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## The Basics of Ocular Histopathology

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### Sample Submission

- Surgical biopsy
  - Gentle tissue handling during biopsy
  - Common samples submitted
    - Palpebral or conjunctival biopsy
    - Keratectomy specimens (partial thickness cornea)
    - Globe (enucleation or orbital exenteration)
    - Uveal evisceration
- Consider performing cytology, bacterial and fungal culture- before fixation!
- Fixation in 10X volume of 10% neutral buffered formalin or modified Davidson's fixative
- History: Very important in ocular pathology!!!!
  - Signalment, history, prior treatment and response, results and case number of previous biopsy (if any), clinical impression
- Develop good avenues of communication with your pathologist

### Review of Ocular Histology

- Eyelids
  - Haired skin
  - Meibomian (sebaceous) glands
  - Cilia (eyelashes)
- Conjunctiva
  - Mucosal lymphoid system
- Third Eyelid
  - Gland of the third eyelid
- Cornea
  - Stratified squamous epithelium (non-keratinized in health)
  - Stroma
  - Descemet's membrane
  - Corneal endothelium
- Uvea (Vascular tunic)
  - Iris
  - Ciliary body
    - Secretes aqueous humor
    - Zonules anchor the lens for accommodation
  - Choroid
    - Choriocapillaris
    - Tapetum lucidum
- Iridocorneal angle
- Lens

- Lens epithelium secretes lens capsule (a basement membrane)
- Lens fibers
- Vitreous Body
- Retina
  - Retinal pigment epithelium (RPE)
  - Visual cell layer (rods and cones)
  - External limiting membrane (Muller's fiber cells)
  - Outer nuclear layer
  - Outer plexiform layer
  - Inner nuclear layer
  - Inner plexiform layer
  - Ganglion cell layer
  - Nerve fiber layer
  - Internal limiting membrane
- Optic nerve
  - Axons of the retinal ganglion cells, extend to brain
  - Covered by leptomeninges (contiguous with leptomeninges of the brain)
- Sclera
- Orbit
  - Lacrimal glands
  - Adipose tissue
  - Skeletal muscle
  - Orbital bones

### **Corneal Diseases**

- Corneal Trauma and Healing
  - Processes in corneal wound healing
  - Corneal Ulcers
    - Uncomplicated
    - Complicated, deep or Desmetocele
      - Melting corneal ulcers
    - Refractory
  - Sequelae of corneal ulceration
    - Chronic ulcers
      - Neovascularization, fibroplasias, hyperpigmentation
    - Fungal keratitis in horses
- Corneal Neoplasia
  - Squamous cell carcinoma
  - Hemangioma and hemangiosarcoma
  - Melanoma of the cornea and sclera ("Limbal Melanoma")

### **Uveal Diseases**

- Uveal Inflammation
  - Uveitis by location
    - Iritis, cyclitis, choroiditis
    - Iridocyclitis= anterior uveitis

- Posterior uveitis= inflammation of ciliary body and choroid
  - Chorioretinitis= inflammation of choroid and retina
  - Panuveitis
- Cellular Responses in Uveitis
  - Suppurative Uveitis- usually bacterial or fungal agents
  - Lymphoplasmacytic Uveitis- reflects antigenic stimulation
  - Granulomatous Uveitis- usually fungal, also feline infectious peritonitis, Vogt-Koyanagi-Harada-like syndrome in dogs
- Uveal Neoplasia
  - Primary
  - Secondary (metastatic)

### Ocular Trauma

- Post-traumatic ocular sarcomas in cats
- Suppurative lenticular inflammation and uveitis in dogs
- Globe rupture in horses

### Glaucoma

- Normal IOP
  - Aqueous Production= Aqueous Outflow
- Glaucoma is a group of related diseases with elevated IOP
  - Reduced net outflow is the usual cause of increased IOP
- Elevated IOP causes damage to other intraocular structures
  - Globe enlarges- (buphthalmos) with sclera and uveal stretching
  - Collapse of ciliary cleft and trabecular meshwork
  - Uveal atrophy- iris stroma thins and ciliary body atrophies
  - Lens luxation or subluxation due to tearing of zonules
  - Cataract forms- associated with changes in aqueous humor content
  - Corneal endothelial cells decrease metabolism, results in corneal edema
  - Corneal edema and buphthalmos result in lagophthalmos (eyelids not close), so get exposure keratitis
  - Vitreous liquifies (vitreous syneresis)
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### Pathology of the Retina

- Retinal dysplasia
  - Abnormal differentiation during development of the retina- folds, rosettes
- Retinal degeneration
  - Retinal atrophy may result from elevated intraocular pressure (glaucoma)
  - Other causes include inherited defects or metabolic diseases
- Retinal detachment
- Separation of neurosensory retina from the RPE

- Types:
  - Congenital
  - Tractional-shrinkage of vitreous or vitreous inflammation
  - Exudative- fluid or cells in subretinal space
  - Rhegmatogenous- tear in neuroretina and leakage of vitreous and fluid into the subretinal space, dissecting the retina from the underlying RPE