HISTOLOGY ASSIGNMENT

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COURSE: ANA 305 assignment

1.Write an essay on the histological importance of the eye in relation to it's cellular functions.

Cells in the eye called rods and cones are primarily responsible for detecting light. They send signals to the brain through retinal ganglion cells (RGCs) so the brain can form our perception of images.

The eye is made up of both internal and external structures. The layers of the eye perform distinct functions which coalesce to create a unified, perceptual experience. The essential role of the external eye structures is to protect the delicate tissue of the internal eye. Internal parts of the eye have primarily structural and visual functions.

* The eternal structures of the eye include the:

-**The eyelashes**: Eyelashes are finely sensitive to touch and warn the eye of possible debris and particles that may cause injury

-**The eyelids**: The eyelid prevents foreign bodies from entering the inner eye and helps refresh and *distribute* the tear film by blinking.

-**The conjunctiva** :lines the inner part of the eyelids. The tarsal plate lies beneath the conjunctiva and contains meibomian glands, which secrete an oily substance to decrease the evaporation of the tear film.

-***Tear film****:* The tear film consists of aqueous, mucus, and oily secretions.

-***Accessory glands****:* Apocrine glands of Moll, meibomian glands, lacrimal glands.

- ***Muscles****:*They include different types of muscles such as Orbicularis oculi, levator palpebrae superioris, superior tarsal muscle.

* The internal structures of the eye consists of three layers of tissue arranged concentrically:

1. The sclera and cornea make up the exterior layers.
2. The uvea is the vascular layer in the middle, subdivided into the iris, ciliary body, and choroid.
3. The retina constitutes the innermost layer and is made up of nervous tissue.

***-Cornea (transparent front layer of the eye)****:*Consists of type I collagen fibers oriented in a uniform parallel direction to maintain transparency. Cornea serves a protective role and is responsible for two-thirds of the refractive properties of the eye. The remaining one-third of refraction is performed by the lens, which is functionally adjustable through the action of the zonular fibers and ciliary muscles. Consists of five layers:

* Bowman layer: This is a layer of subepithelial basement membrane protecting the underlying stroma. It is composed of type 1 collagen, laminin, and several other heparan sulfate proteoglycans.
* Stroma: The largest layer of the cornea, the stroma has collagen fibers arranged in a regular pattern. Keratocytes maintain the integrity of this layer. The function of this layer is to maintain transparency, which occurs by the regular arrangement, and lattice structure of the fibrils, whereby scatter from individual fibrils gets canceled by destructive interference, and the spacing of less than 200 nm allows for transparency.
* Descemet’s membrane: an acellular layer made of type IV collagen that serves as a modified basement membrane of the corneal endothelium
* Corneal endothelium: a one cell thick layer made of either simple squamous or cuboidal cells. Cells in this region do not regenerate and have pumps that maintain fluid balance and prevent swelling of the stroma. When corneal endothelial cells are lost, neighboring cells stretch to attempt to compensate these losses.
* Corneal epithelium: fast growing, regenerating multicellular layer which interacts directly with the tear film.-*The sclera (white of the eye):*The sclera is dense connective tissue made of mainly type 1 collagen fibers, oriented in different directions. The lack of parallel orientation of collagen fibers gives the sclera its white appearance, as opposed to the transparent nature of the cornea. However, the collagen of the sclera and cornea are continuous.The four layers of the sclera from external to internal are episclera, stroma, lamina fusca, endothelium.

-**Middle Layer: Uvea (Iris, Ciliary Body, Choroid)":**

*1. Iris:* Consists of (1) stromal layer with pigmented, fibrovascular tissue and (2) pigmented epithelial cells beneath the stroma.

2. *Ciliary Body:* The tissue that divides the posterior chamber and vitreous body. *3.Choroid:*Consists of a dense network of blood vessels supplying nourishment to structures of the eye, housed in loose connective tissue. The choriocapillary layer is located in the innermost part of the choroid and supplies the retina.

Uvea of the eye is a crucial mediator of nutrition and gas exchange, as blood vessels course through the ciliary body and iris. while the choriocapillaris in the posterior eye help support the retina.

**- Innermost layer: Lens, Vitreous, Retina:**

1. Lens: separates the aqueous and vitreous chambers.

2. Vitreous: a jelly-like space made of type II collagen separating the retina and the lens

3. Retina: nervous tissue of the eye where photons of light convert to neurochemical energy via action potentials

Moreover, the retina itself is divided into various layers as follows

-Retinal pigment epithelium: made of cuboidal cells containing melanin which absorbs light. These cells also establish a blood-retina barrier through tight junctions.

 -Rod and cone cells: the layer of cells with photoreceptors and glial cells. Rods are located peripherally and are more sensitive to light and motion than cones. Cones have higher visual acuity and specificity for color vision.

2.Corona virus can penetrate the body through the eye and implicate the immune system, briefly discuss the layers of the retina for information on this penetration.

Coronaviruses are a group of common viruses. Some affect only animals (such as bats, cats, camels and cattle), while others also affect people, according to the U.S. National Library of Medicine.

* COVID-19 can trigger ailments as minor as the common cold, or more consequential such as bronchitis, pneumonia and kidney failure. The most severe cases may be life-threatening. This is the seventh known type of coronavirus, according to the CDC. Currently, it’s not known how “easily or sustainably” the virus spreads from person to person, according to the CDC, but large gatherings and events have been canceled as a public health measure to contain the spread of coronavirus. Coronavirus can hit anyone and most people recover. Symptoms of COVID-19 include a mild to severe respiratory illness accompanied by a fever, cough and breathing problems . Other symptoms include runny nose, sore throat and headache.
* Our eyes may play an important role in the spread and prevention of the new coronavirus outbreak seen throughout the world, eye doctors and health experts say. To cut your personal risk of contracting the new coronavirus, avoid touching your eyes, nose and mouth with unwashed hands. It is the mucous membranes (membranes that line various cavities in the body) that are most susceptible to transmission of the virus. The relationship between the transmission of the coronavirus and your eyes is complicated.

It’s thought that coronavirus spreads from person to person mainly through airborne “respiratory droplets” produced when someone coughs or sneezes. These droplets can land in the mouths or noses of people who are nearby, and possibly be inhaled into the lungs. These droplets also can be spread to your eyes when you touch your face. Patients who have contracted the new coronavirus may have ocular symptoms such as: [Conjunctivitis](https://www.allaboutvision.com/conditions/conjunctivitis.htm) is an inflammation of the membrane covering the eyeball. It is often referred to as “pink eye.” Conjunctivitis often presents as an infected, red, “wet and weepy” eye

The **retina** is the innermost, light-sensitive layer of tissue of the [eye](https://en.m.wikipedia.org/wiki/Eye) of most vertebrates  and some [molluscs](https://en.m.wikipedia.org/wiki/Mollusca). It has several layers in it in which the corona virus enters and passes through. The virus then affects the basic functions associated with all these layers. Below are the layers in which the corona virus passes through.

* [Inner limiting membrane](https://en.m.wikipedia.org/wiki/Inner_limiting_membrane) – basement membrane elaborated by [Müller cells](https://en.m.wikipedia.org/wiki/Muller_glia).
* Nerve fibres layer -axons of the [ganglion cell](https://en.m.wikipedia.org/wiki/Retinal_ganglion_cell) bodies (note that a thin layer of Müller cell footplates exists between this layer and the inner limiting membrane).
* [Ganglion cell layer](https://en.m.wikipedia.org/wiki/Ganglion_cell_layer) – contains nuclei of ganglion cells, the axons of which become the optic nerve fibres, and some displaced [amacrine cells](https://en.m.wikipedia.org/wiki/Retina_amacrine_cell" \o "Retina amacrine cell).
* [Inner plexiform layer](https://en.m.wikipedia.org/wiki/Inner_plexiform_layer) – contains the synapse between the [bipolar cell](https://en.m.wikipedia.org/wiki/Retina_bipolar_cell) axons and the dendrites of the [ganglion](https://en.m.wikipedia.org/wiki/Retinal_ganglion_cell) and amacrine cells.
* [Inner nuclear layer](https://en.m.wikipedia.org/wiki/Inner_nuclear_layer) – contains the nuclei and surrounding cell bodies (perikarya) of the [amacrine cells](https://en.m.wikipedia.org/wiki/Amacrine_cells" \o "Amacrine cells), [bipolar cells](https://en.m.wikipedia.org/wiki/Retina_bipolar_cell), and [horizontal cells](https://en.m.wikipedia.org/wiki/Retina_horizontal_cell).
* [Outer plexiform layer](https://en.m.wikipedia.org/wiki/Outer_plexiform_layer) – projections of rods and cones ending in the rod spherule and cone pedicle, respectively. These make synapses with dendrites of bipolar cells and horizontal cells. In the [macular](https://en.m.wikipedia.org/wiki/Macula) region, this is known as the *Fiber layer of*[*Henle*](https://en.m.wikipedia.org/wiki/Friedrich_Gustav_Jakob_Henle).
* [Outer nuclear layer](https://en.m.wikipedia.org/wiki/Outer_nuclear_layer) – cell bodies of rods and cones.
* [External limiting membrane](https://en.m.wikipedia.org/wiki/External_limiting_membrane) – layer that separates the inner segment portions of the photoreceptors from their cell nuclei.
* Inner segment / outer segment layer – inner segments and outer segments of rods and cones. The outer segments contain a highly specialized light-sensing apparatus.[[14]](https://en.m.wikipedia.org/wiki/Retina#cite_note-14)[[15]](https://en.m.wikipedia.org/wiki/Retina#cite_note-15)
* [Retinal pigment epithelium](https://en.m.wikipedia.org/wiki/Retinal_pigment_epithelium) – single layer of cuboidal epithelial cells (with extrusions not shown in diagram). This layer is closest to the choroid, and provides nourishment and supportive functions to the neural retina, The black pigment melanin in the pigment layer prevents light reflection throughout the globe of the eyeball; this is extremely important for clear vision.

Peking University respiratory specialist Wang Guangfa believes he contracted COVID-19 while not wearing eye protection  when he treated patients at health clinics in China. Medical officials, though, say while this is possible, it may be unlikely. Wang reported that his left eye became inflamed afterward, followed by a fever and a buildup of mucous in his nose and throat. He subsequently was diagnosed with the new coronavirus. It was also made known that Wang thinks the virus entered his left eye because he wasn’t wearing protective eyewear. In Wang’s situation respiratory droplets from an infected person might have reached his eyes or other mucous membranes.

Generally, though, transmission of COVID-19 through hand-to-eye contact has although not been properly recognized but could still be a major way in which it spreads. It is therefore recommended that contact lens wearers should switch to glasses temporarily as a way contracting the virus that causes COVID-19, the respiratory disease that can be fatal. Glasses and sunglasses don't offer a complete barrier from respiratory droplets sprayed in your direction. Safety glasses, which protect the exposed sides and the area around your eyes may offer better protection.

If you feel an urge to itch or rub your eye or even to adjust your glasses, use a tissue instead of your fingers. Dry eyes can lead to more rubbing, so consider adding moisturizing drops to your eye routine. If you must touch your eyes for any reason — even to administer eye medicine — wash your hands first with soap and water for at least 20 seconds.