Medical School Histology Basics
Eye

VIBS 289 lab

Larry Johnson  Texas A&M University
OUTLINE

OVERVIEW

CELLULAR STRUCTURES THROUGH WHICH LIGHT PASSES

A. CORNEA
B. LENS
C. RETINA

STRUCTURES WHICH INFLUENCE THE IMAGE

A. IRIS
B. CILIARY BODIES
C. TRABECULAR MESHWORK

Aqueous humor

Vitreous humor
VITREOUS BODY
(VITREOUS HUMOR)

Aqueous humor
Conjunctiva

Stratified squamous epithelium with some goblet cells

sclera

Eye – conjunctiva on white of eye
Eye 192 human and 34412 monkey

Connective tissue

Nerve

Retina

Optic nerve

Sclera

Vitreous body

Chorioid layer

Aqueous humor

Posterior chamber

Cornea

Pupil

Anterior chamber

Lens

Iris

Ciliary body
Fig. 19-3  Cornea (transverse section). Stain: hematoxylin and eosin. The cornea consists of three layers: (1) anterior epithelium, (2) anterior limiting membrane (Bowman's membrane), (3) corneal stroma (substantia propria), (4) posterior limiting membrane (Descemet's membrane), (5) posterior epithelium, (6) squamous cells, (7) columnar cells, (8) nuclei of corneal cells (keratocytes), (9) lamella of collagen fibrils, (10) low cuboidal cells.
Eye – corneal layers

- Bowman’s membrane
- Stratified squamous Epithelium
- Corneal stroma
- Corneal endothelium
- Corneal fibroblasts
- Descemet’s Membrane
Ciliary muscle: smooth muscle

- Ciliary processes
- Blood vessel
- Nerves
- Ciliary muscle
- Lens
Eye – ciliary muscle

- Conunctival sac
- Sclera-cornea junction (limbus)
- Ciliary muscle
- Anterior chamber
- Pupil
- Iris
- Artifactual space
- Ciliary processes
- Posterior chamber
- Ciliary muscle (smooth muscle)
Pigmented cells of the ciliary processes become the dilator muscle of the iris.

Secretory cells become the pigmented cells of the iris.
Eye (toluidine blue)

- Conjunctiva
- Iris
- Ciliary muscle
- Air
- Trabecular meshwork
- Canal of Schlemm
- Limbus
- Endothelium of trabecular meshwork is continuous with the transport endothelium of the cornea
- Anterior chamber
- Posterior chamber
- Iris
- Ciliary processes
Eye – trabecular meshwork and canal of Schlemm

- Limbus
- Trabecular meshwork
- Canal of Schlemm
- Ciliary muscle
- Anterior chamber with aqueous humor
Canal of Schlemm
Trabecular meshwork
Iris
Posterior chamber with aqueous humor
Blood vessels
Dilator muscle
secretory cells
Ciliary processes
Monkey eye
Eye (toluidine blue)

Eye structures:
- Iris
- Pupil
- Lens

Muscles:
- Constrictor muscle
- Dilator muscle

Epithelium:
- Cuboidal epithelium on anterior surface of lens

Chambers:
- Anterior chamber
- Posterior chamber
- Lens capsule

Other structures:
- Retina
- Vitreous
Eye (toluidine blue)

- Iris constrictor smooth muscle
- Lens capsule
- Lens cuboidal epithelium
- Lens
The capsule is a shared basement membrane of the lens epithelium.
The capsule is a shared basement membrane of the lens epithelium.
**Lens and iris**

- Iris constrictor muscle is smooth muscle
- Lens anterior surface
- Pigmented epithelium of iris
- Lens capsule
- Lens cuboidal epithelium
- Posterior chamber
Eye (toluidine blue) elongation of lens cuboidal cells at bow region

Lens cuboidal epithelium on its anterior surface gives rise to elongated lens fibers in the bow region, and the shared basement membrane of these cells is the capsule.

No cuboidal epithelium on the posterior surface of the lens and the capsule is thinner there.
Eye monkey

Sites of attachment of zonules to the lens’ capsule

Anterior surface

Posterior surface

Iris

Ligaments (zonules)

One site of attachment of a zonule to the capsule on the lens on its posterior surface
Zonules

Sclera

Ciliary muscle

Capsule and cuboidal epithelium on the anterior surface of lens

Thinner capsule on the posterior surface of the lens

Lens fibers
Eye monkey

Pigmented layer of epithelial cells

Elaborate network of vessels, the choroid plexus.

Capillary network in retina

Central artery of the retina
Fig. 19-5  Retina, Choroid, and Sclera (panoramic view). Stain: hematoxylin-eosin. Medium magnification.

Fig. 19-6  Layers of the Choroid and Retina (detail). Stain: hematoxylin-eosin. High magnification.
Rods

Cones

Nuclei of rod and cone cells = outer nuclear layer

Retinal pigmented epithelium

Photosensitive portion of rod and cone cells
Eye - Retina and choroid:

- Blood vessels in the retina
- Artifact space
- Choroid plexus
- Sclera
- Melanin granules
- Nucleus
- Retinal pigment epithelium
- Optic nerve
Typical retina

- Ganglion cell layer
- Bipolar cells
- Rods and cones
- Retinal pigmented epithelium

Macula with top two layers pulled back to aid vision

- Rods and cones
- Retinal pigmented epithelium
Conjunctiva
Sclera
Cornea
Iris
Vitreous body
Aqueous humor
Anterior chamber
Posterior chamber
Optic nerve
Choroid plexus
MACULA
Lens
Retina
Cornea
lens
Sclera
Photosensitive region of rods and cones

Blind spot where optic nerve enters the retina

Pigmented epithelium

Choroid

Bipolar cell layer

Ganglion cell layer
Eye (toluidine blue)

Blind spot
where
optic nerve enters
the retina
Choroid plexus

Retina

OPTIC CUP AND NERVE HEAD

Retina
In summary

OUTLINE

OVERVIEW

CELLULAR STRUCTURES THROUGH WHICH LIGHT PASSES
A. CORNEA
B. LENS
C. RETINA

STRUCTURES WHICH INFLUENCE THE IMAGE
A. IRIS
B. CILIARY BODIES
C. TRABECULAR MESHWORK
Questions on the eye

1. The integrity of the relationship among structures of the eye is produced/maintained by:
   a. supporting layer of the eye holding pressure
   b. precise regulation of pressure via aqueous humor production and outflow
   c. the bony structure of the sclera in mammals
d. a and b
e. a, b, and c

2. Which structure is not correctly paired with its function?
   a. the iris regulates the amount of light that reaches the retina
   b. ciliary bodies alter the shape of the lens by the attached zonules
   c. the trabecular meshwork enhances the outflow of vitreous humor
   d. the cornea focuses the image on the retina
e. the retinal and choroid blood vessels provide nutrients to the retina

3. Which function(s) least match(s) that of the cornea?
   a. protection
   b. structural support
   c. filter out undesirable light rays
d. focus image on photosensitive portion of the photoreceptor cells
e. none of the above
Many illustrations in these VIBS Histology YouTube videos were modified from the following books and sources: Many thanks to original sources!

Medical School Histology Basics
Eye

VIBS 289 lab

Larry Johnson
Texas A&M University