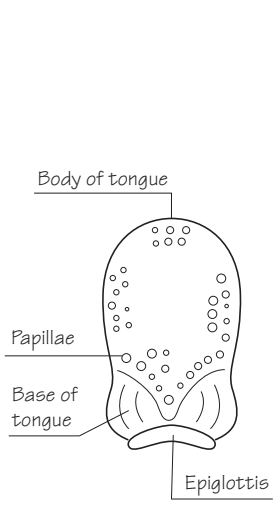
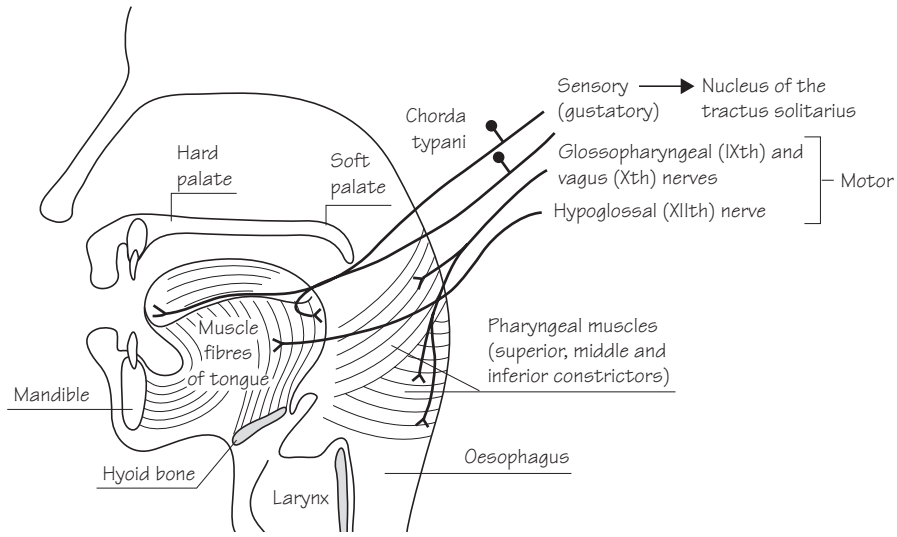
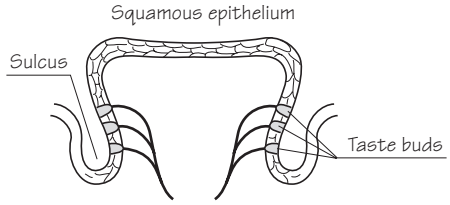
3 Tongue and pharynx



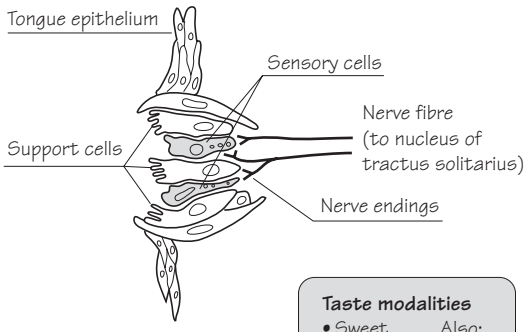


Papilla



Gustatory nerve fibres travel via chorda tympani branch of facial (VIIth cranial) and glossopharyngeal (IXth cranial) nerves

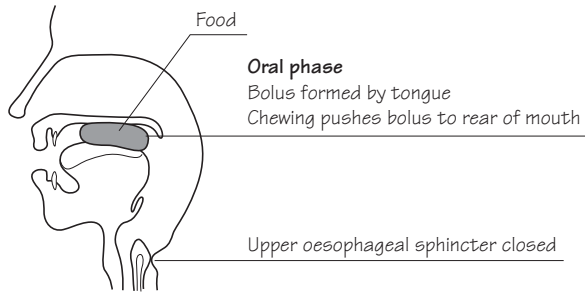
Taste bud

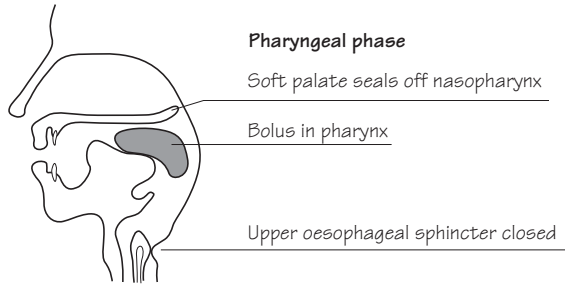


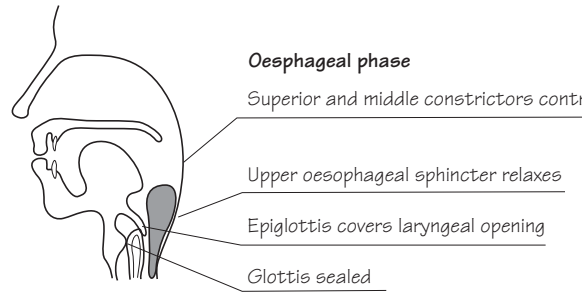
Taste modalities

• Sweet	Also:
• Salt	• Cold
• Sour	• Heat
• Bitter	• Pain
• 'Umami'	

Swallowing







The tongue and taste buds are an essential part of the mouth, involved in taste, chewing, talking and many other functions.

The tongue

The tongue is a powerful, mobile, muscular organ attached to the mandible and hyoid bone. The body is a flat, oblong surface with a longitudinal ridge along the top. It lies on the floor of the mouth and a thin membranous **frenulum** runs along the under surface in the mid-line anteriorly. Posteriorly, the root is formed from muscle fibres passing downward towards the pharynx and the epiglottis forms its posterior border.

The tongue is covered with a tough non-cornified stratified **squamous epithelium** continuous with the rest of the oral mucosa. On its upper surface it is thrown up into numerous **ridges and papillae**, creating a roughened surface to rasp and lick food. Papillae around the lateral and posterior edges contain numerous **taste buds**. These contain specialized **sensory cells** that communicate directly with **nerve endings** from sensory nerve dendrites. The sensory cells are surrounded and supported by adjacent epithelial cells. They express receptors for chemicals dissolved in **saliva** and each taste bud is sensitive to a single major modality.

The **hypoglossal** (XIIth cranial) **nerve** innervates the tongue muscle. Sensory fibres travel in the **glossopharyngeal** (IXth cranial) nerve and in the **chorda tympani** branch of the **facial** (VIIth cranial) nerve. Taste fibres terminate in the **nucleus of the tractus solitarius** in the mid-brain. The tongue also has a large representation in the **somatic** motor and sensory **cortex** of the brain.

Function

The tongue moves in all planes and reaches throughout the mouth. It **directs** food between the teeth, **retrieves** pieces stuck between the teeth and **clears** away obstructions. It **propels** food and drink posteriorly to initiate the pharyngeal phase of swallowing. The tongue is also crucial to **speech**, varying its shape and selectively closing off and opening air channels.

The major modalities of taste are **sweet**, **sour**, **salt** and **bitter,** and a fifth modality, called **umami**, typified by monosodium glutamate, is now also recognized. Taste **receptors** include G-protein-coupled receptors, ion channels and **cold**, **heat** and **pain** receptors. The flavour of food is a combination of taste and **smell**, which is sensed by a large family of G-protein-coupled olfactory receptors that bind to a myriad of different chemicals.

Common disorders

The tongue may be **paralyzed** by damage to the hypoglossal nerve or a stroke affecting its central connections. In **motor neuron disease**, spontaneous **fasciculations** are readily seen in the denervated tongue muscle.

The tongue may be affected by squamous cell carcinoma and herpes simplex infection (see Chapter 1). Occasionally the tongue may be pigmented, which is not pathological. **Glossitis**, manifest by a smooth, red, swollen, painful tongue occurs; for example, with B-vitamin deficiencies.

Dry mouth, or **xerostomia**, affects taste profoundly, as chemicals must be dissolved for the taste buds to function. Systemic diseases, such as **uraemia**, and drugs, such as **metronidazole**, may **alter taste** by interfering with the function of taste buds.

The pharynx

The pharynx is an air-filled cavity at the back of the nose and mouth, above the openings of the larynx and oesophagus. The walls of the oropharynx are lined by the same non-cornified stratified **squamous epithelium** that lines the oral cavity.

Superiorly, the floor of the sphenoidal air sinus and the skull base bound the **nasopharynx**. The soft palate can be drawn up, closing the connection between the nasopharynx and oropharynx.

The **oropharynx** is bounded posteriorly by tissues overlying the bodies of the upper cervical vertebrae and laterally by the **tonsils** and the openings of the **Eustachian tubes**, which connect the pharynx with the middle ear. Inferiorly it narrows into the **hypopharynx**.

Three straps of voluntary muscle surround the pharynx, overlapping each other and forming the **superior**, **middle and inferior constrictors**. The circular muscle of the upper oesophagus is continuous with the inferior constrictor.

Motor and sensory fibres mainly travel in the **glossopharyngeal** (IXth cranial) and **vagus** (Xth cranial) nerves.

Function

The pharynx is a conduit for air, food and drink, and **swallowing** requires coordinated action of the tongue, pharyngeal, laryngeal and oesophageal muscles, and is controlled by the **brainstem**, via the glossopharyngeal and trigeminal nerves.

The tongue forces a bolus of food backwards into the **oropharynx**, initiating a reflex that raises the soft palate, sealing off the **nasopharynx**, and inhibits respiration.

The superior and middle pharyngeal constrictors force the bolus down into the **hypopharynx**, and the **glottis** closes. The **epiglottis** is forced backwards and downwards, forming a chute over the **larynx**, opening onto the upper oesophageal sphincter.

The sphincter relaxes, allowing the bolus to enter the oesophagus. It is then conveyed downwards by peristalsis. The glottis reopens and respiration recommences.

Common disorders

The pharynx is critically important in ensuring that the upper airway is protected from **aspiration** of food, saliva and drink during swallowing and vomiting. Thus neurological disorders, including **stroke**, **motor neuron disease**, **myasthenia gravis** or reduced conscious level associated with **intoxication**, **anaesthesia** or **coma** can cause **aspiration** into the lungs, and **pneumonia**.

Upper respiratory tract infections often cause **pharyngitis** and may cause **tonsillitis**. Common pathogens include viruses, such as **influenza** and the Epstein–Barr virus, and bacteria, such as **streptococci**. Group A β-haemolytic streptococci may also cause **rheumatic fever**, a systemic autoimmune disorder that can affect the skin, heart and brain. **Diphtheria** is a serious cause of pharyngitis that is preventable by immunization.