

ACTIVITY 8: SPINAL CORD, SPINAL NERVES, SENSORY ORGANS

LABORATORY OBJECTIVES:

1. Identify structures in the gross anatomy of the spinal cord on both models and cadavers or wet specimens.
2. Identify the spinal meninges and spaces.
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 MUSCLES INNERVATED BY EACH PERIPHERAL NERVE LISTED. The specific muscles innervated by the nerves are on the muscle lists (Activities 5 and 6, GREEN COLUMN).**
5. Identify structures from the human eye on models.
6. Dissect a fresh cow eye and identify the structures listed.
7. Identify structures of the ear on classroom models.
8. Histology: Observe and identify structures in a histology slide of the cochlea.

Table 1: Spinal Cord Structures

Gross anatomy of the spinal cord, posterior view:	Spinal meninges & spaces:	Cross section of the spinal cord:
Structures to identify: cervical enlargement thoracic region of the spinal cord lumbar enlargement conus medullaris cauda equina filum terminale denticulate ligaments dura mater posterior median sulcus anterior rootlets 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 (C ₀₁)	Structures to identify: epidural space dura mater subdural space arachnoid (mater) subarachnoid space pia mater	Structures to identify: anterior median fissure posterior median sulcus central canal dorsal (posterior) root (<i>sensory function</i>) dorsal (posterior) root ganglion ventral (anterior) root (<i>motor function</i>) gray matter -- dorsal (posterior) horns gray commissure lateral horns ventral (anterior) horns white matter – posterior white columns (funiculi) anterior white columns (funiculi) lateral white columns (funiculi) epidural space (present on some models)

Table 2: PNS Structures

Peripheral nerves	Motor Innervation (Refer to Muscle Tables from Activities 5 and 6 for <u>specific muscles innervated by each nerve listed</u>) Generally, sensory information comes back from the same area
cervical plexus -- phrenic nerve	diaphragm
brachial plexus -- radial nerve ulnar nerve median nerve musculocutaneous nerve axillary nerve long thoracic nerve medial pectoral nerve lateral pectoral nerve	posterior arm and posterior forearm* flexor carpi ulnaris and most hand muscles most anterior forearm muscles* biceps brachii (both heads), brachialis deltoid and teres minor serratus anterior pectoralis major, pectoralis minor pectoralis major
intercostal nerves	intercostal muscles
lumbar plexus -- femoral nerve obturator nerve	anterior thigh muscles* medial thigh muscles*
sacral plexus -- sciatic nerve tibial division common fibular division deep fibular superficial fibular superior gluteal nerve inferior gluteal nerve	branches into tibial and fibular divisions or nerves posterior thigh muscles*; posterior leg muscles*; plantar surface of foot anterior leg muscles*, dorsal surface of foot* fibularis longus and brevis tensor fascia latae, gluteus medius and minimus gluteus maximus

* refer to muscle tables for the specific muscles innervated by this nerve

Study Questions: From your muscle white sheets ...

1. List all 10 muscles innervated by the radial nerve.

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

2. List all 4 muscles innervated by the median nerve. 4

_____	_____
_____	_____

3. List all 7 muscles innervated by the femoral nerve.

_____	_____
_____	_____
_____	_____
_____	_____

4. List all 4 muscles innervated by the obturator nerve.

_____	_____
_____	_____

5. List all 8 muscles innervated by the tibial division of the sciatic nerve (tibial nerve). 8

_____	_____
_____	_____
_____	_____
_____	_____

6. List all 3 muscles innervated by the deep fibular division of the sciatic nerve (deep fibular nerve).

_____	_____
_____	_____

Table 3: Sensory Organs-- Eye

Eye - Superficial view	Eye – Internal view	Extrinsic (extraocular) eye muscles (fig. 11.4)
optic nerve (CNII) lacrimal gland nasolacrimal duct lacrimal caruncle orbital fat pad conjunctiva tapetum lucidum (cow eye only) fibrous tunic- sclera cornea	anterior cavity anterior chamber posterior chamber aqueous humor lens posterior cavity/ vitreous chamber vitreous humor vascular tunic choroid layer ciliary body with ciliary muscles iris nervous tunic retina optic disc ("blind spot") macula lutea fovea centralis	inferior oblique muscle inferior rectus muscle lateral rectus muscle medial rectus muscle superior oblique muscle superior rectus muscle

Table 4: Sensory Organs – Ear

External and middle ear	Inner ear (within the temporal bone)	Histology of the cochlea slide (fig. 19.28)
external ear auricle (pinna) external auditory canal (meatus) middle ear tympanic membrane auditory ossicles malleus incus stapes round window (covers the scala tympani) oval window (covers the scala vestibuli) auditory (eustachian) tube	cochlea (<i>senses sound</i>) scala media / cochlear duct scala vestibuli scala tympani vestibule (<i>senses acceleration and deceleration</i>) saccule utricle semicircular canals (<i>sense angular movement</i>) semicircular ducts with ampulla vestibulocochlear nerve (CNVIII) vestibular branch of CNVIII cochlear branch of CNVIII and cochlear nerve internal auditory canal	bony cochlea in temporal bone scala vestibuli scala media / cochlear duct scala tympani <u>spiral organ (organ of Corti)]</u> basilar membrane hair cells tectorial membrane

Cow Eye Dissection Instructions:

- Wear gloves
- 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 lots of 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 a light shines on them at night.

6. Note the anterior portion of the eye. Notice the semitransparent **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.