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**MATRIC NUMBER: 17/MHS01/063**

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

**Histology of the Eye Structure and Organization**

Cornea

Anterior chamber limbus

Pupil

Iris

Posterior chamber

Ciliary body ciliary processes zonules

Lens

Vitreous body

Retina (neural and pigmented retina)

Ora serrata

Macula and fovea centralis optic disc

**Wall of the Eye ( three main layers)**

1. Fibrous tunic (outermost layer)

Sclera – thick collagenous capsule provides structural support for the eye, is point of attachment for extraocular muscles and is in continuity with the conjunctiva.

Cornea – continuous with the sclera at the limbus

1. Uvea (uveal tract or vascular tunic) (middle layer: composed of iris, ciliary body and choroid)

* the uvea is highly vascular and heavily pigmented.

Iris – optical diaphragm that forms the margin of the pupil

Choroid – vascular supply to the retina

**Components of the Uvea (choroid, ciliary body, iris)**

**Choroid - highly pigmented, highly vascular layer interposed between sclera and retina**

* larger vessels linked to the sclera by collagen and elastic fibrils
* heavily populated by melanocytes
* choriocapillary layer – smaller vessels that supply the retina
* Bruch's membrane - collagen I with an elastic fiber core separates choroid from the retinal pigment epithelium

**Ciliary body - thickened portion of uveal tract at the level of the lens**

* contraction and relaxation of the ciliary muscle regulates the shape of the lens
* ciliary zonules (ciliary ligaments or cables) connect the ciliary body to the lens, running from the ciliary epithelium to the lens capsule
* Ciliary body – ciliary muscle regulates shape of the pupil for visual accommodation, and ciliary epithelium produces aqueous humor that fills the anterior and posterior chambers

Ciliary muscle and visual accommodation

* Distance vision CM relaxes zonules become tense lens is flattened
* Near vision CM contracts zonules relax lens bulges

Production of aqueous humor (“aqueous’) maintains intraocular pressure and provides nutrition to the lens

* ciliary processes - highly vascular, finger-like processes project into the posterior chamber
* ciliary epithelium - two layers of cells aligned apex to apex
* outer layer is heavily pigmented and is continuous with the retinal pigment epithelium
* inner layer (closer to vitreous body) is composed of fluid transporting cells
* apical cell surface faces pigment epithelium
* highly folded basolateral membrane borders posterior chamber
* blood-aqueous barrier = occluding junctions at apex of inner epithelium

**Glaucoma:** Degenerative condition caused by elevated intraocular pressure due toobstruction to outflow and drainage of aqueous humor

* corneoscleral junction (limbus) is the site of the outflow path for aqueous humor
* trabecular meshwork leads to the canal of Schlemm

**Iris regulates pupillary diameter**

* posterior surface (bordering posterior chamber) is lined by pigmented epithelium which is continuous with the pigmented epithelium of ciliary body
* pigmented myoepithelium (dilator muscle of pupil) is deep to the pigmented epithelium
* constrictor muscle of the pupil occupies the margin of the iris
* anterior surface of the iris (bordering anterior chamber) has no epithelium
* stroma of the iris is a highly vascular fibroblastic connective tissue that contains many melanocytes
* Iris – optical diaphragm that forms the margin of the pupil

**Eye color -** determined by the quantity, distribution of pigment cells primarily in the stroma of the iris

Blue eyes: few melanocytes, little pigment in stroma

Grey to green: moderate amount of melanocyte pigment

Brown: heavily pigmented melanocytes in stroma

Pink: albinism, absence of pigment

**Uveitis:** Inflammation of the uvea, common in ocular pathologies**.**

**Intraocular melanoma:** Can arise from structures throughout the eye, but uveal

Melanoma is the most common

**Lens of the Eye**

**Unique epithelial structure - biconvex, transparent, avascular**

* lens epithelium - simple cuboidal epithelium located only on anterior surface of lens
* lens fibers
* elongated (7-10mm), highly differentiated cells
* oriented anterior-posterior (span depth of lens)
* originate in germinal zone at periphery of lens
* High content of crystallins (90% of protein content of cell) contributes to the refractive index of lens.
* lens fibers nearest center of lens have highest crystallin content
* lens capsule - basement membrane serving as attachment point for ciliary zonules

**Retinal detachment** is separation of the neural retina from the wall of the eye. This often occurs at the weak interface between the photoreceptor cells and the RPE. This constitutes a medical emergency requiring immediate action to prevent permanent loss of sight.

Macular detachment affects the region of highest visual acuity (macula and fovea) and isoften associated with traction due to shrinkage of the vitreous.

Diabetic retinopathy is the most common diabetic eye disease and a leading cause ofblindness in adults. Micro-aneurysms and focal ischemia, or proliferative neovascularization can be involved.

**Neural Retina**

Sensory neuron photoreceptors (rods and cones) plus supporting cells and integrative neurons

Synaptic body: synaptic contact with bipolar cells of retina

Inner segment: perinuclear region

Outer segment: photosensitive receptor apparatus is a highly modified cilium (in contact with the RPE)

**Rods cones**

Function night vision (scotopic) daylight (photopic), color low acuity high acuity

Photo pigment rhodopsin 3 pigments, wavelength specific

Distribution "peripheral" "central"

Number 120 million 6 million

Other ocular structures

Ora serrata - anterior margin of neural retina; one point of attachment for vitreous body

Fovea centralis - located within the macula, near the center of the fundus

* cones only, so is area of highest visual acuity at center of the visual axis

Optic disc - coalescence of ganglion cell processes forming the optic nerve

* "blind spot", no photoreceptors are located here

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

The retina is the innermost layer of the wall of the eye. It is in immediate contact with the vitreal cavity on one side and with the choroid (of the uveal layer) on the other side.

The cellular layers of the retina are as follows:

1) The pigmented epithelium, which is adjacent to the choroid, absorbs light to reduce back reflection of light onto the retina

2) The photoreceptor layer contains photosensitive outer segments of rods and cones

3) The outer nuclear layer contains cell bodies of the rods and cones

4) The outer plexiform layer contains synapses between axons of photoreceptors and dendrites of intermediate neurons,

5) The inner nuclear layer contains cell bodies of intermediate neurons and Muller cells

6) The inner plexiform layer contains synapses between intermediate neurons and ganglion cells of the optic tract

7) The ganglion cell layer contains cell bodies of ganglion cells

8) The optic nerve fiber layer contains axons of ganglion cells. Membrane layers that are not visible in this image separate the photoreceptors from their cell bodies and retina from the vitreal body.