

**THE UNIVERSITY OF CONNECTICUT**  
**Meds 384, Mammalian Neuroanatomy**  
**Midbrain and Cranial Nerves**

**Barr's: Chapters 7 & 8**

**Caudal Midbrain (CNS 25-26)**

In CNS-25, what structures are part of the midbrain? Which are part of the pons? What are the minimum essential structures needed to identify the midbrain? Identify the inferior colliculus.

In CNS-25 to CNS-26, identify the major structures of the caudal midbrain:

tectum (alar plate)  
 tegmentum (basal plate)  
 central gray  
 cerebral aqueduct (of Sylvius)  
 trochlear nerve  
 lateral lemniscus  
 medial lemniscus  
 spinal lemniscus  
 trigeminal lemniscus  
 superior cerebellar peduncle  
 midbrain reticular formation

**Rostral Midbrain (CNS 27-30)**

Identify the superior colliculus. How is the shape of the midbrain different at this level from that of preceding levels? In CNS-27, identify the major structures in the rostral midbrain:

|                     |                    |
|---------------------|--------------------|
| tectum              | red nucleus        |
| tegmentum           | pineal body        |
| superior colliculus | central gray       |
| cerebral peduncles  | oculomotor nucleus |
| substantia nigra    | pretectal nuclei   |

In CNS-30, identify which structures belong to the midbrain, pons, thalamus, and telencephalon. Find the:

|                                 |                              |
|---------------------------------|------------------------------|
| central gray                    | oculomotor nerve roots       |
| brachium of superior colliculus | oculomotor nucleus           |
| pretectal nuclei                | Edinger-Westphal nuclei      |
| MLF                             | midbrain reticular formation |
| posterior commissure            |                              |

---

## **OVERVIEW OF CRANIAL NERVES**

Cranial nerves are associated with entry points in specific parts of the brain.

- |   |  |
|---|--|
| I. Olfactory bulb and tract - Telencephalon                   | VII. Facial - Pontomedullary junction                                  |
| II. Optic nerve, optic chiasm, and optic tract - Diencephalon | VIII. Stato-acoustic (vestibular & cochlear) - Pontomedullary junction |
| III. Oculomotor - Midbrain                                    | IX. Glossopharyngeal - Medulla   |
| IV. Trochlear - Midbrain                                      | X. Vagus - Medulla   |
| V. Trigeminal - Middle Pons                                   | XI. Spinal Accessory - Medulla   |
| VI. Abducens - Pontomedullary junction                        | XII. Hypoglossal - Medulla   |

### **Alar and Basal Plate Derivatives**

Review the development of the brainstem so that it is useful in locating cranial nerve nuclei with sensory or motor function. Find the sulcus limitans that divides the alar and basal plate derivatives in CNS-21. Nuclei medial to the sulcus are motor. Nuclei that are lateral to the sulcus are sensory.

## **OCULOMOTOR SYSTEMS**

### **Light Reflex**

Using CNS-30, review the light reflex. Light enters the eye. Projections from the retinal ganglion cells go to the \_\_\_\_\_.? The light reflex is consensual because projections from the \_\_\_\_\_ to the \_\_\_\_\_ are bilateral. What is the name of the preganglionic nucleus that projects to the ciliary ganglion?

### **Eye Movements**

Use CNS-27, CNS-25, and CNS-21 to review the 3<sup>rd</sup>, 4<sup>th</sup>, and 6<sup>th</sup> cranial nerves, respectively, and how the eyes make horizontal conjugate movements. Identify the oculomotor nucleus, trochlear nucleus, abducens nucleus, and medial longitudinal fasciculus. Which nerve makes the medial rectus contract? Which nerve makes the lateral rectus contract? How are the abducens and oculomotor nuclei interconnected?

Compare and contrast the impact of motor neuron death in the oculomotor nucleus with the effects of removing the inputs to the motor neuron.

### **Abducens Nucleus and Nerve**

Identify the abducens nucleus and the abducens nerve roots also in CNS-21. The latter are lateral to the medial lemniscus. What type of neuron is contained in the abducens nucleus? Where does the axon from this neuron synapse?

## **OTHER CRANIAL NERVES**

### **Trigeminal Nerve**

Middle pons contains three components of the trigeminal system. Identify the trigeminal motor nucleus in CNS-22. What type of neuron is contained in this nucleus? Where does the axon from this neuron synapse? Identify the chief (main) sensory nucleus of trigeminal nerve. What is the main source of inputs to the chief sensory trigeminal nucleus? Locate the mesencephalic root of

the trigeminal nerve. What type of neuron is contained in this nucleus? Where does the axon from this neuron synapse?

### **Review the spinal trigeminal nucleus.**

Review slides CNS-10 to CNS-21 to find all the components of the spinal trigeminal system.

### **Facial Nerve**

Identify the facial nucleus, facial colliculus, genu of the facial nerve root, facial nerve in CNS-20 and CNS-21. What type of neuron is found in the facial nucleus? Where does it synapse?

### **Vagus and Glossopharyngeal Nerves**

Locate the vagus nerve and glossopharyngeal nerve in CNS-16 and CNS-17. Locate the sulcus limitans along the floor of the fourth ventricle. Use it to delimit the regions that contain motor nuclei and sensory nuclei. The developmental history of the cells in the brainstem predicts their function. Alar plate derivatives become sensory nuclei, while basal plate derivatives become motor nuclei.

Locate nucleus ambiguus, dorsal motor nucleus of vagus, solitary nucleus, solitary tract, and the spinal trigeminal nucleus in CNS-13 to CNS-16. Determine the relationship of each of these to the vagus or glossopharyngeal nerve. Try to divide the components of the nerves into functional groups with the following criteria: Which nucleus contains motor neurons? Which nucleus contains preganglionic autonomic neurons? Which nucleus contains second-order sensory neurons?

### **Hypoglossal Nucleus.**

Find the hypoglossal nucleus in CNS-12 to CNS-16. What type of neuron is found in the hypoglossal nucleus? The axons of these neurons make up which nerve? Where does this nerve project? When axons of the hypoglossal nerve fire, what is the result in the periphery?