

HISTOLOGY ASSIGNMENT

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QUESTION 1. Write an essay on the histological importance of eye in relation to their cellular function.

Eyes are highly developed photosensitive organs for analyzing the form, intensity, and color of light reflected from objects and providing the sense of light. Internally the eye contains transparent tissues that refract light to focus the image, a layer of photosensitive cells, and a system of neurons that collect, process, and transmit visual impulses to the brain.

Histologically, each eye is composed of three concentric tunics/layer

1. A tough external fibrous layer consisting of the sclera and the transparent cornea.

Sclera is made up of mainly dense irregular connective tissue, with flat bundles of type 1 collagen parallel to the organ surface but intersecting in various directions.

Histological Importance: Because this layer is composed of dense irregular connective tissue, it helps to protect delicate internal structures, supports eye shape and serves as a site for attachment for the extrinsic muscles of the eyes.

Cornea is composed of two layers of epithelium with organized connective tissue in between- 1. An external non-keratinized stratified squamous epithelium 2. An anterior limiting membrane 3. Thick stroma 4. A posterior limiting membrane 5. An inner simple squamous endothelium.

Histological Importance: The organization of this layer helps to protect the anterior surface of the eye and refracts incoming light.

2. A middle vascular layer (uvea) that includes the choroid, ciliary body, and iris.

Choroid is composed of areolar connective tissue; highly vascularized and contains numerous melanocytes. It has two sub layers 1. Inner choroido-capillary lamina. 2. Bruch's membrane, a thin extracellular sheet, is composed of collagen and elastic fibers surrounding the adjacent microvasculature and basal lamina of the retina's pigmented layer.

Histological Importance: Due to its highly vascularized nature, nutrients are adequately supplied to the retina, also a characteristic black layer in the choroid prevent light from entering they eye except through the pupil(pigment absorbs extraneous light).

Ciliary Body is composed of ciliary smooth muscle and ciliary processes; covered with a secretory epithelium

Ciliary muscle is made up most of the ciliary body's stroma and consists of three groups of smooth muscle fibers. Contraction of these muscles affects the shape of the lens and is important in visual accommodation.

Ciliary processes provide a large surface area covered by a double layer of low columnar epithelial cells. The cells directly covering the stroma contain much melanin and correspond to the anterior projection of the pigmented retina epithelium. The surface of cells lacks melanin and is contiguous with the sensory layer if the retina.

Histological Importance: The ciliary body holds suspensory ligaments that attach to the lens and change lens shape foe far and near vision. The low columnar epithelial cells/ciliary epithelium secrete aqueous

humor.

Iris is composed of two layers of smooth muscle (sphincter pupillae and dilator pupillae) and connective tissue, with a central pupil. The anterior surface of the iris, exposed to aqueous humor in the anterior chamber, consists of a dense layer of fibroblasts and melanocytes with interdigitating processes and is unusual for its lack of an epithelial covering. Deeper in the iris, the stroma consists of loose connective tissue with melanocytes and sparse microvasculature.

The posterior surface of the iris has a two-layered epithelium continuous with that covering the ciliary processes, but very heavily filled with melanin. The highly pigmented posterior epithelium of the iris blocks all light from entering the eye except that passing through the pupil. Myoepithelial cells form a partially pigmented epithelial layer and extend contractile process radially as the thin dilator pupillae muscle. Smooth muscle fibers form a circular bundle near the pupil as the sphincter pupillae muscle. The dilator and sphincter muscles of the iris have sympathetic and parasympathetic innervation for enlarging and constricting the pupil.

Histological Importance: controls pupil diameter and thus the amount of light entering the eye. Melanocytes of the iris stroma provide the color of one's eyes.

3. An inner sensory layer, **the retina**, which communicates with the cerebrum through the posterior optic nerve. It is the innermost tunic of the eye, develops with two fundamental sublayers from the inner and outer layers. 1. The pigmented layer that consists of pigmented epithelial cells 2. The neural layer that consist of photoreceptors, bipolar neurons, ganglion cells, and supporting Muller cells.

Histological Importance: The pigmented layer helps to absorb extraneous light and provides vitamin A for photoreceptor cells. The neural layer detects incoming light rays; light rays are converted to nerve signals and transmitted to the brain.

QUESTION 2. Corona virus can penetrate the body through the eyes and implicate the immune system. Briefly discuss the layers of the retina for information penetration

The retina is the innermost tunic of the eye, develops with two fundamental sublayers from the inner and outer layers. It is the thick layer of the eye inside the choroid. The central retinal vein and artery pass through the optic nerve and enter the eye at the optic disc. These vessels initially lie between the vitreous body and the inner limiting layer (ILL) of the retina, but their smaller lateral branches penetrate this layer and enter the retina, forming capillaries that extend as far as the inner nuclear layer (INL). Nutrients and O₂ for the outer retinal layers diffuse from capillaries in the choroid.

Between the vitreous body and the choroid, the retina usually consists of nine neural layers and a pigmented layer. Following the path of light, these are:

1. The inner limited layer (ILL) consist of terminal expansions of other Muller cell processes that cover the collagenous membrane of the vitreous body.
2. The nerve fiber layer (NFL), containing the ganglionic cell axons that converge at the optic disc and form the optic nerve.
3. The ganglionic layer (GL), containing cell bodies of the ganglion cells and thicker near the retina's center than its periphery. The neurons (ganglion cells) have much more longer axons.
4. The inner plexiform layer (IPL), containing the fibers and synapses of the ganglion cells and the bipolar neurons of the next layer. It also consists of axons and dendrites connecting neurons of the inner

nuclear layer (INL).

5. The inner nuclear layer (INL), with the cell bodies of several types of bipolar neurons which begin to integrate signals from the rods and cones over a wide area of the retina. Amacrine cells and horizontal cells are also found in this layer.

6. The outer plexiform layer (OPL) includes axons of the photoreceptors and dendrites of association neurons in the INL. It contains fibers and synapses of the bipolar neurons and the rod and cone cells.

7. The outer nuclear layer (ONL), with the cell bodies and nuclei of the photosensitive rod and cone cells.

8. The outer limiting layer (OLL) is a faint but well-defined series of tight and adherent junctions that form at the level of the rod and cone inner segments between the photoreceptors and Muller cell processes. The OLL forms one side of the compartment that encloses the rods and cones.

9. The rod and cone layer (RCL) contains the outer segments of these cells where the photoreceptors are located. The neurons are polarized with their photosensitive portions aligned in this layer and their axons in the IPL. Rod and cone cells have highly specialized outer and inner segments.

10. The non-neural pigmented layer (PL) has several supportive functions important for the function and maintenance of the neural retina.