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HISTOLOGY HOME WORK

QUESTION 1

Write an essay on the histological importance of the eyes in relation to their cellular function

The eye is a photosensitive organ responsible for vision. It receives light through the cornea. The light is focused by the lens onto the retina, which contains specialized cells that encode the various patterns of the image for transmission to the brain via the optic nerve. The eye is composed of three layers:

1. Tunica fibrosa (outer layer)
2. Tunica vasculosa (middle layer)
3. Retina (inner layer)
4. TUNICA FIBROSA
5. SCLERA: Is the fibrous, external layer of the eye ball that protects the more delicate internal structures and provides sites for muscle insertion. The sclera is the opaque white posterior five- sixth of the external layer. It is relatively avascular, and consists of tough, dense connective tissue containing flat type 1 collagen bundles which interacts in various directions which intersects with a moderate amount of scattered fibroblasts.
6. CORNEA: It is the anterior one- sixth of the eye. It is colorless, transparent and completely avascular. It is highly innervated and joins the sclera in a region called the LIMBUS. The cornea is composed of five layers;
7. CORNEAL EPITHELIUM: It is a stratified squamous non keratinized epithelium. It lines the anterior aspect of the cornea. It possesses microvilli in its superficial layer; the microvilli traps moisture, protecting the cornea from dehydration.
8. BOWMAN MEMBRANE: It is a homogenous noncellular layer that functions to provide form, stability and strength to the cornea.
9. CORNEAL STROMA: This is the thickest corneal layer. It has channels, located in the region of the limbus, that are lined by endothelium, forming the canal of schlemn. This canal drains fluid from the anterior chamber of the eye into the venous system.
10. DESCEMENT MEMBRANE: Is a thick basal lamina separating the stroma from the endothelium lining the cornea.
11. CORNEAL ENDOTHELIUM: Lines the posterior aspect of the cornea. It is a simple squamous epithelium with cells that exhibit numerous pinocytic vesicles. It resorbs fluid from the stroma, thus contributing to the transparency of the cornea; it is also contributory to light refraction.
12. TUNICA VASCULOSA (UVEA)

It is the middle layer of the eye. It consists of three parts, from posterior to anterior; the coroid, the ciliary body & the lens

* CHOROID: Is a highly vascular tunic in the posterior two- thirds of the eye, with loose well vascularized connective tissue rich in collagen and elastic fibers, fibroblasts, melanocytes, macrophages, lymphocytes, mast cells and plasma cells. The abundant melanocytes give the layer its characteristic black color, and block light from entering the eye except through the pipil.
* CILIARY BODY: An anterior expansion of the choroid at the level of the lens. It is a thickened ring of tissue lying just inside the anterior portion of the sclera. It completely encircles the lens and separates the ora serrata from the iris. It is lined on its surface by two layers of cells; an outer pigmented columnar epithelium rich in melanin, and an inner non pigmented simple columnar epithelium.
* CILIARY PROCESSES: Are readily arranged extension (about 70%) of the ciliary body. They have a connective tissue core containing many fenestrated capillaries. They also posses suspensory ligaments (zonulae) that arise from the processes and insert into the capsule of the lens, serving to anchor it in place.
* CILIARY MUSCLE:Is attached to the sclera and ciliary body in such a manner that its contractions stretch the ciliary body and release and release tension on the suspensory ligaments and lens. Contractions permit the lens to become more convex, allowing the eye to focus on nearby objects (accommodation). The lens looses this ability with advancing age.
* IRIS: The iris is the most anterior extension of uvea that partially covers the lens, leaving a round opening in the center called the pupil. It consists of an irregular, discontinuous layer of fibroblasts and melanocytes densely packed. The heavy pigmented epithelium of the iris prevents light from entering the eye except through the pupil. Melanocytes of the iris stroma also provide the color of the eyes. The dilator papillae muscle which is a smooth muscle with fibers that radiate from the periphery of the iris towards the pupil dilates the pupil by contracting upon stimulation by sympathetic nerve fibers.

Sphincter papillae muscle is also a smooth muscle from the iris arranged in concentric rings around the pupilary orifice. It constricts the pupil by contracting upon stimulation by parasympathetic nerve fibers.

REFRACTIVE MEDIA OF THE EYE

1. Aqueous humor: Is a plasma like fluid, located in the anterior compartment of the eye, that is formed by epithelial cells lining the ciliary process. It is secreted into the posterior chamber of the eye and then flows into the anterior chamber, from there it enters the venous system via the canal of schlemn.
2. The Lens: the lens is a transparent biconvex structure immediately behind the iris, used to focus light on the retina. The lens has three principal components:

* Lens capsule: covered by a thick, homogenous capsule rich in proteoglycans and type IV collagen. The capsule protects the underlying cells and provides the places of attachment for zonular fibers.
* Lens Epithelium: Consists of a single layer of cuboidal epithelial cells and is present only on the anterior surface of the lens. At the posterior edge of this epithelium, near the equator of the lens, the cells divide to provide new cells that differentiates as lens fibers. This process allows for growth of the lens.
* Lens Fibers: they are highly elongated and appear as thin, flattened structures. The fibers are densely packed together; forming a perfectly transparent tissue highly specialized for light refraction.

1. Vitreous body: occupies the vitreous chamber behind the lens. It is composed of transparent connective tissue containing mostly (99%) water (vitreous humor), bound to hyauronate and a small amount of collagen. The only cells in the vitreous body are a few macrophages and a small population of cells near the membrane called hyalocytes which synthesize hyauronate and collagen.
2. RETINA: the retina is the innermost of the three tunics of the eye and is responsible for photoreception. It has a shallow depression in its posterior wall that contains only cones; this avascular region called the fovea contrails, exhibits the greatest visual acuity. The photoreception is achieved by the photoreceptor layers which are the rods and cone cells. The rods are most sensitive to lights even of low intensity, which is why we can see even at night/ when the lights are dim.

ACCESSORY STRUCTURES OF THE EYE

1. Conjunctiva: lines the eyelid and is reflected onto the anterior portion of the orb up to the cornea, where it becomes continuous with the corneal epithelium.
2. Eyelids: the eyelids are lined internally by conjunctiva and externally by skin that is elastic and covers a supportive frame work of tarsal plates. They contain highly modified sebaceous glands (meibomian gland), modified sebaceous gland (gland of zeis), and sweat glands (glands of moll)
3. Lacrimal Apparatus

LACRIMAL GLAND

* It is a compound tubular gland with secretory units that are surrounded by an incomplete layer of myoepithelial cells.
* It secretes tears. Tears drains via 6- 12 ducts into the conjunctiva fornix, from which the tears flow over the cornea and conjunctiva, keeping them moist. Tears (which contains lysozyme, an antibacterial enzyme), then enter the lacrimal puncta and lacrimal canaliculi.

QUESTION 2

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

