Central nervous system role in regulation of physiological functions of oral cavity.

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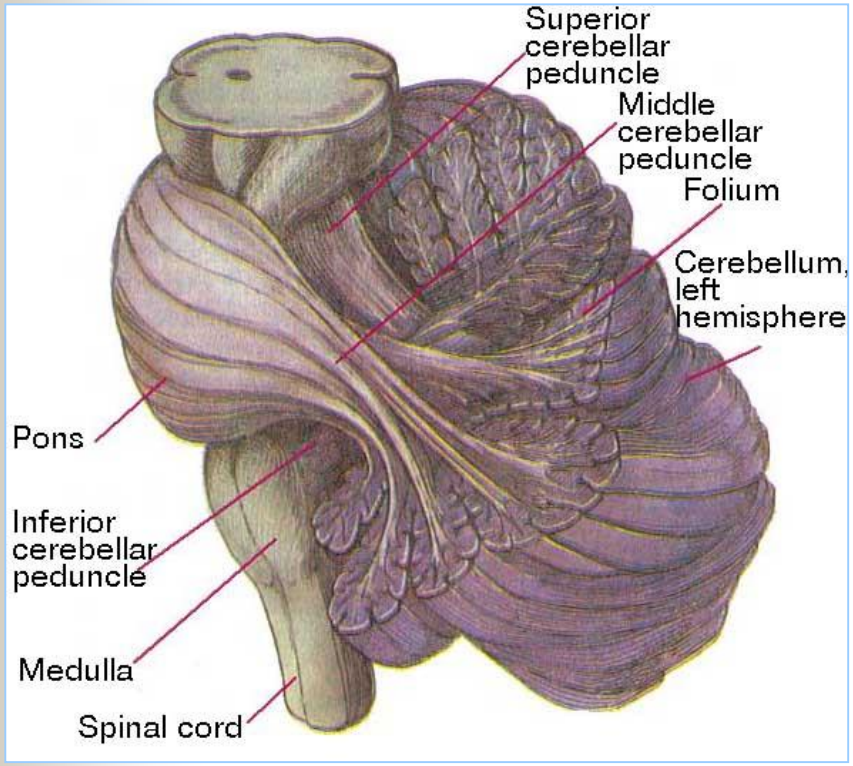
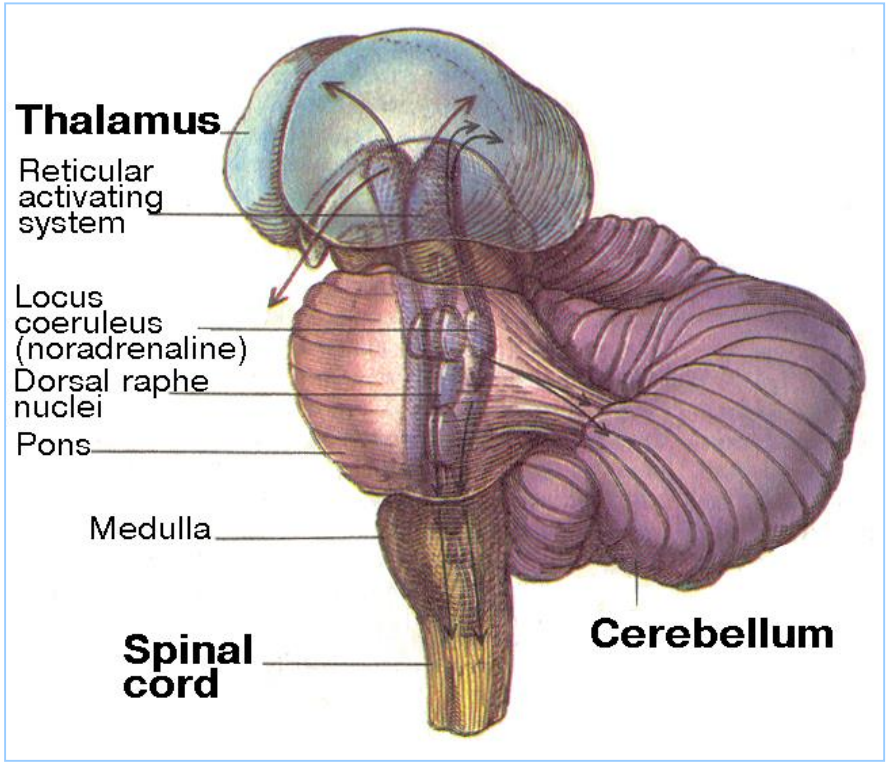
Brainstem: mesencephalon, pons cerebri, myelencephalon (medulla oblongata), reticular formation.



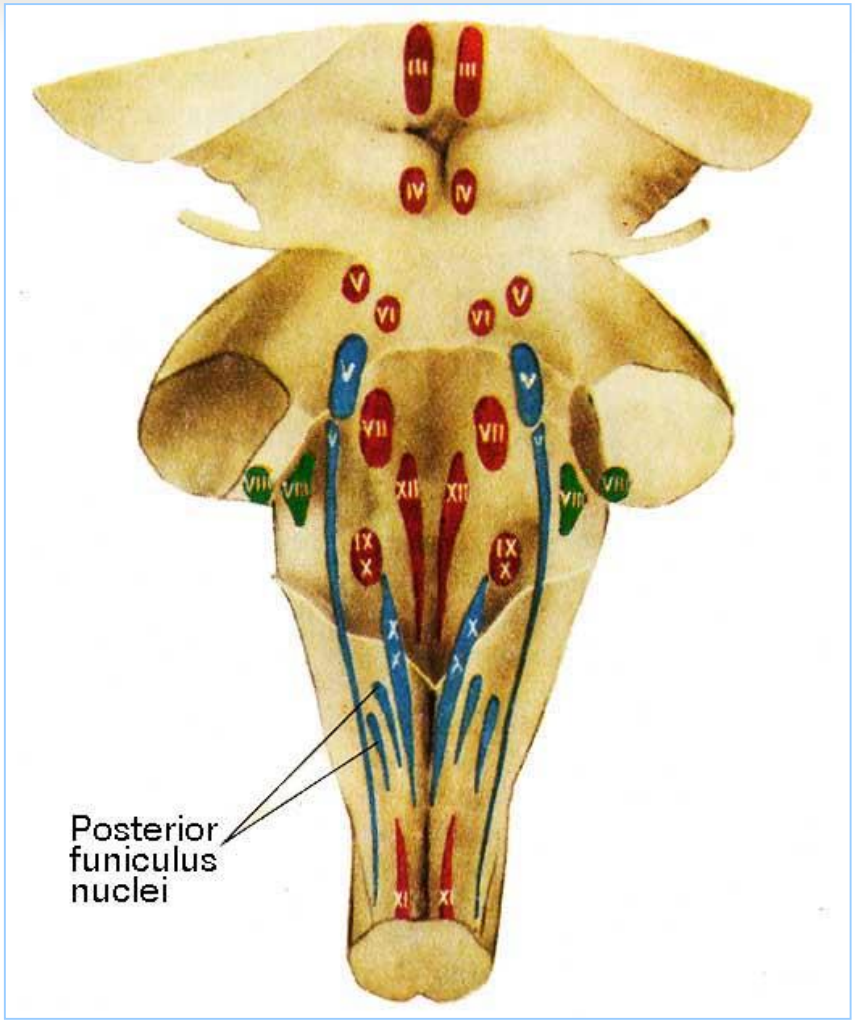


The cerebellum is connected: with upper pedunculi with a mesencephalon, with middle - with Varolli pons, with inferior - with medulla oblongata.

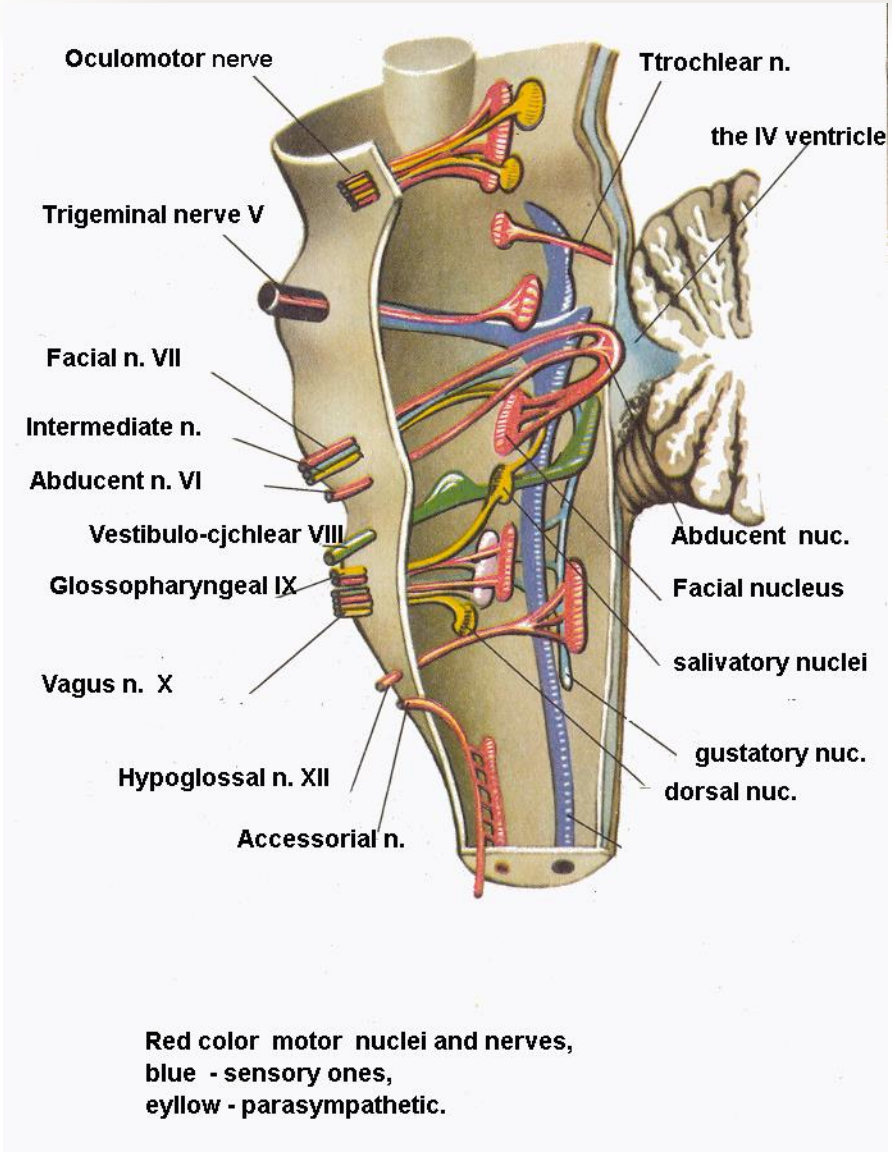
Motor nuclei of cranial nerves are similar to anterior horn of a spinal cord, sensory – to the posterior ones.

Base and tegmentum are distinguish here.

Descendant pathways are in the base. Cranial nerves nuclei and reticular formation are in tegmentum.



Localization of cranial nerve nuclei, anteroposterior projection.
Motor nerve nuclei mark red, sensory nerve nuclei mark blue, vestibulocochlear nerve nuclei mark green.

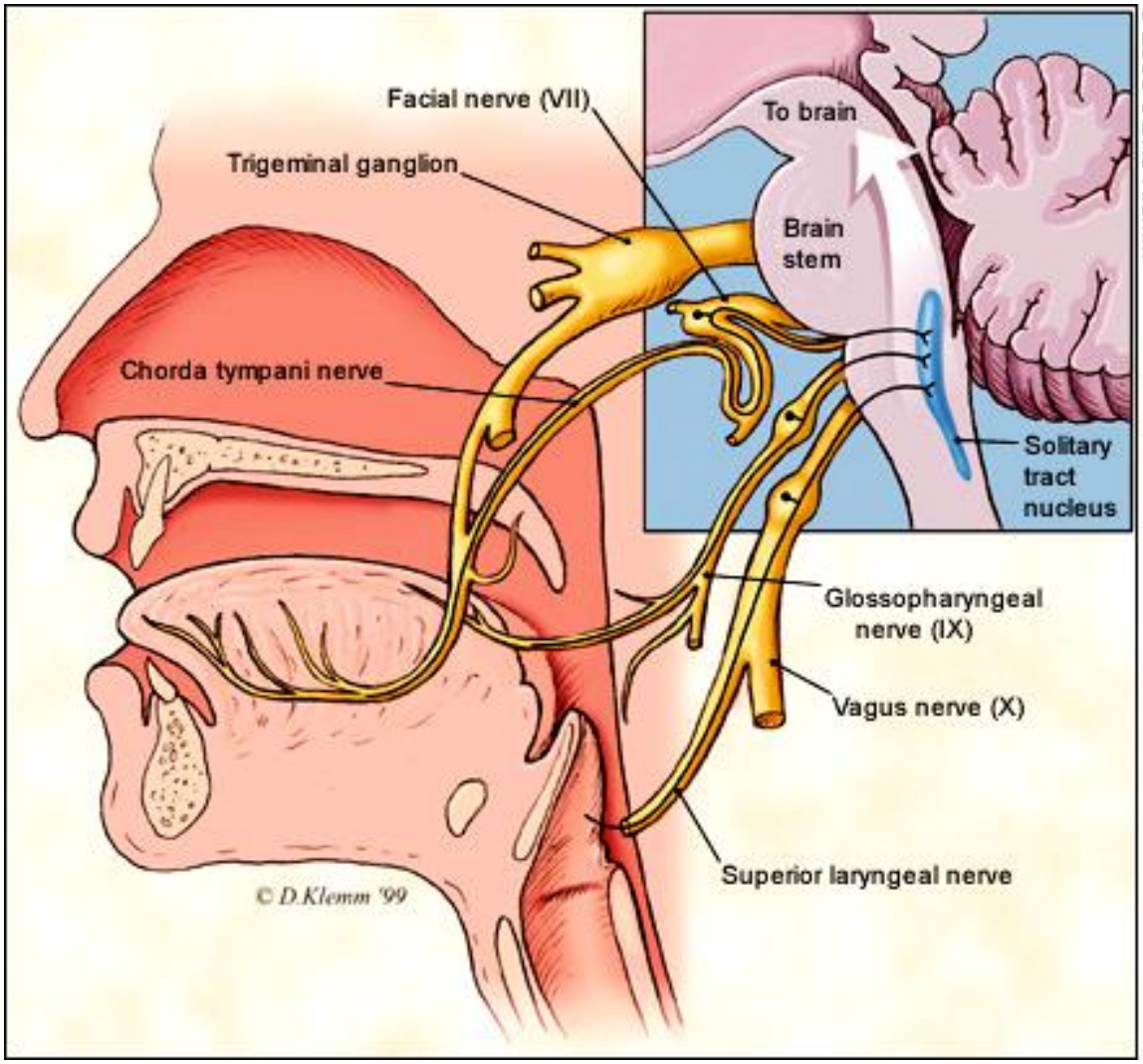


Red color motor nuclei and nerves,
blue - sensory ones,
eyllow - parasympathetic.

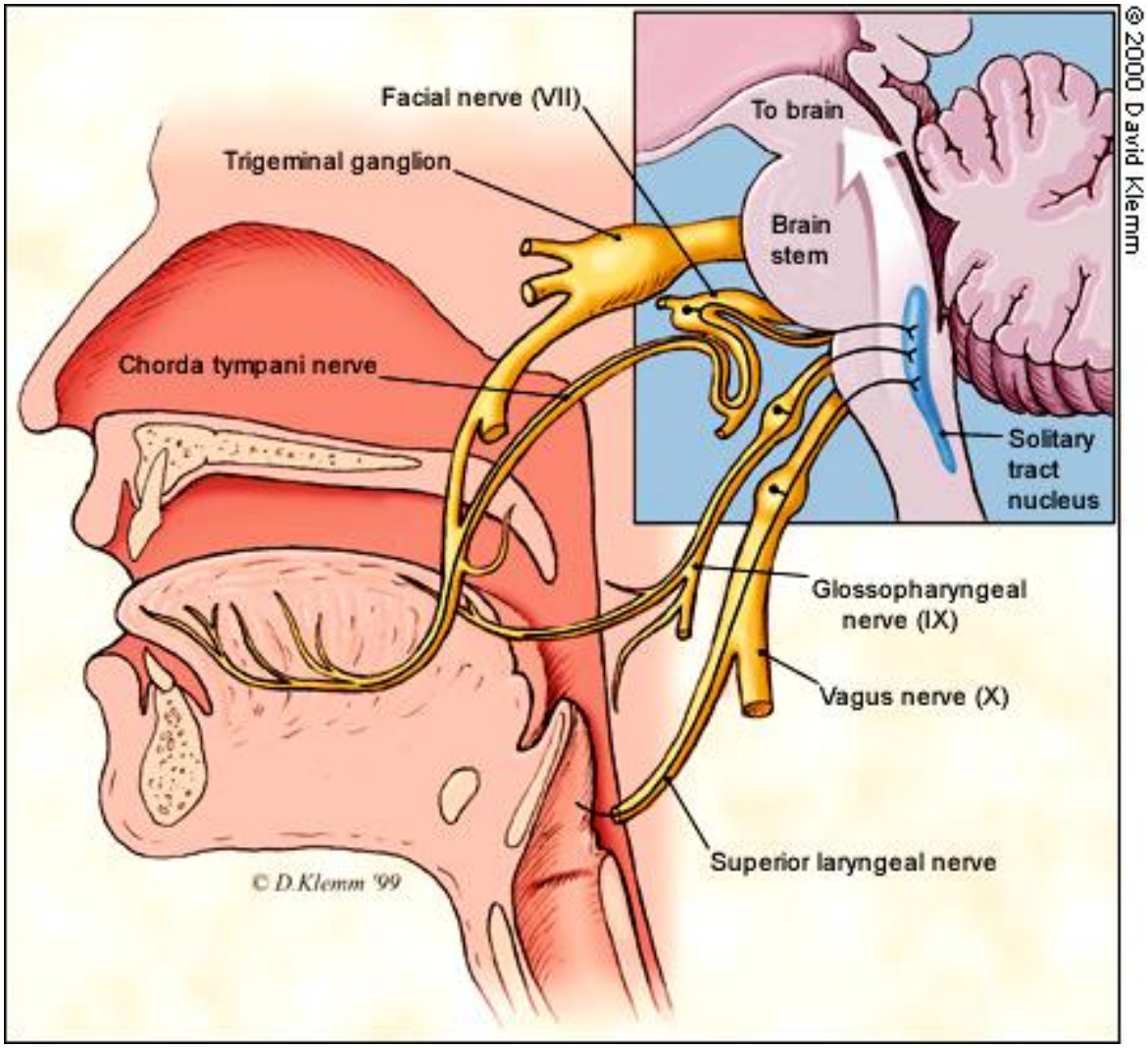
Metencephalon (posterior brain) consists of medulla oblongata and pons varolii.

Medulla oblongata repeats spinal cord structure. It represents nuclei and conductive pathways. The inferior edge is decussation of pyramids (first cervical segment). Cranial nerves nuclei which perform afferent and efferent innervation of a head and visceral (inner) organs are located here.

- **Hypoglossal nerve (XII pair) nucleus** innervates muscles of tongue.



- **Vagus (X pair) nucleus** is mixed: motor nucleus controls contraction of muscles of a pharynx and larynx at respiration, sensory and vegetative nuclei realize parasympathetic innervation of heart and alimentary tract.
- **Glosso-pharyngeal nerve (IX pair)** is mixed:
  — motor nuclei control muscles of an oral cavity and pharynx,
  — sensory nuclei realize innervation from gustatory papillas of a back third of tongue,
  — vegetative nuclei innervate parasympathetic ganglions of salivary glands.

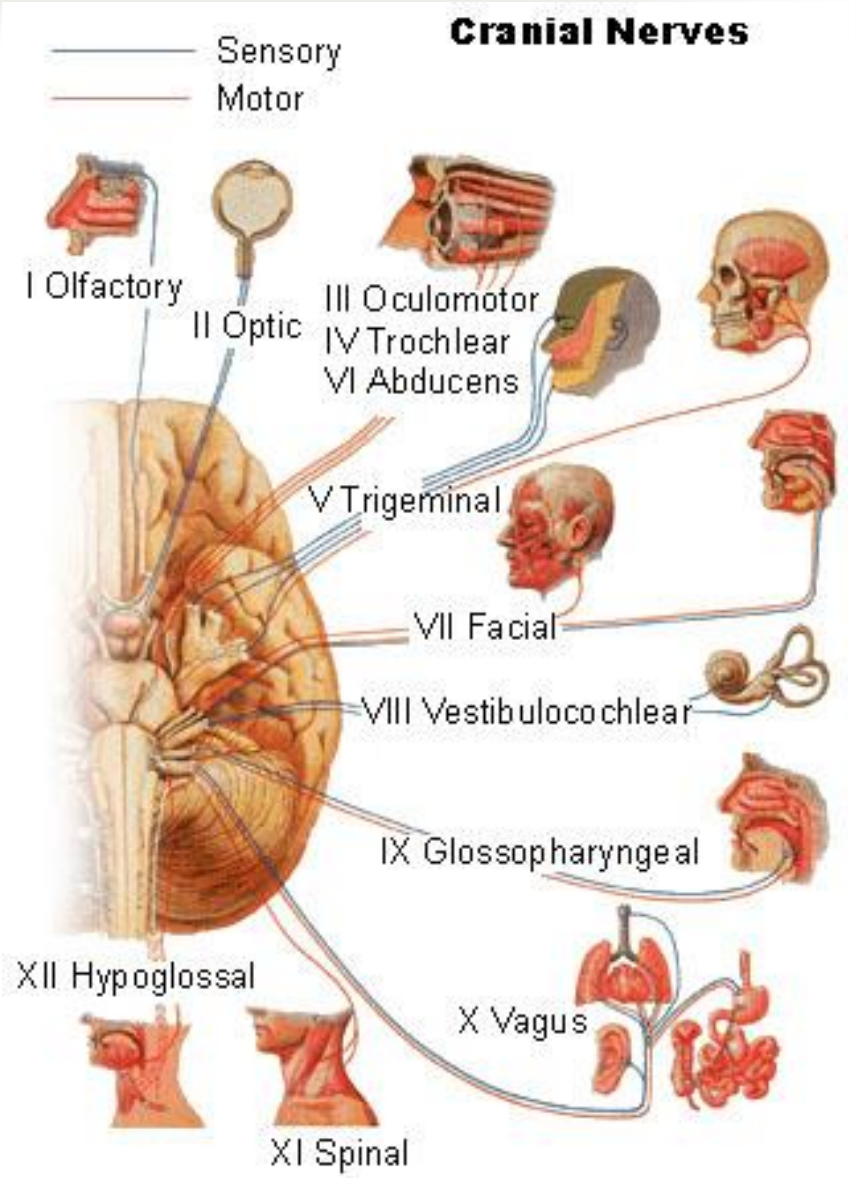


Lesion of a brainstem due to bulbar paralysis

- *The lesion of a hypoglossal nerve leads to speech disturbance which call* ***dysarthria****.*
- *Two-sided lesion of IX, X nerves nuclei result in loosing of pharyngeal and palatal reflexes, the swallowing is broken -* ***dysphagia*** *is observed.*
- *The paralysis of muscles of larynx results to hoarse vote. It is* ***dysphonia.***
- **Bulbar paralysis (peripheral)** – at a lesion nuclei, roots, trunci of the IX, X, XII nerves an atrophy of tongue, muscles of pharynx, soft palate, fibrillar oscillations are observed; pharyngeal reflexes get decreased.

Such structures are located on the boarderline between medulla oblongata and pons cerebri:

- **Vestibulo-cohlear nerve (**VIII pair**) nuclei**.
- Nerve consists of cochlea nerve and vestibular nerve. **Cochlea nerve** terminate in cochlear nuclei. V**estibular nerve** terminate in nuclei of Shwalbe, Deuters, Behterev. Vestibulo-spinal tract is origined from Deuters' nucleus.



In pons reticular formation lateral part:

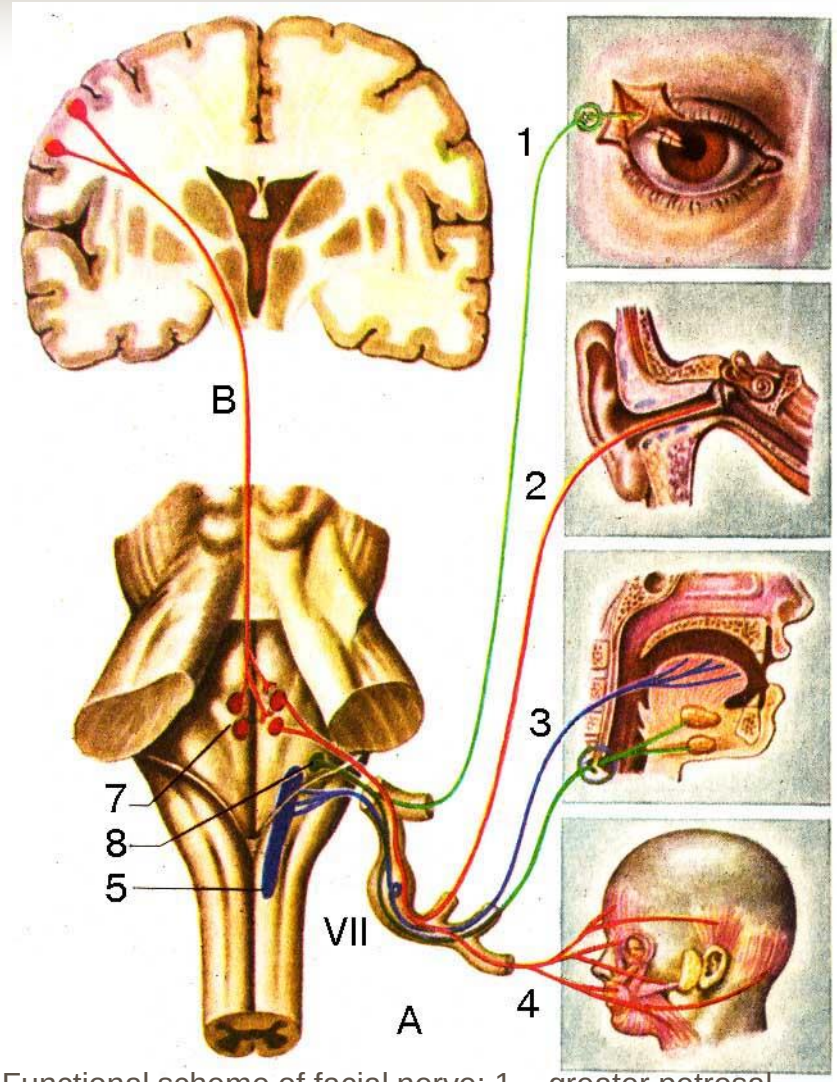
- **Facial nerve nucleus (VII pair).**

This nerve is mixed, it innervates mimic musculature, muscle of an auricle, stapedius muscle, hypodermic muscle of neck.

Sensory fibers conduct information from anterior part of tongue. Vegetative fibers innervate submandibular and sublingual salivary glands, lacrimal gland fibers.

Lesion of facial nerve is hypoactivity of lacrimal gland and xerophthalmia, unpleasant enforced sound perception, flaccid (peripheral) paralysis of mimic muscles.

- **Abducent nerve (VI pair)** innervates muscles moving an eyeball.



Functional scheme of facial nerve: 1 – greater petrosal nerve, 2 –stapedial nerve, 3 – tympanichord, 4 – facial nerve, 5 – solitary pathway nucleus (gustatory nucleus), 6 – upper salivatory nucleus, 7 – facial nerve nucleus, 8 – corticonuclear tract.

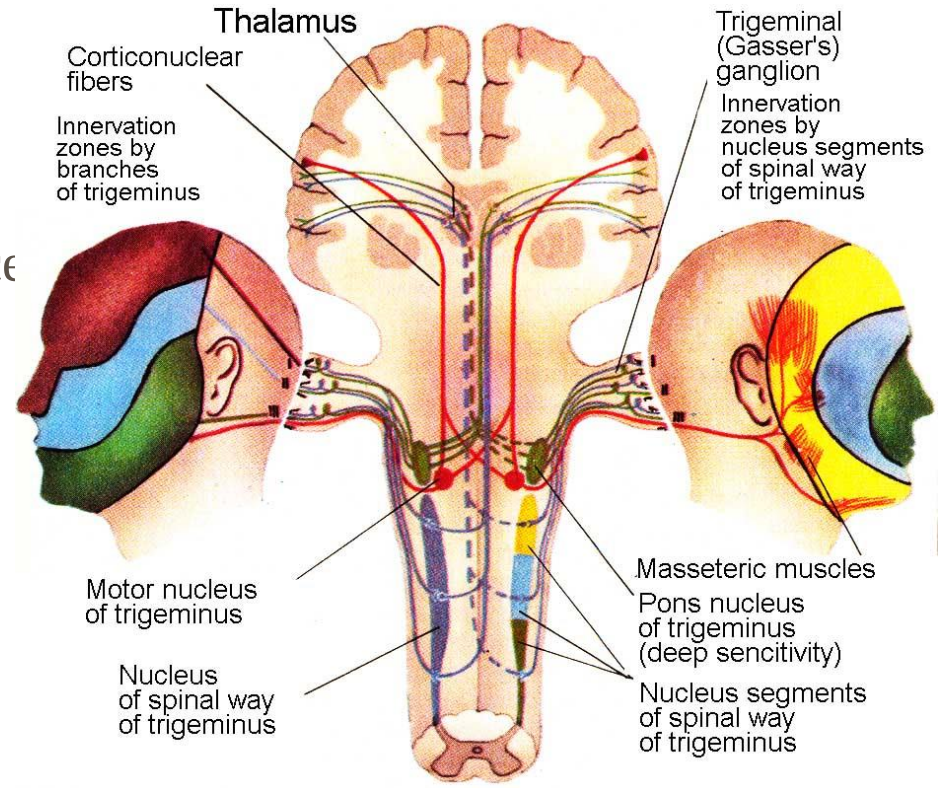
- **Trigeminal nerve** (V pair) is mixed. It conducts sensitivity information from face skin, head hairy area anterior part, nasal and oral cavity, tongue, eyeball, cerebral sheathes and realizes motor innervation of masseters.

  Trigeminal node lays on anterior surface of a pyramid of a temporal bone.

- *There are **three branches of a trigeminal nerve:***

  Ophthalmic nerve conducts signals from skin of forehead, anterior hairy of head, upper eyelid, interior angle of an eye and dorsum of nose.

  Maxillary nerve conducts sensitivity from skin of inferior eyelid, external angle of an eye, top of cheeks, upper lip, maxilla and its teeth.



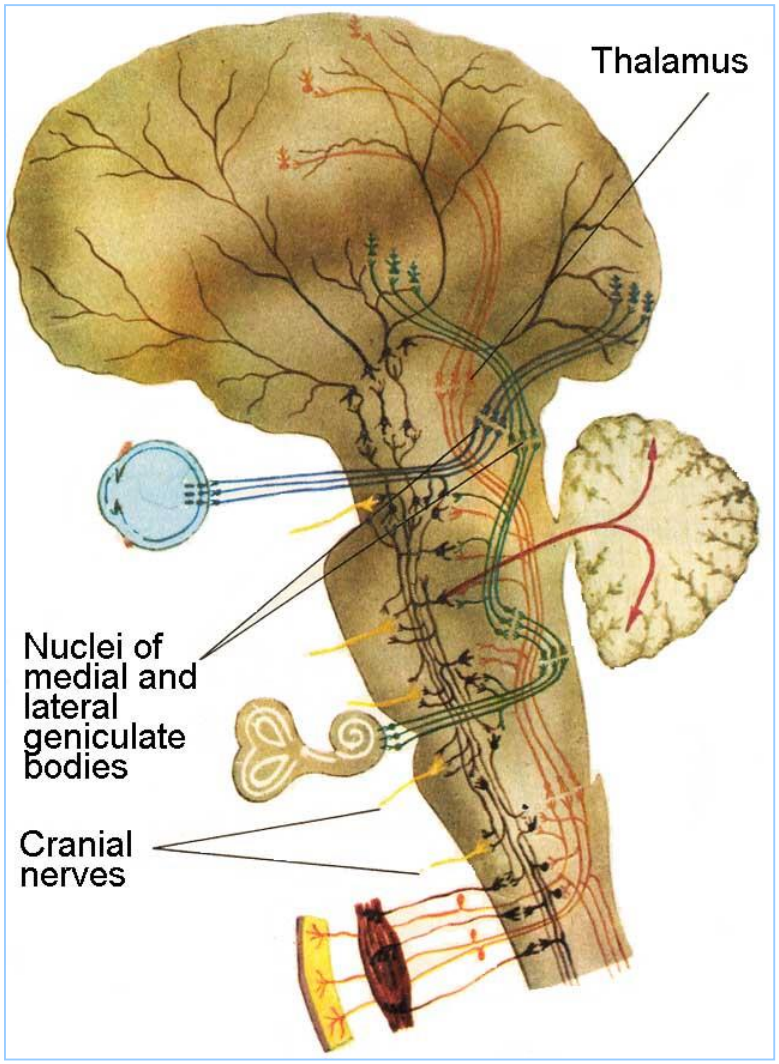
- Nuclei of **fascicle of Goll** and **fascicle of Burdach** are located in metencephalon.
- These pathways carry information from tactile receptors and proprioreceptors. They inform about position of a body in space.

Functions of reticular formation of metencephalon

- It is located in dorsal part of medulla oblongata and pons, in a hypothalamus and brain cortex. Such centers are intimately connected to it:

  circulation of the blood and **respiration**,

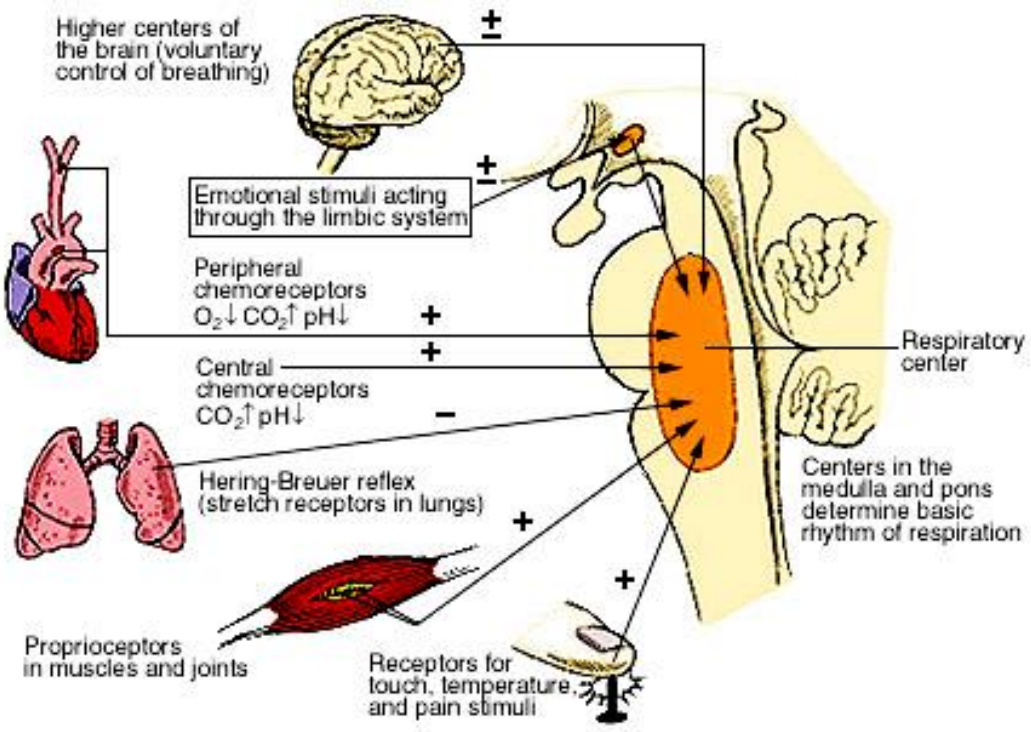
  vasomotor center (floor of the IV-th ventricle) which have **pressor** and **depressor** parts.
- The stimulation of vasomotor center causes augmentation of vascular tone, rising of blood pressure, tachycardia.



Respiratory center is localized in a medial part of reticular formation of medulla oblongata; it consists of **expiratory** and **inspiratory** parts. It is capable to automatism.

Periodicity of its work is controlled by **pneumotaxic center**, which is located in Varolii pons area.

Nuclear group of **reticular formation** provides consciousness, dream and wakefulness. It performs functional coordination of ascendant and descendant functional systems of brain by means of mental, somatic and vegetative-visceral components of activity integration.

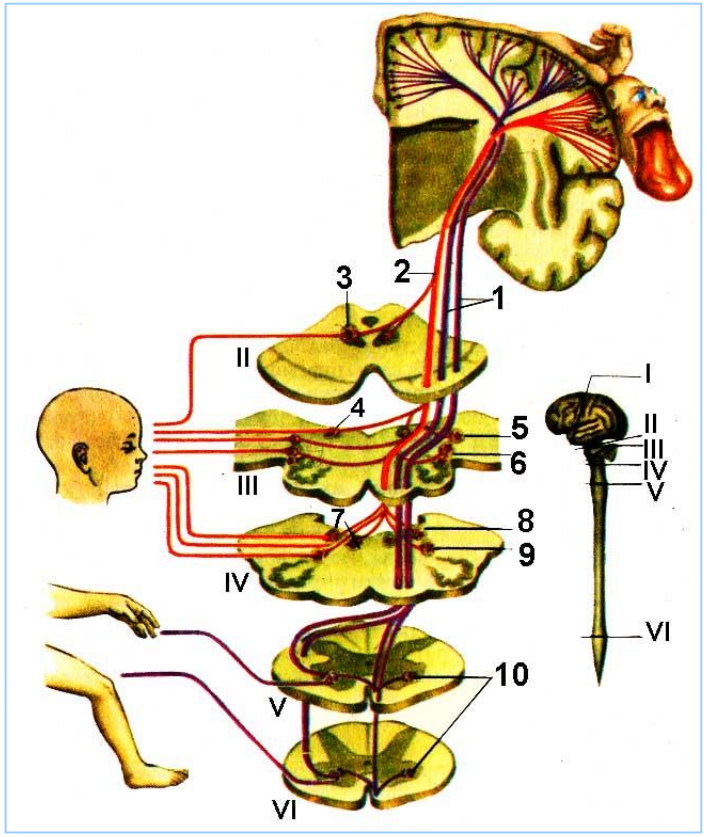


Corticonuclear tract

(it is part of pyramidal system)

From the inferior third of anterior central gyrus (1-st neuron) the fibers go in a genu of internal capsule and mesencephalon. In a brainstem the pathway comes to an end at motoneurons of cranial nerves motor nuclei. The fibers are crossed particularly.

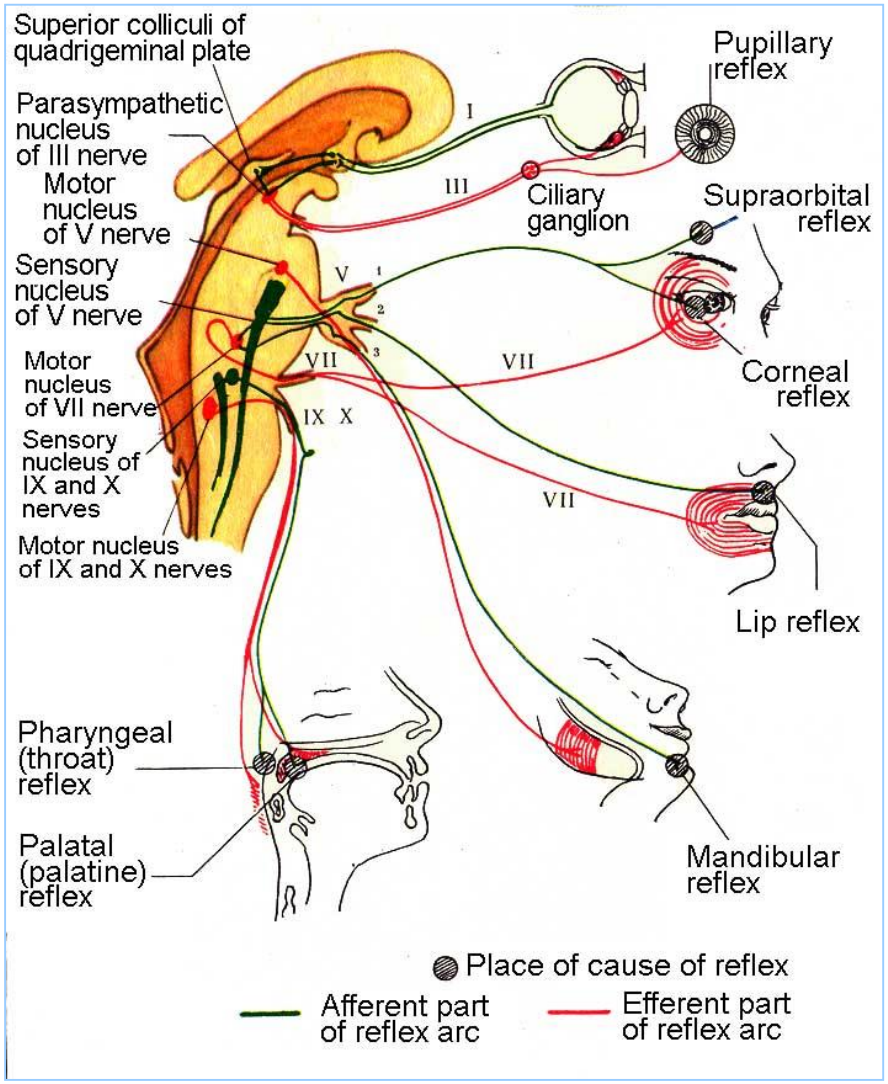
There is complete decussation of fibers going to facial and sublingual nerves nuclei inferior part. They receive impulses from opposite brain hemisphere.



Corticospinal and corticonuclear tracts.
I – coronal section of brain at internal capsule level; II – midbrain; III – pons; IV – medulla;V – cervical intumescence of spinal cord; VI – lumbar intumescence of spinal cord.
1 – corticospinal (pyramidal) tract; 2 – corticonuclear tract; 3 – nucleus of oculomotor nerve; 4 – nucleus of abducent nerve; 5 – motor nucleus of trigeminus; 6 – nucleus of facial nerve; 7 – nucleus of sublingual nerve; 8 – ambiguous nucleus;9 – nucleus of accessory nerve; 10 – motoneurons.

Reflexes of posterior brain

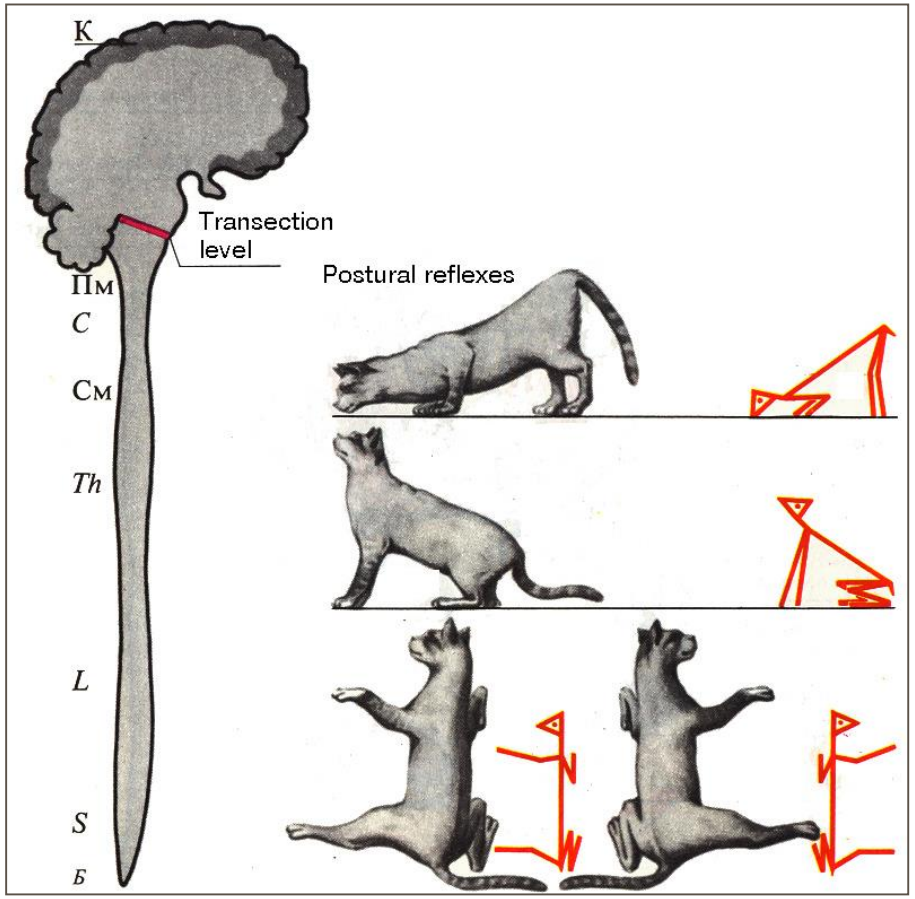
- **Corneal, superciliar, conjunctival, mandibular** reflexes are performed by pons through trigeminal and facial nerves.
- **Pharyngeal, palatal** reflexes are performed by medulla oblongata through glossopharyngeal and vagal nerves.



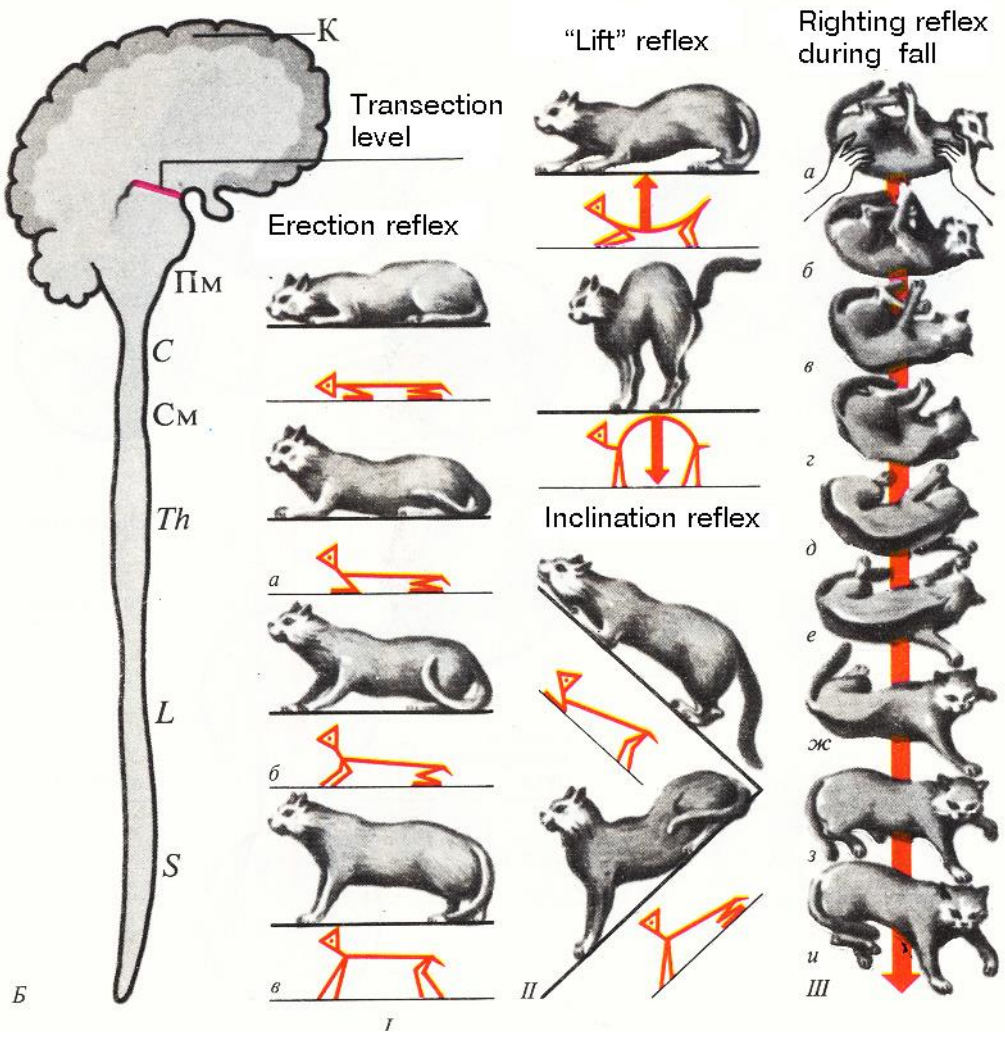
Posterior brain reflexes

directed to maintenance of a posture

- **Cervical tonic reflexes** appear under excitement of neck muscles proprioreceptors. Extensors tone is increased under head movement back.
- **Vestibular static reflexes** are observed under excitement of receptors of a membranous labyrinth vestibule. They provide maintenance of a posture and equilibrium of a body (reflexes of location and of erection.

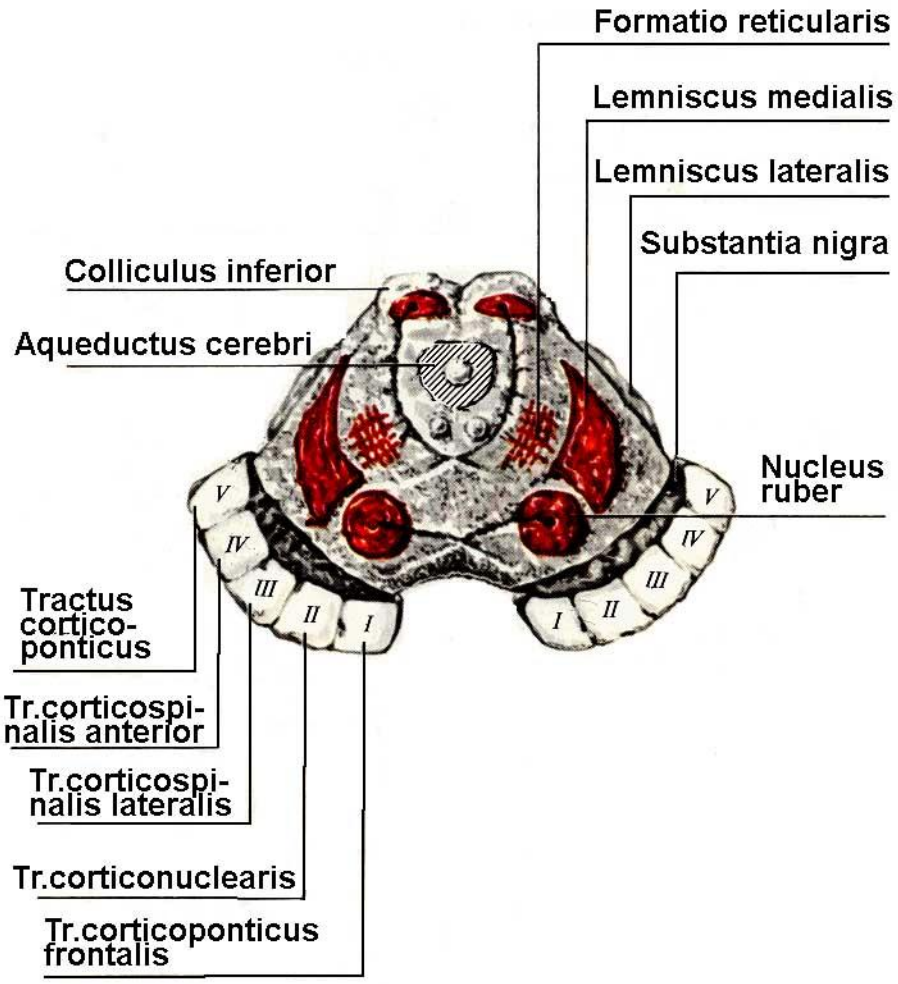


- **Statokinetic reflexes** provide maintenance of a posture during change of movement speed; they are linked to exaltation of semicircular ducts receptors. ***Nystagmus*** appears during body rotation in a horizontal plane.
- **Lifting reflexes** are augmentation of tone of muscles-extensors during acceleration upwards and augmentation of tone of muscles-flexors at acceleration downwards.



Mesencephalon or midbrain

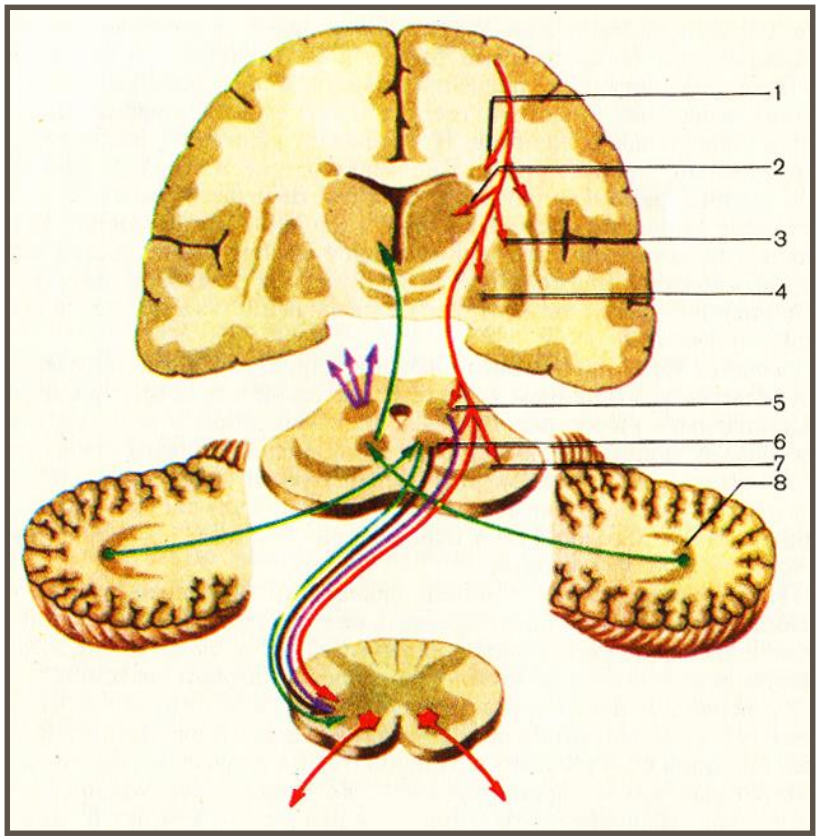
- It consists of roof (***corpora quadrigemina***), base (***pedunculi of a brain***), in middlepart ***nuclei*** of a mesencephalon are located.
- In center there is an **aqueduct** binding the III and the IV ventricles.
- All ascendant pathways pass through mesencephalon to thalamus, big hemispheres, cerebellum and descendant pathways pass to medulla oblongata and spine.



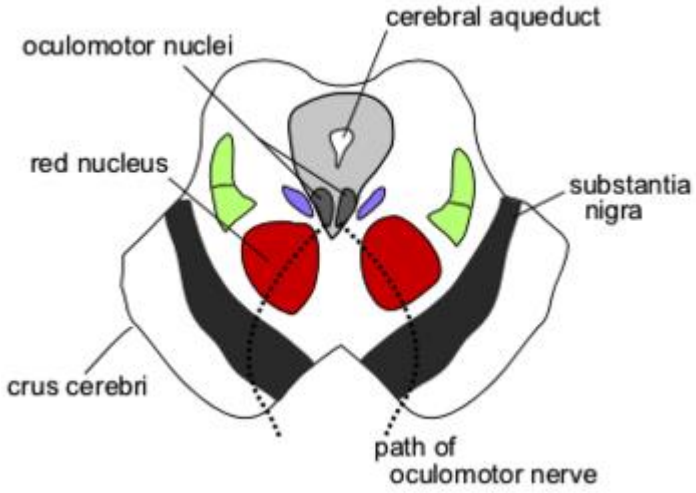
Functions of a mesencephalon nuclei

Two upper colliculi of the corpora quadrigemina, the **superior colliculi**, is primary visual subcortical center (orienting reflex, papillary jerk).

The **inferior colliculi** is primary subcortical acoustical center (position-finding reflex, rotational displacement of a head and body to a sound). ”**Watch or patrol reflex**” – redistribution of a muscle tone – intensifying of flexors tone (escape, offence).

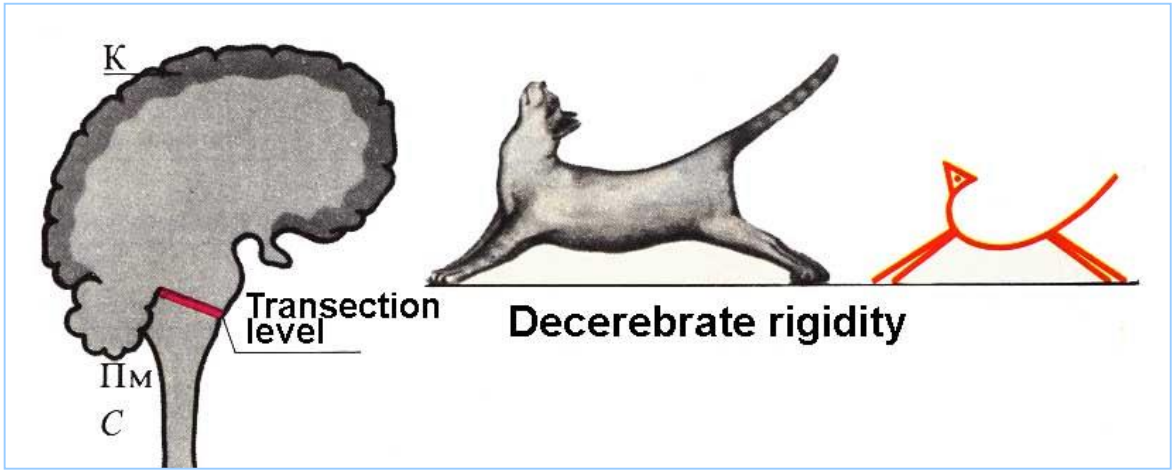


- ***Black substance*** (in pedunculi of a brain) performs composite coordinated locomotions, fine movements of fingers, regulation of tone. A mediator of neurons is dopamine (affective behavior, composite motor acts). Axons from a black substance go towards a neoencephalon (forebrain), to nuclei of a striate body. The damage of a black substance results in an involution of dopaminergic fibers going to a striate body and infringement of fine locomotions of hand, to development of a muscle rigidity and thremor. Thus, the Parkinson's disease is developed.
- ***Red nucleus*** is an intermediate center of conductive pathways of stem part of a brain. It is an ending link of extrapyramidal system, cerebellum and vestibular nuclei. Rubrospinal tract takes its origin from it.
- The nuclei of oculomotor (III) and trochlear (IV) nerves control associated eye movements.



Decerebrative rigidity

- Under brainstem separation lower than a red nucleus level tone of all extensors are increased sharply. The cause of this is predominance of Deuters' nucleus action (*vestibular nuclei of medulla oblongata*) to motoneurons of extensors.
- Cerebellum inhibits Deuters' nucleus. The infringement of connection of a red nucleus with a reticular formation results in a decerebrative rigidity.



- ***Bulbar*** animal is the animal with medulla oblongata separated from midbrain.
- ***Mesencephalic*** animal is the animal with incision above midbrain. Animal preserves a posture, erection reflexes and normal muscle tone. These are functions of a red nucleus and reticular formation.