

# NERVI CRANIALES

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- 12 pairs of nerves.
- It either goes to innervation areas from brain or comes to brain from innervation areas passing through openings on the skull base.

EASY WAY TO  
**REMEMBER**  
CRANIAL NERVES

# NERVI CRANIALES

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1. Nn .olfactorii
  2. N. opticus
  3. N. oculomotorius
  4. N. trochlearis
  5. N. trigeminus
  6. N. abducens
  7. N. facialis
  8. N. vestibulocochlearis
  9. N. glossopharyngeus
  10. N. vagus
  11. N. accessorius
  12. N. hypoglossus
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# I. Nervi olfactorii (Sense of Smell)

- The animals having a good sense of smell (**macrosmatic**), having a poor sense of smell (microsmatic).
- The receptor cells of smell (**bipolar olfactory neurons - 1st neuron**) locate in olfactory mucosa in the olfactory region of nasal cavity. Because of that these cells are directly related with outdoor.
- The dendrites of the receptor cells responsible for the detection of odorants.
- The **unmyelinated axons** of the receptor cells constitutes the olfactory nerve that passes through the cribriform plate of ethmoid bone and tranmits information about odor to olfactory bulb of the brain.

# I. Nervi olfactorii (Sense of Smell)

- Olfactory bulb is located in the rostro-ventral part of the forebrain. It contains two types of interneurons (**2nd neurons**); Mitral cells and Tufted cells.
- The axons (olfactory nerve fibers) synapse with the dendrites of mitral cells.

# I. Nervi olfactorii (Sense of Smell)

- The axons of the Mitral cells form the olfactory tract and transmits the nerve input to the other brain parts.
- Olfactory tract divides into lateral and medial olfactory stria that goes to primary and secondary olfactory cortex (piriform lobe, entorhinal cortex, amygdala, hippocampus and hypothalamus).

## II. Nervus opticus (Sense of Vision)

- Photoreceptor cells (rods and cones) of the Retina transcribes the light into the electrical impulses.
- The bipolar neurons (**1st neuron**) of Retina perceive the impulses.
- They synapse onto the multipolar ganglion cells (**2nd neurons**) of Retina.
- The myelinated axons of the retinal ganglion cells form the optic nerve that transmits visual information from the retina to the brain.

## II. Nervus opticus (Sense of Vision)

- The optic nerve leaves the orbit via the optic foramen, running caudo-medially towards the optic chiasm, where there is a partial decussation (crossing) of fibres from the nasal visual fields of both eyes. (Temporal visual field fibers don't cross)
- The proportion of decussating fibers varies between species, and is correlated with the degree of binocular vision enjoyed by a species (human %55, cat %65, dog %75)
- By the way of the crossing, the corresponding halves of the field of view (right and left) are sent to the left and right halves of the brain, respectively, to be processed.

## II. Nervus opticus (Sense of Vision)

- After the optic chiasm, the fibres called as optic tract enter the brain.
- Most of the fibres (90%) go to lateral geniculate nucleus (**3rd neuron**) in the thalamus. The neurons of the Lateral geniculate nucleus then relay the visual image to the primary visual cortex which is located in the occipital lobe (gyrus linguais and calcarine groove) (**4th neuron**).
- The others go to rostral collicle (visual reflex area) and pretectal area (pupillar reflex area)



# III. Nervus oculomotorius

- The oculomotor nerve is related with the eye movement, pupil constriction and accommodation. It contains motor and parasympathetic fibers. The nuclei of these fibers (**1st neuron**) are located in Mesencephalon. The fibers combine and originate from cerebral peduncles and enter the orbit via orbital fissure (for. orbitarotundum in ru.).
- Inside the orbit, the fibers separate into two main branches; **Ramus dorsalis and Ramus ventralis.**

# III. Nervus oculomotorius

- **Ramus dorsalis** (motor fibers) ;

M.levator palpebrae superioris, m.rectus dorsalis and medial portion of m.retractor bulbi are innervated by.

- **Ramus ventralis** (motor and parasympathetic fibers) ;

Motor fibers innervate m.rectus medialis, m.rectus ventralis and m.obliquus ventralis.

Parasympathetic fibers go to ganglion ciliare, synaptic area for the parasympathetic fibers of oculomotory nerve.

# III. Nervus oculomotorius

- **Ciliary Ganglion** (parasympathetic ganglion) ;
  - It is located on the lateral side of optic nerve in the orbit.
  - From the ciliary ganglion, postganglionic fibers pass through the short ciliary nerve to the constrictor pupillae muscle of the iris (for miosis) and the ciliary muscles (for accommodation of the lens).

## IV. Nervus trochlearis

- The trochlear nerve is thinnest cranial nerve contains motor fibers that innervates only a single muscle: the dorsal oblique muscle of the eye, which operates through the pulley-like trochlea.
- It emerges from tectum of mesencephalon (between caudal collicles and rostral velum)
- It is the only cranial nerve that exits from the dorsal (rear) aspect of the brainstem. Because of that it has the longest intracranial length.
- The fibers enter the orbit via orbital fissure and innervate M.obliquus dorsalis. **\*\*\*Trochlea\*\*\***

# V. Nervus trigeminus

- The largest cranial nerve contains motor and sensory fibers.
- Motor fibers emerge from pons. Sensory fibers are the central arms of trigeminal ggl. neurons.
- The axons (peripheric arms) of sensory neurons (in ggl.trigeminale) bring the information as three main branch (n.opthalmicus, n.maxillaris and n.mandibularis). From the trigeminal ganglion a single, large sensory root enters the brainstem at the level of the pons.
- The axons of motor fibers (motor root) emerges from pons, pass through and innervates the masticatory muscles inside the mandibular nerve after trigeminal ggl.  
**\*\*\* The ophthalmic and maxillary nerves are purely sensory, and the mandibular nerve has sensory and motor functions\*\*\***
- **Ganglion trigeminale** ; Located on pyramis of temporal bone. The ganglion contains pseudounipolar sensory neurons. The peripheric arms are the n.opthalmicus, n.maxillaris and n.mandibularis while the central arm is the sensory root of trigeminal nerve.

# n.ophthalmicus

- It has three subbranches (N.lacrimalis, n.frontalis and n.nasociliaris) take the general sense of frontal, orbital and nasal regions.
- N.ophthalmicus enters the cranial cavity via fissura orbitalis and goes to ganglion trigeminale.

# n.maxillaris

- It has three main subbranches (N.zygomaticus, n.pterygopalatinus and n.infraorbitalis) takes the general sense of maxillary region (upper jaw, upper lips, upper teeth and palate).
- The subbranches combine at fossa pterygopalatina as maxillary nerve and enters the cranial cavity via fissura orbitalis and goes to the ganglion trigeminale.

# n.mandibularis

- It has seven subbranches (buccal, lingual, inferior alveolar...) that can contain both sensory and motor fibers. Sensory fibers take the general sense of mandibular area (lower lips, lower jaw, lower teeth, bucca, ear and anterior part of the tongue).
- Motor fibers innervate the chewing muscles except the caudal portion of digastric muscle
- The subbranches are combine and enter the cranial cavity via For.lacerum and goes to ggl.trigeminale.



# VI. Nervus abducens

- It contains motor fibers, arise from trapezoid body of medulla and enters the orbit via orbital fissure.
- The fibres innervate M.rectus lateralis and lateral part of M.retractor bulbi.

# VII. Nervus facialis

- It arises from ventro-lateral part of Medulla oblongata, enters the facial canal via Meatus acusticus internus and delivers from for.stylomastoideum to the face.
- Facial nerve is a mix nerve contains Motor, sensory and parasympathetic fibers.
- **Motor fibers**; innervate the facial (mimic) muscles and anterior portion of digastric muscle
- **Parasympathetic fibers**; has two main branches.

Some of them goes to ggl.pterygopalatinum as n.petrosus major (preganglionik parasympathetic). After synapse, postganglionic fibers innervate the nasal and lacrimal glands.

The others go to ggl. mandibulare as chorda tympani. After synapse, postganglionic fibers innervate mandibular and sublingual salivary glands.

- **Sensory fibers**; are the axons of bipolar cells located in Ggl.geniculi. The fibers takes the taste sense of anterior part of the tongue (n.lingualis and chorda tympani) and general sense of external acustic meatus and soft palate. Central arms of the neurons enter the brainstem as n.intermedius.

## **VIII. Nervus vestibulocochlearis (Sense of Hearing and Balance)**

- **This is the nerve along which the sensory cells (the hair cells) of the inner ear transmit information to the brain. It consists of the cochlear nerve, carrying information about hearing, and the vestibular nerve, carrying information about balance.**

## **VIII. Nervus vestibulocochlearis (Cochlear nerve – Sense of Hearing)**

- **Special receptor cells of the organ of Corti on the Cochlea of inner ear are responsible for the taking and transduction of the sound to the impulses.**
- **The dendrites of bipolar neurons of spiral ganglion in Modiolus takes the impulses of hearing.**
- **The axons of bipolar neurons (n.cochlearis) go to bulbus of brain via meatus acusticus internus.**
- **The synaptic fibers extend from bulbus to caudal collicles and medial geniculate body of thalamus.**
- **The fibers of medial geniculate nucleus go to the primary auditory cortex in temporal lobe**

## **VIII. Nervus vestibulocochlearis (Vestibular nerve - Sense of Balance)**

- **The receptors in Utriculus, Sacculus and Semicircular canals of inner ear are responsible for the taking of equilibrium.**
- **The dendrytes of bipolar cells in the vestibular ganglion that are located in Meatus acusticus internus.**
- **The axons of bipolar neurons (n.vestibularis) enters the trapezoid body of the brain via meatus acusticus internus.**
- **Most of the fibers go to cerebellum, and the others extend through thalamus to gyrus postcentralis.**

# IX. Nervus glossopharyngeus

- It arises from ventro-lateral part of Medulla oblongata, passes from for.lacerum or for.jugulare.
- Glossopharyngeal nerve is a mix nerve contains Motor, sensory and parasympathetic fibers.
- **Motor fibres** innervate the pharyngeal muscles.
- **Parasympathetic fibers** go to ggl.oticum.  
After synapse, postganglionic fibers innervate parotid salivary gland.
- **Sensory fibers** are the axons of ggl.proximale et distale. They take the taste sense of caudal portion of the tongue and general sense of soft palate.

# X. Nervus vagus

- The longest cranial nerve arises from ventro-lateral part of Medulla oblongata.
- Vagus nerve is a mix nerve contains Motor, sensory and parasympathetic fibers.
- Motor fibers innervate the muscles of pharynx, larynx and soft palate.
- Parasympathetic fibers innervate thoracic and cranial abdominal internal organs (esophagus, stomach, intestines (except descending colon and rectum), trachea, bronchus and heart)
- Sensory fibers are the axons of ggl.proximale. The fibers take taste sense of soft palate and general sense of outer ear, pharynx, larynx, lung, heart, esophagus.

## **N.VAGUS**

- **Emerges from ventrolateral part of bulbus, pass through for.lacerum (or for.jugulare).**
- **Gives n.laryngeus cranialis on the neck (the subbranch n.depressor goes to plx cardiacus and provides the parasympathetic innervation of the heart).**
- **Extends along with sympathetic trunk and covered by a carotid sheat. \*\*\*Tr.vagosympathicus\*\*\***
- **Enters the thoracal cavity and gives rise to the recurrent laryngeal nerve, which hooks around the aortic arch and ascends into the neck between the trachea and esophagus.**
- **Contributes to cardiac, bronchal and eosophageal plexus.**
- **Divides two main root as dorsal and ventral vagal trunks.**
- **Tr.vagalis dorsalis et ventralis pass through hiatus esophageus, enters the abdomen and contributes plexus coeliacus.**



# XI. Nervus accessorius

- It contains motor fibers. The fibers emerge from bulbus, pass through jugular foramen.
- The fibres innervates the muscle of the neck.

## XII. Nervus hypoglossus

- It contains the motor fibers of the all tongue muscles.
- The fibers arise from the bulbus and pass from canalis nervi hypoglossi.