ASSIGNMENT ON NEUROHISTOLOGY

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**QUESTION 1:**

**Write an essay on the histological importance of the eye in relation to their cellular functions.**

**Answer**

The eyes consist of the external layer and internal layer.

**EXTERNAL LAYER:**

1.) **Conjunctiva:** The conjunctiva lines the inner part of the eyelids. It covers the moist back surface of the eyelids and eyeballs. The tarsal plate lies beneath the conjunctiva and contains meibomian glands, which secrete an oily substance to decrease the evaporation of the tear film. It is composed of unkeratinized, stratified squamous epithelium with globet cells and stratified columnar epithelium.

2.) **Tear Film:** It consists of aqueous, mucus and oily secretions. This mucus layer contains protective immunoglobulins and lysozymes, which aids in trapping bacteria and debris.

3.) **Eyelid:** It is a mobile layer made up of skin and muscular tissue. It covers and protects the eyeball. It is lined by palpebral conjunctiva.

4.) **Eyelashes:** The eyelashes protect the eyes. It aids in the reflex action of the eyelid to close when a foreign particle enters it.

5.) Accessory glands; Lacrimal gland, Apocrine glands of Moll, Meibomian gland.

**INTERNAL LAYER:**

1.) **Sclera:** The sclera is a dense connective tissue made up of mainly type 1 collagen fibers. It consist of 4 layers; Episclera, Stroma, lamina fusca and endothelium.

2.) **Cornea:** It consist of type I collagen fibers oriented in a uniform parallel direction to maintain transparency. It serves as a protective role, and responsible for two-third of the refractive properties of the eye. It consists of **5** layers.

i.) Corneal Epithelium: It is lined by non-keratinized, stratified squamous epithelium. It is a fast growing, regenerating multilayer which interact directly with the tear film.

ii.) Bowman’s Layer: It is composed of type I collagen. Consist of a layer of subepithelial basement membrane protecting the underlying stroma.

iii.) Stroma: It is composed of collagen fibers arranged in a regular pattern. Keratocytes maintains the integrity of this layer. It functions in maintaining transparency which occur in regular pattern.

iv) Descemet’s Membrane: It is an acellular layer made up of type IV collagen which serves as a modified basement membrane of the corneal endothelium

v.) Corneal Epithelium: It is lined by either simple squamous or cuboidal cells. It has pumps that maintain fluid balance and prevent swelling of the stroma.

3.) **Iris:** It is lined by simple, cuboidal pigmented epithelium. It controls the amount of light that enters the eye. The Iris allows more light into the eye when the environment is dark and allows less light into the eye when the environment is bright.

4.) **Ciliary Body:** It is lined by two neuro-epithelial layers, a non-pigmented layer internally and a pigmented layer externally. It functions in accommodation, aqueous humor production and reabsorption, and maintenance of the lens zonules for the purpose of anchoring the lens in place.

5.) **Choroid:** It consists of a dense network of blood vessels supplying nourishment to structures of the eye, housed in loose connective tissue.

6.) **Lens:** Consist of an outer capsule, a middle layer called cortex, and an inner layer called the nucleus. The lens focuses light onto the retina. Through the action of the ciliary muscles, the lens becomes thicker to focus on nearby object and thinner to focus on distant objects.

7.) **Vitreous:** A jelly-like space made of type II collagen separating the retina and the lens.

8.) **Retina:** It is made of cuboidal cells containing melanin which absorbs light. It contains the cells that sense light and the blood vessels that nourish them.

9.) **Cones:** It is responsible for sharp, detailed central vision and color vision and are clustered mainly in the macula.

10.) **Rods**: Are responsible for night and peripheral vision.

**QUESTION 2:**

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

**Answer**

The retina of the eye has **10** layers, and the penetration of this corona virus takes place in 3 layers. The virus primarily infects the retinal ganglion cells and the inner nuclear layer cells, showing thinning of the outer plexiform layer, as well as the optic nerve. In acute infection of the retina by the virus, the eye shows retinal layer disorganization, retinitis, vitritis and focal choroiditis with mild cellular infiltration and increased expression of tumor necrosis factor. This virus can induce a retinal ganglion cell death which is caused by variety of cell death mechanism including; necrosis, apoptosis, necroptosis. Conjunctivitis is one of a symptom caused by penetration of this virus in the eye.

**The three (3) main layers the virus can penetrate into are;**

1.) **Ganglion Cell Layer:** It contains nuclei of ganglion cells, the axons of which become the optic nerve fibers and some displaced amacrine cells. The Ganglion cells in this layer extend to form an optic nerve that conveys information from the bipolar cells and processes it determine shapes contrast and color. Damage to this layer by the virus will result in high intraocular pressure that affects the optic nerve, interrupting the signals the brain- Glaucoma vision loss.

2.) **Inner Nuclear Layer:** It contains the nuclei and surrounding cell bodies of the amacrine cells, bipolar cells and horizontal cells. Penetration of the virus in this layer results in focal retinitis and thinning of the outer plexiform layer.

3.) **Outer Plexiform Layer:** Projections of rods and cones ending in the rod spherule and cone pedicle, respectively occurs here. These make synapses with dendrites of bipolar cells and horizontal cells. Penetration of this virus causes thinning of this layer.

**Other layers of the retina include;**

4.) **Inner Limiting Membrane:** Basement membrane elaborated by Muller cells.

5.) **Nerve fiber Layer:** Contains axons of the ganglion cell bodies.

6.) **Inner Plexiform Layer:** Contains the synapse between the bipolar cell axons and the dendrites of the ganglion and amacrine cells.

7.) **Outer Nuclear Layer:** Contains cell bodies of rods and cones.

8.) **External Limiting Membrane:** It separates the inner segment portions of the photoreception from their cell nuclei.

9.) **Inner Segment/Outer Segment Layer:** They are the segments of the rods and cones. The outer segment contains a higher specialized light-sensing apparatus.

10.) **Retinal Pigment Epithelium:** this layer 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 important for clear vision.

Thus, penetration of this virus into the eye can impair the normal functioning of these layers as well as the normal functioning of the immune system. If there’s no quick medical attention, there will gradual decrease in the effectiveness of the immune system on the eye (retina), resulting in total loss of the function of the immune system. This will result in damages to the eye (sense of vision).