The Muscular System: Head and Neck

A muscular system lab activity using Visible Body’s Human Anatomy Atlas

Stephanie Wallace, Instructor of Biology, TCU
This lab activity is aligned with Visible Body's Human Anatomy Atlas app.

Learn more at visiblebody.com/professors
PRE-LAB EXERCISES

Before coming to lab, get familiar with a few muscle groups we’ll be exploring during lab. Using Visible Body’s Human Anatomy Atlas, go to the Views section. Under Systems, scroll down to the Muscular System views. Select the view Expression and find the following muscles. When you select a muscle, note the book icon in the content box. Selecting this icon allows you to read the muscle’s definition.

1. Occipitofrontalis (epicranius)
2. Orbicularis oculi
3. Orbicularis oris
4. Nasalis
5. Zygomaticus major

Return to Muscular System views, select the view Head Rotation and find the following muscles.

1. Sternocleidomastoid
2. Scalene group (anterior, middle, posterior)
IN-LAB EXERCISES

Use the following modules to guide your exploration of the head and neck region of the muscular system. As you explore the modules, locate the muscles on any charts, models, or specimen available. Please note that these muscles act on the head and neck – those that are located in the neck but act on the back are in a separate section.

When reviewing the action of a muscle, it will be helpful to think about where the muscle is located and where the insertion is. Muscle physiology requires that a muscle will “pull” instead of “push” during contraction, and the insertion is the part that will move. Imagine that the muscle is “pulling” on the bone or tissue it is attached to at the insertion.

Access 3D views and animated muscle actions in Visible Body’s Human Anatomy Atlas, which will be especially helpful to visualize muscle actions. When you select a structure in the Atlas app, you’ll see options to read the definition and hear the pronunciation in the content box. When you select a muscle, be sure to select the blue pin icon in the content box. This will give you the option to view origins and insertions as visible pins on the muscle (select “attachments”), view the blood supply, and/or the nerve supply.

In each module below, identify the following:

1. Muscle location
2. Origin(s) and insertion(s)
3. Muscle action
4. Nerve supply
A. Muscles of Facial Expression


These muscles insert into the skin of the face in order to create facial expressions. The specific insertion will determine what type of expression each muscle makes.

Muscles of Facial Expression
<table>
<thead>
<tr>
<th>Muscle</th>
<th>Origin</th>
<th>Insertion</th>
<th>Action</th>
<th>Innervation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occipitofrontalis (epicranius)</td>
<td>Occipital bone: Occipital bone</td>
<td>Occipital bone: Galea aponeurotica</td>
<td>Occipital bone: Draws scalp posteriorly</td>
<td>Facial nerve</td>
</tr>
<tr>
<td></td>
<td>Frontal: Galea aponeurotica</td>
<td>Frontal: Skin above eyebrows</td>
<td>Frontal: Draws scalp anteriorly, raises</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>eyebrows</td>
<td></td>
</tr>
<tr>
<td>Procerus</td>
<td>Fascia of nasal bone and nasal cartilage</td>
<td>Skin of lower forehead between</td>
<td>Draw eyebrows down</td>
<td>Facial nerve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>eyebrows</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nasalis</td>
<td>Maxilla</td>
<td>Aponeurosis on bridge of nose</td>
<td>Depresses nasal cartilage</td>
<td>Facial nerve</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressor septi</td>
<td>Incisive fossa of maxilla</td>
<td>Septum and ala of nose</td>
<td>Draws ala of nose downward</td>
<td>Facial nerve</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(buccal branch)</td>
</tr>
<tr>
<td>Corrugator supercilli</td>
<td>Medial end of superciliary arch</td>
<td>Deep surface of the skin above</td>
<td>Draws eyebrows downward and medially</td>
<td>Facial nerve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the middle of the orbital arch</td>
<td></td>
<td>(temporal branch)</td>
</tr>
<tr>
<td>Depressor supercilii</td>
<td>With fibers of orbicularis oculi</td>
<td>Subcutaneous tissue of eyebrow</td>
<td>Lowers eyebrows</td>
<td>Facial nerve</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Levator palpebrae superioris</td>
<td>Sphenoid part of orbit</td>
<td>Skin and tarsal plates of the</td>
<td>Elevates and retracts eyelid</td>
<td>Oculomotor nerve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>eyelid</td>
<td></td>
<td>(superior branch)</td>
</tr>
<tr>
<td>Orbicularis oculi</td>
<td>Frontal bone, maxilla, medial palpebral</td>
<td>Lateral palpebral raphe, superior</td>
<td>Closes eyelids</td>
<td>Facial nerve</td>
</tr>
<tr>
<td></td>
<td>ligament, lacrimal bone</td>
<td>and inferior tarsi medial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muscle</td>
<td>Origin</td>
<td>Insertion</td>
<td>Action</td>
<td>Innervation</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------------------------</td>
<td>--------------------------------------------------------</td>
<td>---------------------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>Auricularis anterior</td>
<td>Anterior temporal fascia</td>
<td>Projection on the front of the helix of the ear</td>
<td>Draws auricular upward and forward</td>
<td>Facial nerve (temporal branch)</td>
</tr>
<tr>
<td>Auricularis superior</td>
<td>Galea aponeurotica</td>
<td>Upper part of cranial surface of auricle</td>
<td>Raises auricular</td>
<td>Facial nerve (temporal branch)</td>
</tr>
</tbody>
</table>
B. Muscles of the Upper Mouth


Many different muscles are necessary to manipulate the mouth for speech, eating, whistling, and other actions. These muscles originate in different places, but insert on the tissue of the mouth. As you study these muscles, imagine the muscle pulling on the mouth – the angle where the muscle attaches to the mouth will determine how the mouth moves. Muscles located above the mouth will pull the mouth upward.

Muscles of the Upper Mouth

- Right buccinator
- Right zygomaticus minor
- Right zygomaticus major
- Right levator labii superioris
- Right levator anguli oris
- Orbicularis oris
- Right levator labii superioris alaeque nasi
<table>
<thead>
<tr>
<th>Muscle</th>
<th>Origin</th>
<th>Insertion</th>
<th>Action</th>
<th>Innervation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orbicularis oris</td>
<td>Fibers of other facial muscles</td>
<td>Skin at the angle of the mouth</td>
<td>Closes and protrudes lips</td>
<td>Facial nerve (buccal branch)</td>
</tr>
<tr>
<td>Zygomaticus major</td>
<td>Zygomatic bone</td>
<td>Orbicularis oris, depressor anguli oris, levator anguli oris</td>
<td>Draws angle of mouth laterally and upward</td>
<td>Facial nerve (zygomatic branch)</td>
</tr>
<tr>
<td>Zygomaticus minor</td>
<td>Zygomatic bone</td>
<td>Subcutaneous tissue of upper lip</td>
<td>Draws upper lip outward, upward, laterally</td>
<td>Facial nerve</td>
</tr>
<tr>
<td>Levator labii superioris</td>
<td>Zygomatic bone</td>
<td>Skin of upper lip</td>
<td>Raises upper lip and moves it forward</td>
<td>Facial nerve (buccal branch)</td>
</tr>
<tr>
<td>Levator labii superioris alaeque nasi</td>
<td>Frontal process of maxilla</td>
<td>Alar cartilage and levator labii superioris</td>
<td>Raises upper lip</td>
<td>Facial nerve (buccal branch)</td>
</tr>
<tr>
<td>Levator anguli oris</td>
<td>Canine fossa of maxilla</td>
<td>Angle of mouth</td>
<td>Raises angle of mouth</td>
<td>Facial nerve (buccal branch)</td>
</tr>
<tr>
<td>Buccinator</td>
<td>Alveolar processes of maxilla and mandible</td>
<td>Orbicularis oris</td>
<td>Compresses cheeks</td>
<td>Facial nerve (buccal branch)</td>
</tr>
</tbody>
</table>
C. Muscles of the Lower Mouth


Use the same reasoning as with the muscles of the upper mouth to study these muscles. Since these muscles are located under the mouth, the mouth will be pulled downward or laterally when these muscles contract.

Muscles of the Lower Mouth
<table>
<thead>
<tr>
<th>Muscle</th>
<th>Origin</th>
<th>Insertion</th>
<th>Action</th>
<th>Innervation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depressor anguli oris</td>
<td>Mandible (oblique line)</td>
<td>Risorius and orbicularis oris</td>
<td>Draws angle of mouth downward and laterally</td>
<td>Facial nerve (mandibular branch)</td>
</tr>
<tr>
<td>Depressor labii inferioris</td>
<td>Mandible (oblique line)</td>
<td>Skin of lower lip</td>
<td>Draws lower lip inferiorly and laterally</td>
<td>Facial nerve (mandibular branch)</td>
</tr>
<tr>
<td>Risorius</td>
<td>Fascia of masseter</td>
<td>Skin at angle of mouth</td>
<td>Retracts angle of mouth</td>
<td>Facial nerve</td>
</tr>
<tr>
<td>Mentalis</td>
<td>Incisive fossa of mandible</td>
<td>Skin of chin</td>
<td>Raises and protrudes lower lip, wrinkles skin of chin</td>
<td>Facial nerve (mandibular branch)</td>
</tr>
<tr>
<td>Platysma</td>
<td>Fascia of pectoralis major and deltoid</td>
<td>Mandible and skin of lower face</td>
<td>Depresses lower jaw</td>
<td>Facial nerve (cervical branch)</td>
</tr>
</tbody>
</table>
D. Muscles of Mastication


These are the muscles involved in chewing food. Consider the different ways food may be manipulated in the mouth as you study these muscles.

Muscles of Mastication

- Right temporalis
- Right lateral pterygoid
- Right deep masseter
- Right superficial masseter
- Right medial pterygoid
<table>
<thead>
<tr>
<th>Muscle</th>
<th>Origin</th>
<th>Insertion</th>
<th>Action</th>
<th>Innervation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep masseter</td>
<td>Zygomatic arch (aponeuroses)</td>
<td>Mandible</td>
<td>Raises mandible</td>
<td>Trigeminal nerve (mandibular branch)</td>
</tr>
<tr>
<td>Superficial masseter</td>
<td>Zygomatic arch</td>
<td>Ramus of mandible</td>
<td>Raises mandible</td>
<td>Trigeminal nerve (mandibular branch)</td>
</tr>
<tr>
<td>Temporalis</td>
<td>Temporal fossa and temporal fascia</td>
<td>Mandible (coronoid fossa and anterior ramus)</td>
<td>Elevates and retracts mandible</td>
<td>Trigeminal nerve (mandibular branch)</td>
</tr>
<tr>
<td>Medial pterygoid</td>
<td>Medial surface of lateral pterygoid plate</td>
<td>Ramus and angle of mandible</td>
<td>Draws mandible forward</td>
<td>Trigeminal nerve (mandibular branch)</td>
</tr>
<tr>
<td>Lateral pterygoid</td>
<td>Sphenoid and lateral pterygoid plate</td>
<td>Mandibular condyle, front margin of articular disk of TMJ</td>
<td>Draws mandible forward</td>
<td>Trigeminal nerve (mandibular branch)</td>
</tr>
</tbody>
</table>
E. Laryngeal Muscles

Under the Views section, go to Systems: Muscular System Views and select 3. Laryngeal Muscles. These muscles are responsible for manipulating the cartilages and vocal structures of the larynx for speech.

Laryngeal Muscles

- Right thyroepiglottic
- Left lateral cricoarytenoid
- Left posterior cricoarytenoid
- Right aryepiglottic
- Right cricothyroid (oblique part)
- Right thyroarytenoid
- Right vocalis
<table>
<thead>
<tr>
<th>Muscle</th>
<th>Origin</th>
<th>Insertion</th>
<th>Action</th>
<th>Innervation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laryngeal Muscles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thyroepiglottic</td>
<td>Inner surface of thyroid cartilage</td>
<td>Lateral surface of epiglottis</td>
<td>Depresses epiglottis</td>
<td>Inferior laryngeal nerve</td>
</tr>
<tr>
<td>Aryepiglottic</td>
<td>Apex of arytenoid cartilage</td>
<td>Epiglottis</td>
<td>Depresses epiglottis</td>
<td>Internal laryngeal nerve</td>
</tr>
<tr>
<td>Thyroarytenoid</td>
<td>Posterior thyroid cartilage</td>
<td>Anterolateral arytenoid surface</td>
<td>Pulls arytenoid cartilage anteriorly, relaxes vocal ligament</td>
<td>External laryngeal nerve</td>
</tr>
<tr>
<td>Vocalis</td>
<td>Vocal process of arytenoid cartilage, laminae of thyroid cartilage</td>
<td>Ipsilateral vocal ligament</td>
<td>Tenses and relaxes vocal folds</td>
<td>Inferior laryngeal nerve</td>
</tr>
<tr>
<td>Lateral cricoarytenoid</td>
<td>Arch of cricoid cartilage</td>
<td>Vocal process of arytenoid cartilage</td>
<td>Closes glottis</td>
<td>Inferior laryngeal nerve</td>
</tr>
<tr>
<td>Posterior cricoarytenoid</td>
<td>Posterior of cricoid cartilage</td>
<td>Vocal process of arytenoid cartilage</td>
<td>Opens glottis, separates vocal folds</td>
<td>Inferior laryngeal nerve</td>
</tr>
<tr>
<td>Oblique arytenoid</td>
<td>Base of each arytenoid cartilage</td>
<td>Apex of contralateral arytenoid cartilage</td>
<td>Narrows laryngeal inlet</td>
<td>Inferior laryngeal nerve</td>
</tr>
<tr>
<td>Cricothyroid</td>
<td>Anterolateral cricoid cartilage</td>
<td>Inferior margin and horn of thyroid cartilage</td>
<td>Lengthens and stretches vocal folds</td>
<td>External laryngeal nerve</td>
</tr>
</tbody>
</table>
F. Neck Muscles (that act on the head)


View the following Muscle Actions: Neck/head flexion, Neck/head extension, Neck/head lateral flexion, Head rotation (ipsilateral), and Head rotation (contralateral).

These muscles are located in the neck and move the head when they contract. It will again be helpful to pay careful attention to the location of the muscle and insertion to understand the action of each muscle. The muscle action videos will help you visualize how the muscles act during contraction.

Neck Muscles
Neck / Neck Extension

- Right splenius capitis
- Right longissimus capitis
- Right splenius cervicis
- Right trapezius
<table>
<thead>
<tr>
<th>Muscle</th>
<th>Origin</th>
<th>Insertion</th>
<th>Action</th>
<th>Innervation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sternocleidomastoid</td>
<td>Upper and anterior manubrium, superior and anterior medial third of clavicle</td>
<td>Lateral surface of mastoid process, nuchal line of occipital bone</td>
<td>Unilateral: Draws head toward shoulder of same side, rotates head to opposite side Bilateral: flexes head</td>
<td>Accessory nerve, C2-C3</td>
</tr>
<tr>
<td>Semispinalis capitis</td>
<td>Articular processes of C5-7, transverse processes of T1-12</td>
<td>Between superior and inferior nuchal lines of occipital bone</td>
<td>Extends vertebral column, unilaterally draws head to one side so face is turned to opposite side</td>
<td>Dorsal rami of spinal nerves</td>
</tr>
<tr>
<td>Splenius capitis</td>
<td>Ligamentum nuchae and spinous processes of C7-T3</td>
<td>Mastoid process of temporal bone and occipital bone</td>
<td>Supports head, draws head backward, draws head to one side and rotates it turning face to the same side</td>
<td>Dorsal rami of middle cervical spinal nerves</td>
</tr>
<tr>
<td>Splenius cervicis</td>
<td>T3-T6</td>
<td>C1-C3</td>
<td>Unilateral: draws head to one side and rotates it Bilateral: Extends head</td>
<td>C1-C6</td>
</tr>
<tr>
<td>Longissimus capitis</td>
<td>C4-T4</td>
<td>Posterior margin of mastoid process</td>
<td>Bends the head and turn the face to the same side; Bilateral: Extends head</td>
<td>Dorsal rami of middle and lower cervical spinal nerves</td>
</tr>
<tr>
<td>Scalenes</td>
<td>C5-C7</td>
<td>Second rib</td>
<td>Unilateral: bends spinal column laterally, tilts head Bilateral: Elevates first and second ribs, flexes head</td>
<td>C6-C8</td>
</tr>
<tr>
<td>Trapezius</td>
<td>Occipital bone, ligamentum nuchae, T1-T12</td>
<td>Lateral third of clavicle, acromion and spine of scapula</td>
<td>Extends neck; rotation, retraction, elevation, and depression of scapula</td>
<td>Accessory nerve and C3-C4</td>
</tr>
</tbody>
</table>
**G. Mandible Depression**


These muscles attach to the hyoid bone— the only bone in the body that does not articulate with another bone. They participate in swallowing and moving the mandible.

**Mandible Depression**

![Diagram of mandible depression with labeled muscles: Left digastric, Left stylohyoid, Left mylohyoid]
<table>
<thead>
<tr>
<th>Suprahyoid Muscles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Muscle</strong></td>
</tr>
<tr>
<td>Digastric</td>
</tr>
<tr>
<td>Stylohyoid</td>
</tr>
<tr>
<td>Mylohyoid</td>
</tr>
<tr>
<td>Geniohyoid</td>
</tr>
</tbody>
</table>
PUTTING IT ALL TOGETHER

1. Based on what you’ve learned about the muscles in this exercise, what do you think the following terms mean?

   a. Major
      larger muscle of a group

   b. Minor
      smaller muscle of a group

   c. Levator
      lift

   d. Depressor
      lower

   e. Capitis
      head

2. Which muscles are used when performing the following actions?

   a. Smiling
      i. Zygomaticus major
      ii. Zygomaticus minor
      iii. Risorius
      iv. Levator anguli oris
      v. Levator labii superioris
      vi. Levator labii superioris alaeque nasi

   b. Frowning
      i. Corrugator supercili
      ii. Depressor supercili
      iii. Orbicularis oculi
      iv. Orbicularis oris
      v. Depressor anguli oris
      vi. Depressor labii inferioris
      vii. Platysma
      viii. Procerus
c. Raise the eyebrows  
   i. Occipitofrontalis  

d. Expressing surprise  
   i. Occipitofrontalis  
   ii. Levator palpebrae superioris  
   iii. Platysma  

e. Whistling  
   i. Buccinators  
   ii. Orbicularis oris  

f. Chewing  
   i. Deep and superficial masseter  
   ii. Temporalis  
   iii. Medial and lateral pterygoid  

g. Swallowing  
   i. Palatoglossus  
   ii. Styloglossus  
   iii. Digastric  
   iv. Stylohyoid  
   v. Mylohyoid  
   vi. Geniohyoid  

h. Nod the head “yes”  
   i. Sternocleidomastoid  
   ii. Scalenes  

i. Shake the head “no”  
   i. Sternocleidomastoid  
   ii. Scalenes  
   iii. Splenius capitis  
   iv. Semispinalis capitis  

j. Tilt the head to look up toward the sky  
   i. Longissimus cervicis  
   ii. Splenius capitis  
   iii. Semispinalis capitis  

k. Tilt the head to the side (bring the ear to the shoulder)  
   i. Sternocleidomastoid  
   ii. Scalenes  
   iii. Splenius capitis
3. Bell’s Palsy results from damage to the facial nerves. If innervation to the facial nerves ceased, which muscles would be affected? Which actions of the face would be affected?

Most muscles of the face would be affected (see complete list below). Since Bell’s Palsy usually only affects one side of the facial nerve (right or left, but usually not both), only that side of the face would be affected. Muscles of facial expression would be paralyzed.

- Occipitofrontalis – raise eyebrows
- Corrugator supercillii – depress eyebrows
- Procerus – depress eyebrows
- Orbicularis oculi – close eyelids
- Orbicularis oris – close mouth
- Zygomaticus major and minor – draws mouth up and laterally
- Levator labii superioris – raises upper lip
- Levator anguli superioris – raises angle of mouth
- Buccinator – compress cheeks
- Depressor anguli oris – draws angle of mouth downward
- Depressor labii inferioris – draws lower lip inferiorly
- Risorius – retracts angle of mouth
- Mentalis – raises lower lip
- Platysma – depresses mandible
Student Practice
Label the muscles in the following figures
Muscles of Facial Expression

Right auricularis superior

Right depressor supercilii

Right auricularis anterior

Right orbicularis oculi

Right zygomaticus major

Right occipitofrontalis (epicranius)

Left procerus

Right nasalis, transverse portion

Orbicularis oris
Muscles of the Upper Mouth

Right buccinator

Right zygomaticus minor

Right zygomaticus major

Right levator labii superioris

Right levator anguli oris

Orbicularis oris

Right levator labii superioris alaeque nasi
Muscles of the Lower Mouth

- Right risorius
- Right depressor anguli oris (triangularis)
- Right depressor labii inferioris
- Left mentalis
- Left platysma
Muscles of Mastication

Right lateral pterygoid
Right deep masseter
Right superficial masseter
Right temporalis
Right medial pterygoid
Laryngeal Muscles

Right thyroepiglottic

Right aryepiglottic

Right thyroarytenoid

Right vocalis

Right cricothyroid (oblique part)

Left lateral cricoarytenoid

Left posterior cricoarytenoid
Neck Muscles

- Right sternocleidomastoid
- Right splenius cervicis
- Left scalenes
Neck / Neck Extension

- Right splenius capitis
- Right longissimus capitis
- Right splenius cervicis
- Right trapezius
Mandible Depression

Left digastric
Left stylohyoid
Left mylohyoid