

Innervation of the Upper Airway

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What You Must Know

1. The tongue receives afferent (sensory) innervation from branches emanating from **four** cranial nerves:
 - a. trigeminal (CN V) → mandibular (V_3) → lingual nerve
 - b. facial (CN VII) → chorda tympani (taste)
 - c. glossopharyngeal (CN IX) (taste plus general sensation)
 - d. vagus (CN X) → superior laryngeal nerve, internal branch
2. The tongue receives efferent (motor) innervation via the hypoglossal nerve (CN XII) with a small contribution from the vagus (CN X).
3. The upper esophageal sphincter (A.K.A. the cricopharyngeus muscle) is under voluntary control; motor innervation is through the glossopharyngeal nerve (CN IX).
4. Innervation to the larynx originates from branches of the vagus (CN X):
 - a. superior laryngeal nerve
 - b. recurrent laryngeal nerve

The tongue receives afferent innervation from various branches of four separate cranial nerves. These branches provide sensory input and taste. The anterior 2/3^{rds} of the tongue receives sensory input from the lingual branch of the mandibular nerve (V_3) – the third branch of the trigeminal nerve (CN V). Afferents supplying taste innervation to the anterior 2/3^{rds} of the tongue arise from the chorda tympani, a branch of the lingual branch of the facial nerve (CN VII). The posterior 1/3rd of the tongue receives both taste and sensory innervation from the glossopharyngeal nerve (CN IX). A small amount of sensory innervation at the base is from the internal branch of the superior laryngeal nerve, a branch of CN X.

Motor innervation of the tongue arises nearly entirely from the hypoglossal nerve (CN XII). Only the palatoglossus muscle receives motor innervation from the pharyngeal branch of the vagus nerve (CN X).

The pharynx receives motor innervation from the glossopharyngeal nerve (CN IX). Sensory innervation to the pharynx is from the pharyngeal plexus, which receives input from both cranial nerves IX and X.

The larynx receives both sensory and motor innervation from the superior and recurrent laryngeal nerves, branches of the vagus (CN X). The superior laryngeal nerve further branches into internal and external components: the internal branch provides sensory input to the larynx above the level of the vocal folds while the external branch provides motor innervation to the cricothyroid muscles only. The recurrent laryngeal nerve provides motor innervation to all of the intrinsic muscles of the larynx with the exception of the cricothyroids. It provides sensory innervation to the larynx below the level of the vocal cords as well a small portion of the upper trachea.

Additional Reading:

Netter, FH. *Atlas of Human Anatomy*. 5th ed. Philadelphia, PA: Saunders Elsevier. 2011:Plate 62.
Nagelhout, JJ, and Plaus, KL. *Nurse Anesthesia*. St. Louis: Elsevier, 2010:411