboratory manual and your textbook.

NERVOUS SYSTEM TISSUES: HISTOLOGY SLIDES

TABLE 1. SPINAL CORD SMEAR

STRUCTURE	TEXTBOOK REFERENCE AND SKETCH
<input type="checkbox"/> cell body (soma)	described: pp. 416-418, 420 fig. 14.3
<input type="checkbox"/> nucleus	
<input type="checkbox"/> chromatophilic substance (<i>or</i> Nissl bodies)	
<input type="checkbox"/> dendrites	
<input type="checkbox"/> axon hillock	
<input type="checkbox"/> axon	
<input type="checkbox"/> multipolar neuron	
<input type="checkbox"/> glial cell	

TABLE 2. CROSS SECTION OF A NERVE

STRUCTURE	TEXTBOOK REFERENCE AND SKETCH
<input type="checkbox"/> axon	described: p. 426 fig. 14.12a & b
<input type="checkbox"/> endoneurium	
<input type="checkbox"/> perineurium	
<input type="checkbox"/> epineurium	
<input type="checkbox"/> fascicle	
<input type="checkbox"/> myelin sheath	

TABLE 3. TEASED MYELINATED NERVE FIBERS

STRUCTURE	TEXTBOOK REFERENCE AND SKETCH
<input type="checkbox"/> axon	described: p. 416- 417 fig. 14.12c
<input type="checkbox"/> neurilemma	
<input type="checkbox"/> myelin sheath	
<input type="checkbox"/> neurofibril nodes	
<input type="checkbox"/> neurolemmocyte (<i>or</i> Schwann cell) nucleus	

BRAIN ANATOMY: The adult brain is composed of the cerebrum, the diencephalon, the brainstem, and the cerebellum. There are spaces within the brain called ventricles. The cranial nerves are (PNS) nerves directly attached to the brain.

TABLE 4. CEREBRUM: Basic organization of the cerebrum is -- superficial gray matter, deep (central) white matter, and deeper gray matter (cerebral nuclei).

STRUCTURE	TEXTBOOK REFERENCE AND NOTES
<input type="checkbox"/> gyrus (pl. <i>gyri</i>)	described: pp. 438-439 fig. 15.1
<input type="checkbox"/> sulcus (pl. <i>sulci</i>)	
<input type="checkbox"/> gray matter	described: p. 442 fig. 15.3
<input type="checkbox"/> white matter	
<input type="checkbox"/> longitudinal fissure	described: p. 452 fig. 15.10
<input type="checkbox"/> cerebral hemispheres (right and left)	
<input type="checkbox"/> corpus callosum	described: p. 452, 457 fig. 15.1c, 15.3
<input type="checkbox"/> frontal lobe	described: p. 453-454 fig. 15.10, 15.11
<input type="checkbox"/> precentral gyrus	
<input type="checkbox"/> central sulcus	
<input type="checkbox"/> postcentral gyrus	
<input type="checkbox"/> parietal lobe	
<input type="checkbox"/> parieto-occipital sulcus	
<input type="checkbox"/> occipital lobe	
<input type="checkbox"/> lateral sulcus	
<input type="checkbox"/> temporal lobe	
<input type="checkbox"/> fornix	described: p. 448 fig. 15.15, 15.23
<input type="checkbox"/> septum pellucidum	described: p. 470 fig. 15.15
<input type="checkbox"/> cerebral nuclei (or basal nuclei, often <i>incorrectly</i> called basal ganglia)	described: p. 459 fig. 15.14
<input type="checkbox"/> lateral ventricles	described: p. 448 fig. 15.6, 15.14

TABLE 5. DIENCEPHALON: Composed of epithalamus, thalamus, and hypothalamus and other associated structures

STRUCTURE	TEXTBOOK REFERENCE AND NOTES
<input type="checkbox"/> EPITHALAMUS <input type="checkbox"/> pineal gland	described: p. 461 fig. 15.15
<input type="checkbox"/> THALAMUS <input type="checkbox"/> interthalamic adhesion (or intermediate mass)	described: p. 461 fig. 15.15, 15.16
<input type="checkbox"/> HYPOTHALAMUS <input type="checkbox"/> mammillary body <input type="checkbox"/> infundibulum	described: p. 462, 608 fig. 15.1b, 15.17, 15.18, table 15.6
<input type="checkbox"/> pituitary gland	described: p. 608-609 fig. 15.15, 15.17, 20.4
<input type="checkbox"/> optic chiasm (chiasma)	fig. 15.1b, 15.24, 15.18
<input type="checkbox"/> optic tracts	described: p. 580 fig. 15.1b, 15.24
<input type="checkbox"/> third ventricle	described: p. 448 fig. 15.6, 15.13, 15.14

TABLE 6. BRAINSTEM: Composed of the mesencephalon, pons, medulla oblongata, and other associated structures

STRUCTURE	TEXTBOOK REFERENCE AND NOTES
<input type="checkbox"/> MIDBRAIN (OR MESENCEPHALON)	described: pp. 439, 463 fig. 15.1c, 15.18, 15.19
<input type="checkbox"/> corpora quadrigemina (tectal plate) <ul style="list-style-type: none"> <input type="checkbox"/> superior colliculus (pl. <i>colliculi</i>) <input type="checkbox"/> inferior colliculus (pl. <i>colliculi</i>) <input type="checkbox"/> cerebral peduncles	described: p. 463 fig. 15.15, 15.18, 15.19
<input type="checkbox"/> PONS	described: p. 463, 466 fig. 15.1, 15.18, 15.20
<input type="checkbox"/> MEDULLA OBLONGATA	described: p. 466 fig. 15.1, 15.18
<input type="checkbox"/> cerebral aqueduct	described: p. 448 fig. 15.6, 15.15, 15.22
<input type="checkbox"/> fourth ventricle	

TABLE 7. CEREBELLUM

STRUCTURE	TEXTBOOK REFERENCE AND NOTES
<input type="checkbox"/> vermis	described: pp. 467-468 fig. 15.22
<input type="checkbox"/> cerebellar hemispheres	
<input type="checkbox"/> arbor vitae	

CRANIAL MENINGES AND CSF CIRCULATION STRUCTURES

TABLE 8. DURAL VENOUS SINUSES, CRANIAL MENINGES AND SPACES, AND CRANIAL DURAL SEPTA

STRUCTURE	TEXTBOOK REFERENCE AND NOTES
MENINGES AND SPACES	
<input type="checkbox"/> dura mater <input type="checkbox"/> subdural space <input type="checkbox"/> arachnoid (mater) <input type="checkbox"/> subarachnoid space <input type="checkbox"/> pia mater	described: p. 446 fig. 15.4, 15.5
CRANIAL DURAL SEPTA: Flat partitions of dura mater extending into the cranial cavity	
<input type="checkbox"/> falx cerebri <input type="checkbox"/> tentorium cerebelli <input type="checkbox"/> falx cerebelli	described: p. 447 fig. 15.5
DURAL VENOUS SINUSES: Large veins that drain blood from the brain into the internal jugular veins	
<input type="checkbox"/> superior sagittal sinus <input type="checkbox"/> transverse sinus <input type="checkbox"/> straight sinus <input type="checkbox"/> inferior sagittal sinus	described: pp. 446, 450-451, 695 fig. 15.4, 15.5, 15.8, 23.11b

TABLE 9. VENTRICLES

STRUCTURE	TEXTBOOK REFERENCE
<input type="checkbox"/> lateral ventricles	described: p. 448 fig. 15.6, 15.14
<input type="checkbox"/> third ventricle	described: p. 448 fig. 15.6, 15.13, 15.14
<input type="checkbox"/> cerebral (mesencephalic) aqueduct	described: p. 448 fig. 15.6, 15.15, 15.22
<input type="checkbox"/> fourth ventricle	
<input type="checkbox"/> central canal (of spinal cord)	described: p. 448 fig. 15.6, 15.14

TABLE 10. CRANIAL NERVES: These are not part of the Central Nervous System. They are (PNS) peripheral nerves directly attached to the brain. Fig. 15.24, Tables 15.7, 15.8

NUMBER	NAME	FUNCTION (S= sensory; M= motor)	FORAMINA
<input type="checkbox"/> I	olfactory nerve	S = olfaction (smell)	cribriform plate of ethmoid
<input type="checkbox"/> II	optic nerve	S = vision	optic canal
<input type="checkbox"/> III	oculomotor nerve	M = four extrinsic eye muscles contraction; opens eyelid Parasympathetic M= pupil constriction; rounds lens	superior orbital fissure
<input type="checkbox"/> IV	trochlear nerve	M = superior oblique eye muscle contraction	superior orbital fissure
<input type="checkbox"/> V	trigeminal nerve	S = sensation from anterior scalp, nasal cavity, face, mouth, tongue, part of external ear M = chewing (mastication) muscles	superior orbital fissure foramen rotundum foramen ovale
<input type="checkbox"/> VI	abducens nerve	M = lateral rectus eye muscle contraction	superior orbital fissure
<input type="checkbox"/> VII	facial nerve	S = taste from anterior two-thirds of tongue M = muscles of facial expression Parasympathetic M= lacrimal gland, submandibular and sublingual salivary gland secretion	internal acoustic meatus
<input type="checkbox"/> VIII	vestibulocochlear nerve	S = hearing (cochlear branch); equilibrium (vestibular branch)	internal acoustic meatus
<input type="checkbox"/> IX	glossopharyngeal nerve	S = touch and taste on posterior tongue; visceral sensation from carotid bodies M = one muscle in pharynx Parasympathetic M= parotid salivary gland secretion	jugular foramen
<input type="checkbox"/> X	vagus nerve	S = visceral sensation from pharynx, larynx, carotid bodies, heart, lungs, most abdominal organs; sensory information from ear M = most pharynx muscles, larynx muscles Parasympathetic M= innervates heart muscle and smooth muscle and glands of lungs, larynx, trachea, and most abdominal organs	jugular foramen
<input type="checkbox"/> XI	accessory nerve	M = trapezius muscle; sternocleidomastoid muscle	foramen magnum, jugular foramen
<input type="checkbox"/> XII	hypoglossal nerve	M = tongue muscles	hypoglossal canal

4. **Superior View of the Sheep Brain:** Place the brain on the dissecting tray so the superior side is facing up. Notice the thin layer of arachnoid that covers the surface of the brain but does not dip into the sulci of the brain. Also notice the vast amounts of blood vessels that are between the arachnoid mater and the pia mater. The space the blood vessels occupy is also where cerebrospinal fluid flows in the sheep.

IDENTIFY THE FOLLOWING STRUCTURES ON THE SHEEP BRAIN, from a superior view:

arachnoid (mater)	cerebrum	spinal cord
blood vessels	gyrus	sulcus
cerebellum	longitudinal fissure	cerebral cortex

Now, pick up the brain, hold it with the cerebellum facing you, and carefully pull the cerebellum away from the cerebrum.

IDENTIFY THE FOLLOWING STRUCTURES ON THE SHEEP BRAIN, from a posterior view:

cerebellum	inferior colliculi*	pineal gland
cerebrum	superior colliculi*	

*superior colliculi + inferior colliculi = corpora quadrigemina

MIDSAGITTAL AND CORONAL SECTIONS OF THE SHEEP BRAIN

Note: Some of you will dissect a midsagittal section of the sheep brain, and some will dissect a coronal section. Ask your instructor which section you are to dissect before you begin cutting. Make sure you observe both dissections, even though you are only performing one.

Midsagittal Section:

1. Place the sheep brain on your dissecting tray with its superior surface facing you. Starting on the anterior end, place your scalpel in the longitudinal fissure and cut the brain in half along the midsagittal plane.
2. Once you have cut the brain in half, identify the following structures on the cut, midsagittal surface.

IDENTIFY THE FOLLOWING STRUCTURES ON THE SHEEP BRAIN, from a midsagittal section:

central canal	fornix	pituitary gland
cerebellum	fourth ventricle	pons
cerebral aqueduct	mammillary body	spinal cord
cerebral peduncle	medulla oblongata	superior and inferior colliculi
cerebrum	optic chiasm	thalamus, with interthalamic adhesion
corpus callosum	pineal gland	septum pellucidum

Coronal section:

1. Place the sheep brain on your dissection tray with the inferior side facing you. Next, identify the pituitary gland. Use your scalpel to cut the brain in half along the coronal plane.
2. Once you have cut the brain in half, identify the following structures on the cut surface.

IDENTIFY THE FOLLOWING STRUCTURES ON THE SHEEP BRAIN, from a coronal section:

cerebral peduncle	hypothalamus	pons
cerebrum	thalamus	third ventricle
corpus callosum	lateral ventricles	cerebral nuclei
fornix	longitudinal fissure	cerebral cortex

YOU MUST DISPOSE OF THE SHEEP BRAIN AS INSTRUCTED, AND COMPLETELY CLEAN, DRY, AND PUT AWAY ALL INSTRUMENTS AND TRAYS IN ORDER TO EARN YOUR PARTICIPATION GRADE FOR THE LAB.