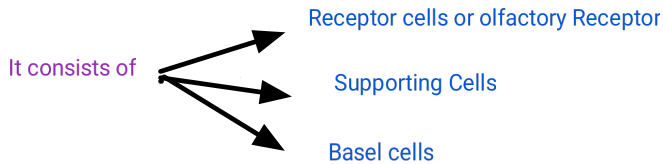


Physiology

Lecture 7 part 2

1. Olfaction (Sense of a smell) (low threshold) (chemical sense)

The olfactory Epithelium Contains 10 - 100 Million receptors



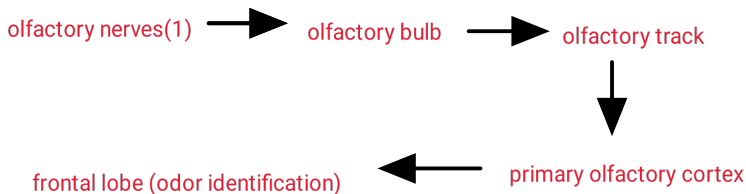
extending from dendrites of olfactory receptors (nonmotile olfactory cilia) → olfactory transduction (a stimulus to graded potential) using G- proteins and cAMP

transduction occurs:

1. odorant is binding on olfactory receptors stimulates G-protein .
2. G-protein activates the enzyme adenylate cyclase which produce cAMP
3. cAMP opens sodium ion channels, the sodium will enter the cytosol causes depolarization
4. if it reaches the threshold an action potential will be generated

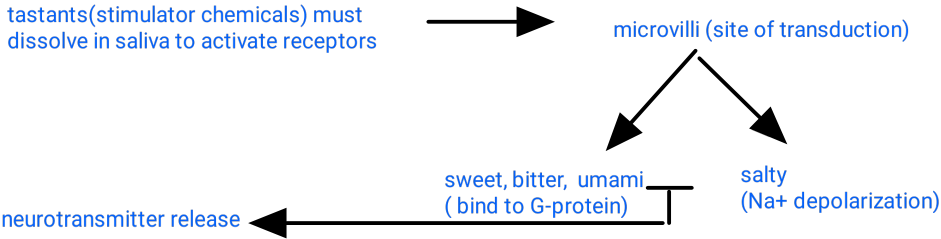
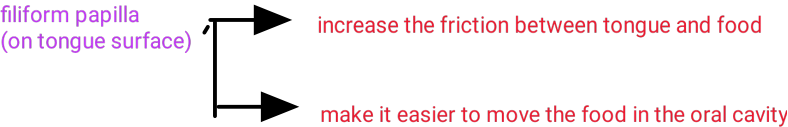
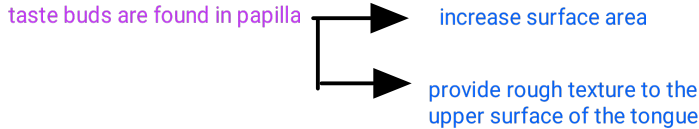
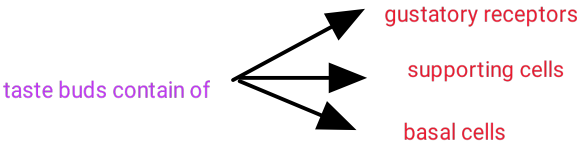
adaption (decreased sensitivity) to odors (rapidly)(within a minute)

the pathway:

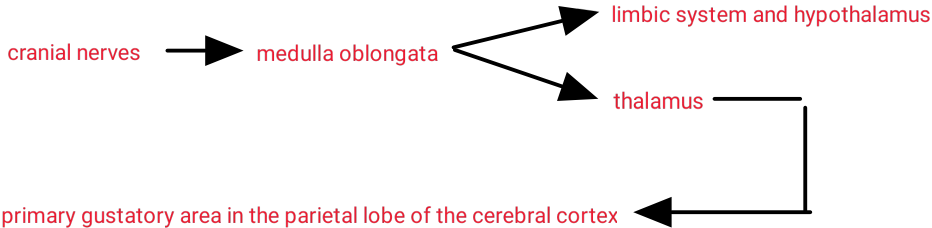


2. gustation (sense of taste) (chemical sense)(threshold varies due to the taste)

the olfactory system is a stronger than the gustatory system adaption would take 1-5 min



the pathway:



vision (more than half sensory receptors are located in the eye)(large part of cerebral cortex is specialized for vision)

vision detects electromagnetic waves (400-700 nm)

accessory structures of the eye:

1.eyelids

- shade the eye during sleep
- protect the eye
- spread the lubricating secretion over the eyeball

conjunctiva(thin protective mucous membran)

- nonkeratinized stratified squamous epithelium with goblet cells
- areolar connective tissue

bloodshot eyes = dilated and congested conjunctival vessels

2.eyelashes

sebaceous ciliary glands (found at the base of each eyelash hair follicle) (produce oil)

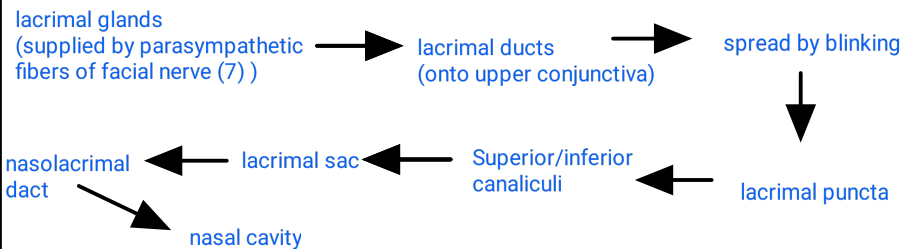
infection of these glands (usually bacterial) leads to sty(painful, pus-filled swelling)

3. eyebrows (Transversely above the upper eyelids)

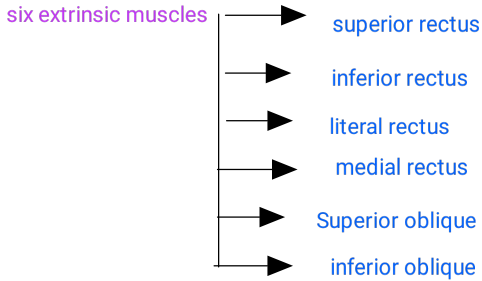
- protect the eyeball from
- foreign objects
 - perspiration
 - direct rays of the Sun

4. lacrimal apparatus (group of structures that produce and the drain lacrimal fluid)
(lacrimal glands secretes lacrimal fluid)(tears drain into 6-12 lacrimal ducts)

the pathway of tears:

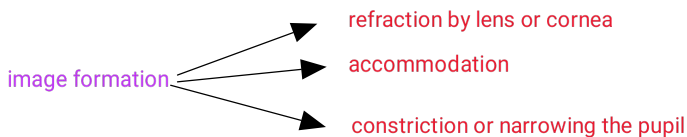
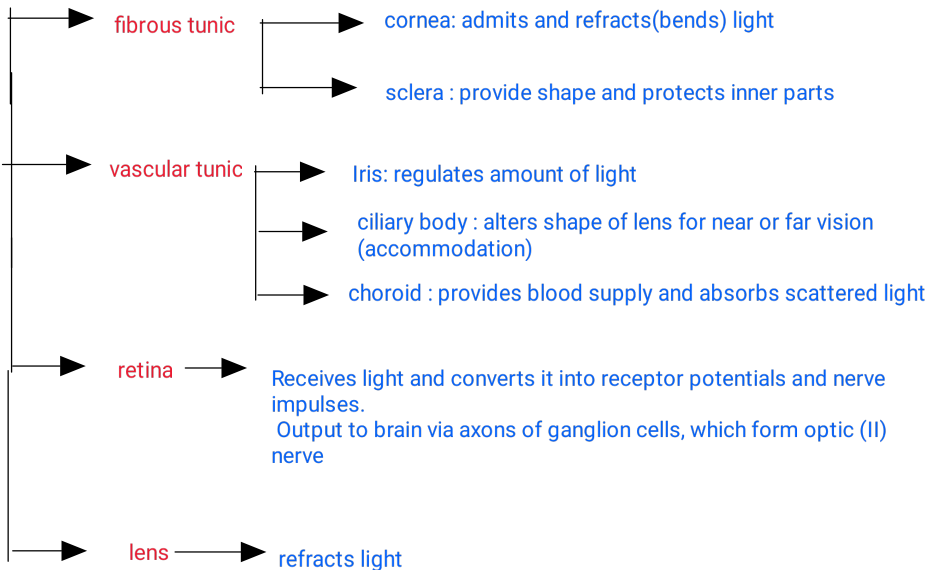


5. extrinsic eye muscles (are capable to move the eyeball in almost all directions)



neural circuits in the brain stem and cerebellum coordinate and synchronize the movement of the eyes

structures of the eyeball



1. the refraction
- images focused on the retina are inverted (upside down)
 - 75% refraction at the cornea
 - 25% at the lens
 - distance vision (parallel, don't need much refraction)
 - close vision (diverges, need much refraction)

2. accommodation
- accommodation: is the increase of curvature of the lens for near vision
 - the lens becomes more spherical, increase the refraction
 - the near point of vision: is the minimum distance from the eye that an object can be clearly focused with maximum accommodation

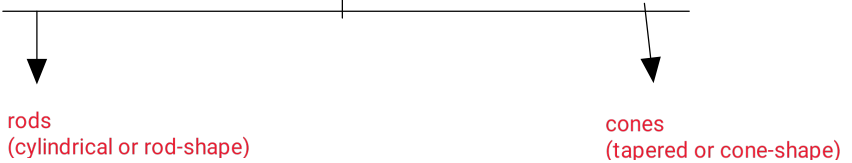
3. constriction of the pupil → narrowing of the diameter of the hole through which light enters the eye due to the contraction of the circular muscles of the iris.
-

- convergence
- medial movement of the two eyeballs
 - binocular vision: both eyes focus on one subject
 - nearer the object, the greater the degree of convergence needed
-

refraction abnormalities:

- myopia (can see close objects clearly but not the distant one)
 - due to
 - eyeball is too long relative to the focusing power of cornea and lens
 - lens is thicker than normal
- hyperopic (can see the distant objects clearly but not the close one)
- astigmatism (parts of the image are out of focus, and thus vision is blurred or distorted)
 - due to → cornea or the lens has an irregular curvature

types of photoreceptors



transduction occurs in the outer segments of both cones and rods

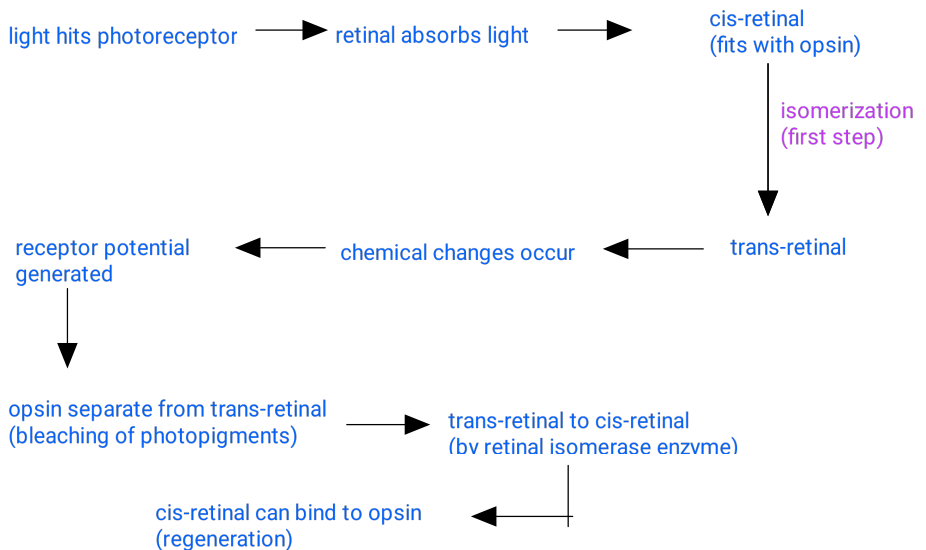
photopigments are integral proteins in the plasma membrane of the outer segments

visual transduction

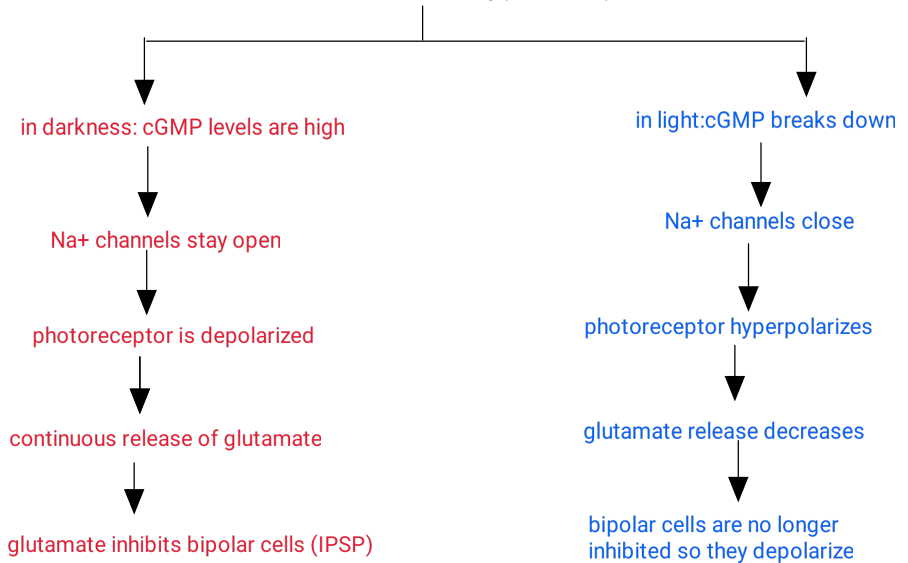
important notes :

1. rods contain only one type of photopigment (rhodopsin), while cones have three.
2. photopigments= opsin(glycoprotein) + retinal (vitamin A derivative)(light absorbing)
3. differences in opsin(by small variations and amino acids sequences) determine which wavelenaths are absorbed .
4. cones photopigments regenerate much more quickly than rhodopsin in rods

the pathway:



release of neurotransmitter by photoreceptors



brain pathway :

