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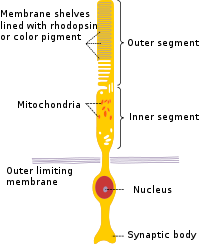
**ANA 305 ASSIGNMENT**

1. The human eyes are highly developed photosensitive organs for analyzing the form, intensity and colour of light being reflected from objects, hence, providing the sense of sight.

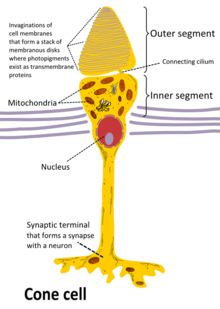
The major cells responsible for this ability are the photoreceptor cells. A photoreceptor cell is a specialized cell found in the retina that is capable of visual phototransduction, they convert light (visible electromagnetic radiation) into signals that can stimulate biological processes. There are two classical types of photoreceptor cells present in the retina of the eye, the rods and cones and an additional type, the intrinsically photosensitive retinal ganglion cells.

Rods and cones are found in the outermost layer of the retina, the human eye has about 130 million rods and about 6 million cones. Rods are responsible for vision at low light levels (scotopic vision), they do not mediate colour vision and have a low spatial acuity, cones, on the other hand, are active at a higher light level, are capable of colour vision and are responsible for high spatial acuity.

Rods have an elongated structure which consists of four regions: an outer segment, an inner segment, the cell body and the synaptic region. The outer segment contains the phototransdction apparatus, which is composed of membrane disks that contain the photoreceptor molecule rhodopsin. Rhodopsin is made up of a photoreceptor protein, opsin and Vitamin A (retinal). Rhodopsin is responsible for the night vision.



Cones, are cone-shaped photoreceptors found in the centre of the retina. They contain a pigment called iodopsin (violet coloured pigment) which combine with retinal to form photopsin.



1. The retina is a light sensitive tissue that lines the inside of the eye. The human retina is located on the inner surface of the posterior two-thirds to three-fourths of the eye.

Layers of the retina

The retina has ten layers in total, beginning with the innermost layer (closest to the vitreous body) and proceeding outward towards the choroid and sclera. The layers of the retina are as follows:

1. Inner limiting membrane: This is the boundary between the retina and the vitreous body. It is formed by astrocytes and the footplates of Muller cells together with a basal lamina.
2. The nerve fiber layer: This is the layer of optic nerve fibers consisting of ganglion cell axon fibers, which course towards the optic nerve head (note that a thin layer of Muller cell footplates exist between this layer and the inner limiting membrane).
3. The ganglion cell layer: They contain the nuclei of ganglion cells, the axons of which become the optic nerve fibers for messages. There are also some displaced amacrine (intrinsic interneuron) cells. This layer also contains the non-rod and non-cone photoreceptors, which are important for reflexive responses to bright daylight.
4. The inner plexiform layer: This layer contains the synapses between the dendrites of ganglion cells and amacrine cells and the axons of bipolar cells.
5. The inner nuclear layer: This layer contains the nuclei and surrounding cell bodies of horizontal, bipolar and amacrine cells. This layer is thicker in the central area of the retina compared with the peripheral retina because greater density of cone bipolar cells and smaller and more closely spaced horizontal cells and amacrine cells connected with the cone pathways. There are also nuclei of the supporting Muller cells.
6. The outer plexiform layer: This layer contains the rod and cone axons (projection of rods and cones ending in the rod spherule and cone pedicle respectively), horizontal and bipolar cell dendrites. Synapses among these structures occur within this layer.
7. The outer nuclear layer: This layer consists of the cell bodies of the retinal rods and cones. In the peripheral retina, the rod cell bodies outnumber those of the cone, whereas the reverse is the case in the central retina.
8. The outer (external) limiting membrane: This is the layer that separates the inner segment portions of the photoreceptors from their cell nuclei.
9. The rod and cone (bacillary) layer: This layer contains the inner and outer segments of the rod and cone photoreceptor cells.
10. The pigment epithelium: This is the most external layer of the retina. This layer is closest to the choroidal layer of the eye. It is a single layer of cuboidal epithelial cells for the neural portion of the retina. These cells contain black pigment melanin, which prevents light scatter throughout the globe of the eyeball, this function is important for clear vision.

The diagram below shows the different layers of the retina as viewed under a light microscope

