

The Cranial Nerves of the Human Brain

Refer to figure 15-21a and b for an illustration of the cranial nerves. You should know this information on this handout for both the lecture and lab. For the lab, you will be expected to be able to identify each of the twelve cranial nerves as well. There is two of each cranial nerve, one for each side of the body.

Cranial nerve I: Olfactory nerve: The olfactory nerve is composed of axons from the olfactory receptors in the nasal sensory epithelium. It carries olfactory information (sense of smell) to the olfactory bulb of the brain. The olfactory nerve is usually lost when a brain is removed from the cranium. What you see when you look on a brain in the lab is the olfactory bulb and olfactory tract.

Cranial nerve II: Optic nerve: The optic nerve is composed of axons of the ganglion cells in the eye. It carries visual information to the brain. The axons that compose the optic nerve converge just below the hypothalamus to form the optic chiasm. In the chiasm the axons from the ganglion cells of the nasal portion of each retina cross to the opposite side. After passing through the chiasm the optic axons form the optic tract that enters the brain.

Cranial nerve III: Oculomotor nerve: The oculomotor nerve is composed of motor axons coming from motor neurons in the midbrain. It provides somatic motor innervation to four of the extrinsic eye muscles: the superior rectus, inferior rectus, medial rectus, and the inferior oblique muscles. It also provides somatic motor innervation to the muscles of the upper eyelid and supplies visceral motor innervation to the pupillary eye muscle via the ciliary ganglion.

Cranial nerve IV: Trochlear nerve: The trochlear nerve is composed entirely of motor axons coming from motor neurons in the brain at the transition between the midbrain and pons. The trochlear nerve is the only cranial nerve to come off of the brain just behind the inferior colliculus. It is the only cranial nerve to come off of the dorsal side of the brain. It provides somatic motor innervation to one of the eye muscle, the superior oblique muscle.

Cranial nerve V: Trigeminal nerve: The trigeminal is the largest cranial nerve. It is composed of both sensory and motor axons. It provides somatic sensory information (touch, pain, and temperature) from the face, forehead, nasal cavity, oral cavity including the tongue, gums and teeth. Its motor component provides somatic motor innervation to the muscles of mastication or “chewing. The cell bodies of the motor neurons of the trigeminal nerve lie in the pons. The cell bodies of the sensory component of the trigeminal nerve lie in the trigeminal ganglion.

Cranial nerve VI: Abducens nerve: The abducens nerve is a pure motor nerve. It carries somatic motor innervation to one of the extrinsic eye muscles, the lateral rectus muscle. The cell bodies of the abducens motor neurons lie at the transition between the pons and medulla oblongata.

Cranial nerve VII: Facial nerve: The facial nerve is composed of both sensory and motor axons. It carries somatic motor innervation to the muscles of facial expression. It provides visceral motor innervation to the lacrimal gland of the eye and salivary glands. The facial nerve carries somatic sensory information from the face (deep pressure sensation) and taste sensation from the anterior two thirds of the tongue. The cell bodies of the sensory component of the facial nerve lie in the geniculate ganglion. The cell bodies of the facial motor neurons lie in the medulla oblongata.

Cranial nerve VIII: Vestibulocochlear nerve: The vestibulocochlear nerve innervates the hair cell receptors of the inner ear. It carries vestibular information to the brain from the semicircular canals, utricle, and saccule providing the sense of balance. It also carries information from the cochlea providing the sense of hearing. The cell bodies of the VIIIth nerve lie in the vestibulocochlear ganglion.

Cranial nerve IX: Glossopharyngeal nerve: The glossopharyngeal nerve innervates the pharynx (upper part of the throat), the soft palate and the posterior one-third of the tongue. It is a mixed nerve, composed of both sensory and motor axons. It carries sensory information (touch, temperature, pain, and pressure) from the pharynx and soft palate. It carries taste sensation from the taste buds on the posterior one third of the tongue. It provides somatic motor innervation to the throat muscles involved in swallowing. It provides visceral motor innervation to the parotid salivary gland. The motor neurons of the IXth cranial nerve lie in the medulla oblongata, and the cell bodies of the sensory component lie in the glossopharyngeal nerve.

Cranial nerve X: Vagus nerve: The vagus nerve is consists of many rootlets that come off of the brain just behind the glossopharyngeal nerve. It consists of both a sensory and motor component that innervate many structures in the throat, thorax and abdominal cavity. It provides somatic sensory information (touch, temperature, and pressure) from the external auditory meatus (ear canal) and a portion of the external ear, as well as from the visceral organs of the thorax and abdomen the esophagus, respiratory tract, and abdominal viscera (stomach, intestines, liver, etc.). It carries taste sensation from taste buds in the pharynx. It provides visceral motor innervation to the heart, stomach, intestines, and gallbladder. The vagal motor neurons are located in the medulla oblongata. The cell bodies of the sensory component are located in two vagal ganglia.

Cranial nerve XI: Accessory nerve: The accessory nerve is a pure motor nerve. It provides somatic motor innervation to some of the muscles in the throat involved in swallowing, and to the muscles of the vocal cords. It also provides somatic motor innervation to the trapezius muscles. Its motor neurons lie in the medulla and rostral spinal cord.

Cranial nerve XII: Hypoglossal nerve: The hypoglossal nerve is a pure motor nerve. It provides somatic motor innervation to the muscle of the tongue. The motor neurons of the hypoglossal nerve lie in the medulla oblongata.