ACTIVITY 8: SPINAL CORD, SPINAL NERVES, SENSORY ORGANS

OBJECTIVES:

1) How to get ready: **Read Chapter 16 and 19, McKinley *et al*., Human Anatomy, 5e. All text references are for this textbook.** You can also complete most of Table 3 BEFORE you come to lab.
2) **Identify structures in the gross anatomy of the spinal cord on both models and cadavers or wet specimens.**
3) **Identify structures in the cross section of the spinal cord on classroom models.**
4) **Identify the nerve plexuses and specific nerves from each.** AT THIS POINT, STUDENTS ARE RESPONSIBLE FOR THE SPECIFIC SENSORY FUNCTIONS AND MUSCLES INNERVATED BY EACH PERIPHERAL NERVE LISTED.
5) **Identify structures from the human eye on models.**
6) ★ **Dissect a cow eye and identify the structures listed.** YOU MUST BRING GLOVES FOR THIS ACTIVITY.
7) **Identify structures of the ear on classroom models.**
8) **Histology: Observe and identify structures in a histology slide of the cochlea.**
9) Before next class: **Preview Heart and Blood terms lists from SLCC Anatomy Laboratory website or your printed laboratory manual and your textbook.**

TABLE 1. GROSS ANATOMY OF THE SPINAL CORD, POSTERIOR VIEW

STRUCTURE	TEXTBOOK REFERENCE & NOTES
❑ **cervical enlargement**	**described: p. 483** **fig. 16.1**
❑ **thoracic region of the spinal cord**	
❑ **lumbar enlargement (*or* lumbosacral enlargement)**	
❑ **conus medullaris**	
❑ **cauda equina**	
❑ **filum terminale**	
❑ **posterior median sulcus**	**described: p. 483** **fig. 16.2b, 16.3**
❑ **anterior median fissure**	
❑ **anterior rootlets**	**described: p. 489** **fig. 16.2b, 16.3**
❑ **posterior rootlets**	
❑ **spinal nerves** ❑ **cervical spinal nerves (C1-C8)** ❑ **thoracic spinal nerves (T1-T12)** ❑ **lumbar spinal nerves (L1-L5)** ❑ **sacral spinal nerves (S1-S5)** ❑ **coccygeal spinal nerve (Co1)**	**described: p. 489** **fig. 16.1, 16.7-16.11**
❑ **denticulate ligaments**	**described: p. 487** **fig. 16.1b**

TABLE 2. CROSS SECTION OF THE SPINAL CORD

STRUCTURE	TEXTBOOK REFERENCE & NOTES
❑ central canal	described: p. 447 fig. 16.2, 15.6
❑ posterior median sulcus	described: p. 483 fig. 16.2b
❑ anterior median fissure	
❑ posterior (*or* dorsal) root	described: p. 489 fig. 16.2b, 16.4
❑ posterior rootlets	
❑ posterior (*or* dorsal) root ganglion	
❑ anterior (*or* ventral) root	
❑ anterior rootlets	
❑ gray matter ❑ posterior (dorsal) horns ❑ gray commissure ❑ lateral horns ❑ anterior (ventral) horns	described: p. 487 fig. 16.3a & b
❑ white matter ❑ posterior white columns (funiculus) ❑ anterior white columns (funiculus) ❑ lateral white columns (funiculus)	described: p. 489 fig. 16.3a
SPINAL MENINGES & SPACES (superficial to deep)	
❑ epidural space	described: pp. 485,487 fig. 16.2a
❑ dura mater	
❑ subdural space	
❑ arachnoid mater	
❑ subarachnoid space	
❑ pia mater	

TABLE 3. MAJOR NERVE PLEXUSES AND SELECTED NERVES**:** You are now responsible for the listed nerves, the muscles they innervate (only) from your muscle lab list, and sensory functions when appropriate. **Refer to Chapter 12, Chapter 16 and your muscle tables from Activities 5 & 6 to fill in any blanks in the following tables.**

STRUCTURE	MOTOR FUNCTION	SENSORY FUNCTION
❑ CERVICAL PLEXUS **described: p. 492 fig. 16.8, table 16.2**		
❑ phrenic nerve **(also contains fibers from brachial plexus)**	**diaphragm**	NONE

STRUCTURE	MOTOR FUNCTION	SENSORY FUNCTION
❑ BRACHIAL PLEXUS **described: p. 493 fig. 16.9, table 16.3**		
❑ long thoracic nerve	serratus anterior	NONE
❑ medial pectoral nerve	▪ pectoralis major ▪ pectoralis minor	NONE
❑ lateral pectoral nerve	pectoralis major	NONE
❑ axillary nerve	▪ deltoid ▪ teres minor	**lateral arm near shoulder**
❑ median nerve	anterior forearm muscles (LIST 6)	**tips of lateral three digits lateral palmar surface of hand**
❑ musculocutaneous nerve	▪ biceps brachii (both heads) ▪ brachialis ▪ coracobrachialis	**lateral forearm**
❑ ulnar nerve	▪ flexor carpi ulnaris ▪ flexor digitorum profundus (medial ½) ▪ most hand muscles	**ring finger and pinky**

(BRACHIAL PLEXUS CONTINUED) STRUCTURE	MOTOR FUNCTION	SENSORY FUNCTION
❑ radial nerve	▪ posterior arm muscles (LIST 3) ▪ posterior forearm muscles (LIST 8)	**most of the dorsal surface of the hand**

INTERCOSTAL NERVES **do not form a plexus**	MOTOR FUNCTION	SENSORY FUNCTION
❑ INTERCOSTAL NERVES: **branch from thoracic spinal nerves** **described: p. 492, fig. 16.7**	intercostal muscles	**anterior and lateral chest wall**

STRUCTURE	MOTOR FUNCTION	SENSORY FUNCTION
❑ LUMBAR PLEXUS **16.10, table 16.4**		**described: p. 498 fig.**
❑ femoral nerve	anterior thigh muscles (LIST 8)	**anterior and medial surfaces of thigh and leg; arch of foot**
❑ obturator nerve	medial thigh muscles (LIST 6)	**proximal medial thigh**

STRUCTURE	MOTOR FUNCTION	SENSORY FUNCTION
❑ SACRAL PL		**described: p. 501 fig. 16.11, table 16.5**
❑ superior gluteal nerve	▪ tensor fasciae latae ▪ gluteus medius ▪ gluteus minimus	NONE
❑ inferior gluteal nerve	gluteus maximus	NONE
❑ sciatic nerve **(branches to tibial nerve and common fibular nerve)**		
❑ tibial nerve	▪ posterior thigh muscles (LIST 4) ▪ posterior leg muscles (LIST 6) ▪ plantar surface of foot	**plantar surface of the foot and heel**
❑ common fibular nerve **(branches to deep fibular nerve and superficial fibular nerve)**	biceps femoris (short head)	
❑ deep fibular nerve	anterior leg muscles (LIST 3)	**space between first and second toes**
❑ superficial fibular nerve	lateral leg muscles (LIST 2)	**distal anterior leg dorsal surface of foot**
❑ pudendal nerve	muscles of perineum, external anal sphincter, external urethral sphincter	**external genitalia**

TABLE 4. EXTRINSIC EYE MUSCLES AND ACCESSORY STRUCTURES OF THE EYE

STRUCTURE		TEXTBOOK REFERENCE
EXTRINSIC EYE MUSCLES		
Muscle	**Innervation**	
❑ inferior oblique muscle	**CNIII (oculomotor nerve)**	**described: pp. 326-329** **fig. 11.4**
❑ inferior rectus muscle		
❑ superior rectus muscle		
❑ medial rectus muscle		
❑ lateral rectus muscle	**CNVI (abducens nerve)**	
❑ superior oblique muscle	**CNIV (trochlear nerve)**	
ACCESSORY STRUCTURES		
❑ palpebra (eyelid), superior and inferior		**described: pp. 568,570** **fig. 19.9b**
❑ orbital fat pad		
❑ lacrimal gland		**described: p. 570** **fig. 19.9a, 19.10**
❑ nasolacrimal duct		
❑ lacrimal caruncle		

TABLE 5. EYE

STRUCTURE	TEXTBOOK REFERENCE & NOTES
❑ **optic nerve (CN II)**	**fig. 19.11, 19.17**
❑ **conjunctiva**	**described: pp. 569-570** **fig. 19.19b**
LAYERS OF THE EYE WALL **(superficial to deep)**	
❑ fibrous tunic (outermost layer)	**described: pp. 570-572** **fig. 19.11**
❑ **sclera**	
❑ **cornea**	
❑ vascular tunic (middle layer)	**described: p. 572** **fig. 19.11**
❑ **choroid**	
❑ **ciliary body with ciliary muscles**	
❑ **iris**	
❑ **pupil**	
❑ neural tunic (innermost layer)	**described: pp. 572, 575** **fig. 19.11, 19.13**
❑ **retina**	
❑ **optic disc ("blind spot")**	
❑ **macula lutea**	
❑ **fovea centralis**	
❑ **ora serrata**	

TABLE 6. CAVITIES OF THE EYE

STRUCTURE	TEXTBOOK REFERENCE & NOTES
❑ anterior cavity	**described: p. 576** **fig. 19.16, 19.11**
❑ **anterior chamber**	
❑ **posterior chamber**	
❑ **aqueous humor**	
❑ lens	**described: pp. 575** **fig. 19.16, 19.11**
❑ posterior cavity (vitreous chamber)	**described: pp. 576-578** **fig. 19.11, 19.16**
❑ **vitreous humor**	

★ COW EYE DISSECTION INSTRUCTIONS

- WEAR GLOVES FOR THIS ACTIVITY
- **Wash hands before and after dissection**

1. Obtain dissection pan, dissecting tools and a fresh cow eye. Observe the following external anatomical structures before beginning your dissection.

- ❑ cornea
- ❑ extrinsic eye muscles
- ❑ optic nerve
- ❑ orbital fat pad
- ❑ sclera
- ❑ iris
- ❑ pupil

2. Using scissors and forceps, remove the orbital fat pad and extrinsic eye muscles, leaving the optic nerve **intact.**

3. Using a scalpel, scissors and forceps, cut the eye open by making a coronal incision through the tough, white, sclera**, which completely encircles the eye. You should end up with two halves of the eye, a back half that contains the optic nerve connected to the posterior surface of the eye, and a front half that contains the** cornea **on the anterior surface.**

You may notice a clear, thin liquid leaking out of the eye. This is the aqueous humor**.**

If you notice a clear, jelly-like fluid leaking out of the vitreous chamber**, this is the** vitreous humor**. The function of the vitreous humor is to hold the** retina **against the wall of the eye.**

In the cow eye, a lot of the choroid **contains black pigment, which may become mixed with the vitreous humor when the eye is cut open.**

Look for the yellowish or pinkish thin, delicate membrane lining the inner surface of the eye and attached to the posterior of the eye at the optic nerve. This is the retina**, which contains the neurons responsible for detecting light and sending vision information to the brain.**

4. Find the optic nerve and locate the spot on the inside of the eye where the optic nerve attaches to the eye (the location where the retina attaches to the back of the eye on the inside). This spot within the eye is called the optic disc **or blind spot. This spot has no neurons that can detect light (photoreceptors), and is where the axons from the retina leave the eye and travel to the brain through the** optic nerve **(CNII).**

5. Move the retina aside and observe the inner wall of the posterior half of the eye. Notice the colorful, iridescent tapetum lucidum**. This structure is not present in human eyes, but is present in animals that are able to see well in dim light. It reflects light around within the eye, so that dim light can still activate numerous photoreceptors. It is the reflection of the light from the tapetum lucidum that causes a cat's eyes (as well as other animal species) to shine or glow when light shines on them at night.**

6. Note the anterior portion of the eye. Notice the semi-transparent lens**, which is suspended in place by a ring of black-colored tissue called the** ciliary body**. The cavity anterior to the lens is the** anterior chamber **of the eye. In a living organism, it is filled with a clear, thin fluid called** aqueous humor**.**

7. Remove the lens from the eye. You can see through it. Place it on a piece of paper containing some text and note the change in appearance of the text. What did you see?

8. Identify the following structures on the interior of the dissected cow eye:

- ❑ anterior chamber
- ❑ choroid
- ❑ ciliary body
- ❑ lens
- ❑ optic disc
- ❑ posterior chamber
- ❑ retina
- ❑ tapetum lucidum
- ❑ vitreous humor

9. WHEN YOU HAVE FINISHED THE DISSECTION, CLEAN UP THE AREA. DISPOSE OF THE COW EYE AS DIRECTED. CLEAN, DRY AND PUT AWAY YOUR INSTRUMENTS AND DISSECTION TRAY IN ORDER TO RECEIVE CREDIT FOR YOUR PARTICIPATION GRADE FOR THE DAY.

TABLE 6. EAR: **The ear is composed of three regions: the external ear, located mostly on the outside of the head, and the middle and inner ear, which are housed within the petrous portion of the temporal bone.**

STRUCTURE	TEXTBOOK REFERENCE & NOTES
EXTERNAL EAR	
❑ **auricle (pinna)**	**described: p. 581**
❑ **external acoustic meatus (*or* canal)**	**fig. 19.19, 19.20**
❑ **tympanic membrane (eardrum; the partition between external and middle ear)**	
MIDDLE EAR	
❑ **auditory ossicles (lateral to medial)**	**described: pp. 582-583**
❑ **malleus**	**fig. 19.19, 19.20**
❑ **incus**	
❑ **stapes**	
❑ **auditory (eustachian) tube**	
❑ **round window (covers the scala tympani)**	**described: pp. 582-583, 595**
❑ **oval window (covers the scala vestibuli)**	**fig. 19.19, 19.20**
INNER EAR	
❑ **vestibule (senses acceleration and deceleration of head)**	**described: pp. 583-585**
❑ **utricle**	**fig. 19.21, 19.22**
❑ **saccule**	
❑ **semicircular canals (sense angular movement of head)**	**described: pp. 585, 588-589**
❑ **semicircular ducts**	**fig. 19.21, 19.24**
❑ **ampulla (pl. *ampullae*)**	
❑ **cochlea (hearing)**	**described: p. 589**
❑ **scala vestibuli (*or vestibular duct*)**	**fig. 19.26a & b, 19.21**
❑ **scala media (*or cochlear duct*)**	
❑ **scala tympani (*or tympanic duct*)**	
❑ **vestibulocochlear nerve (CNVIII)**	**fig. 19.19, 19.24, 19.26**
❑ **vestibular branch**	
❑ **cochlear branch and nerve**	

TABLE 7. STRUCTURE OF THE COCHLEA AND SPIRAL ORGAN **(histology slide and model)**

STRUCTURE	TEXTBOOK REFERENCE & SKETCH
❑ **cochlear branch of CNVIII**	**described: pp. 589-591** **fig. 19.19, 19.21, 19.26 b & c**
❑ **scala vestibuli**	
❑ **scala media / cochlear duct**	
❑ **scala tympani**	
❑ **spiral organ (organ of corti)**	
❑ **basilar membrane**	
❑ **hair cells**	
❑ **tectorial membrane**	