

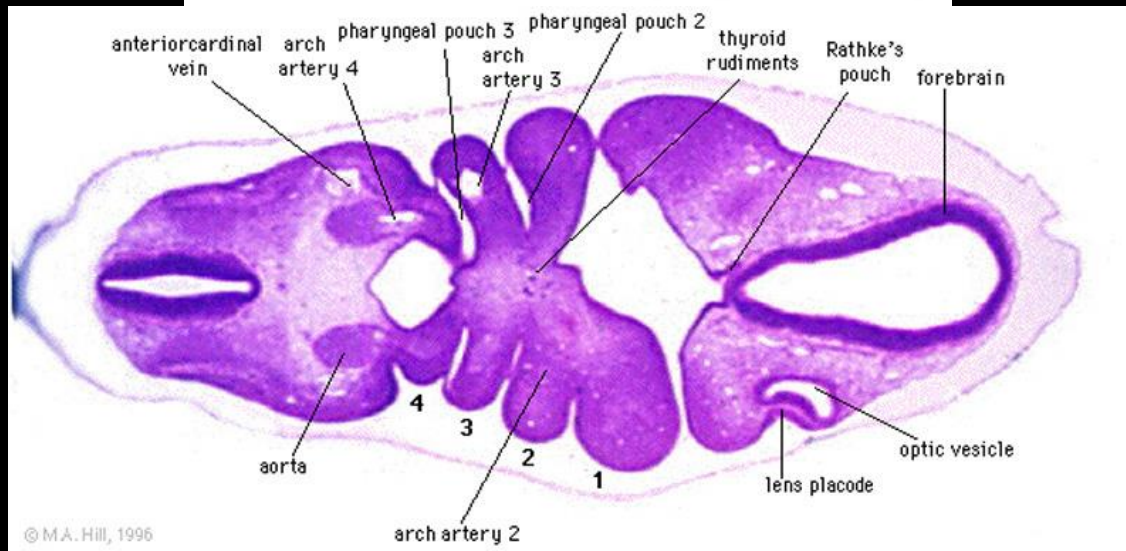
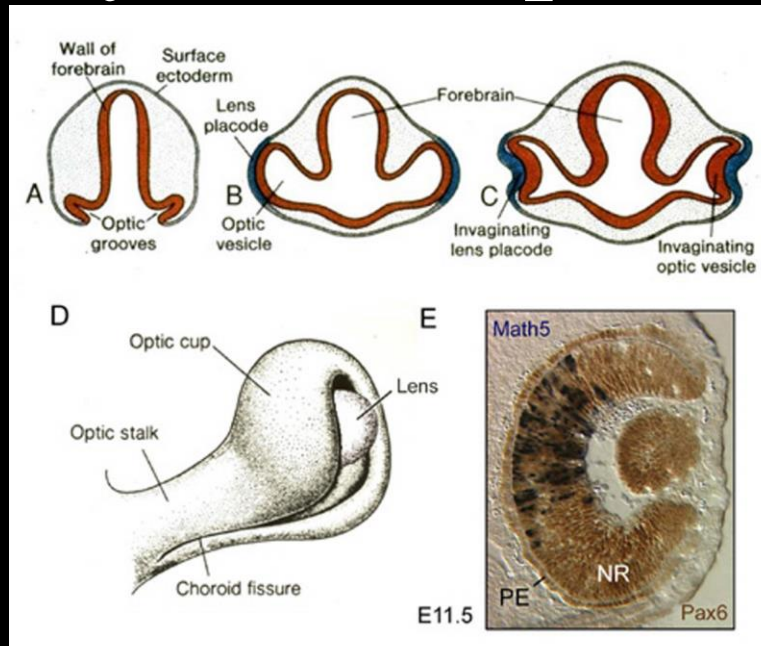
# The Pathology of the Lens

Dick Dubielzig

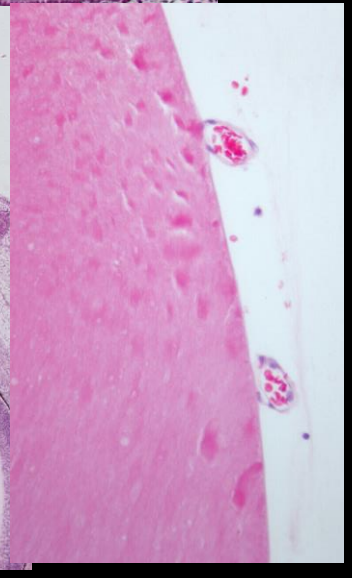
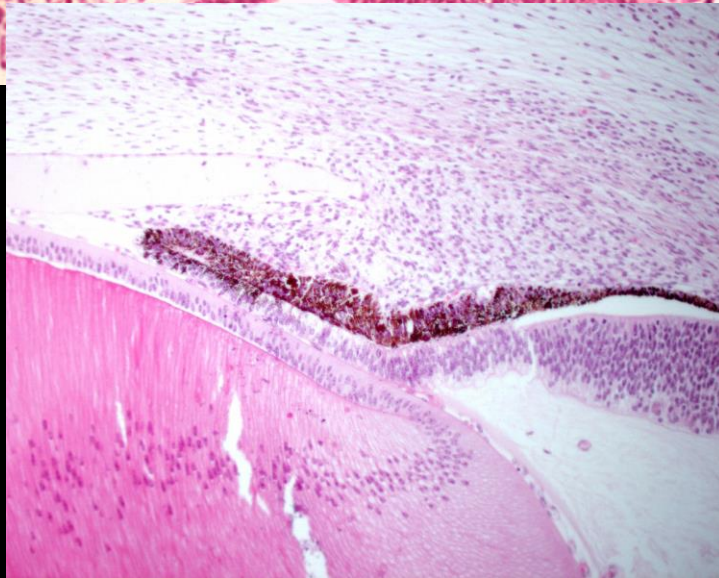
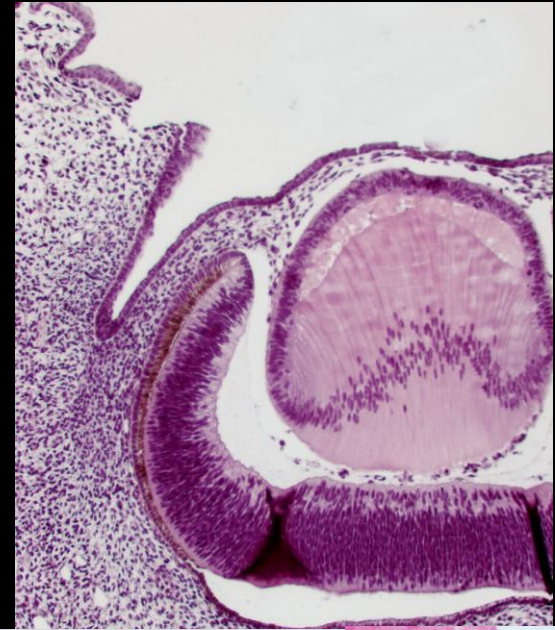
# Lens Development

- The induction of the lens placode
- Involution of the lens placode
- Elongation of the posterior lens epithelial cells
- Formation of the cortex
- The tunica vascularis lentis

# Early Development



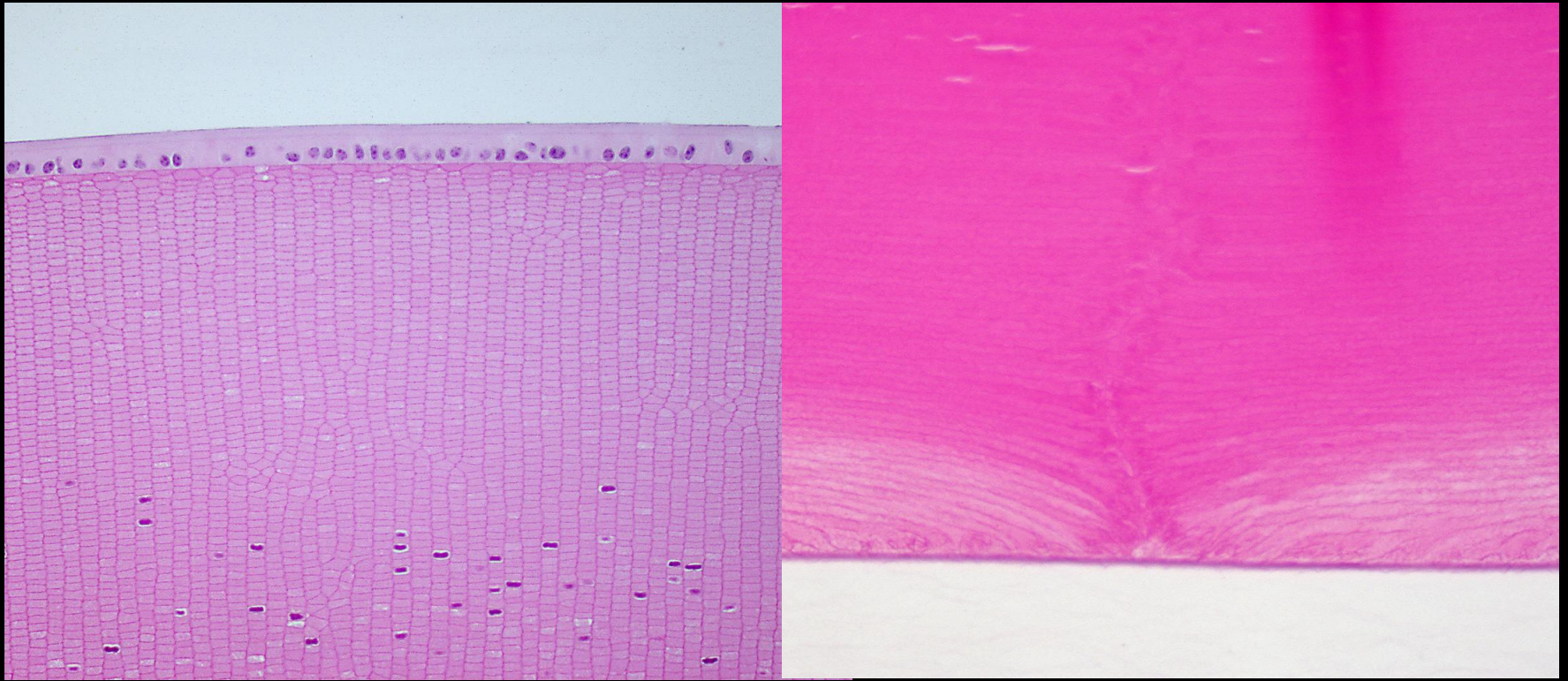
# Lens Development



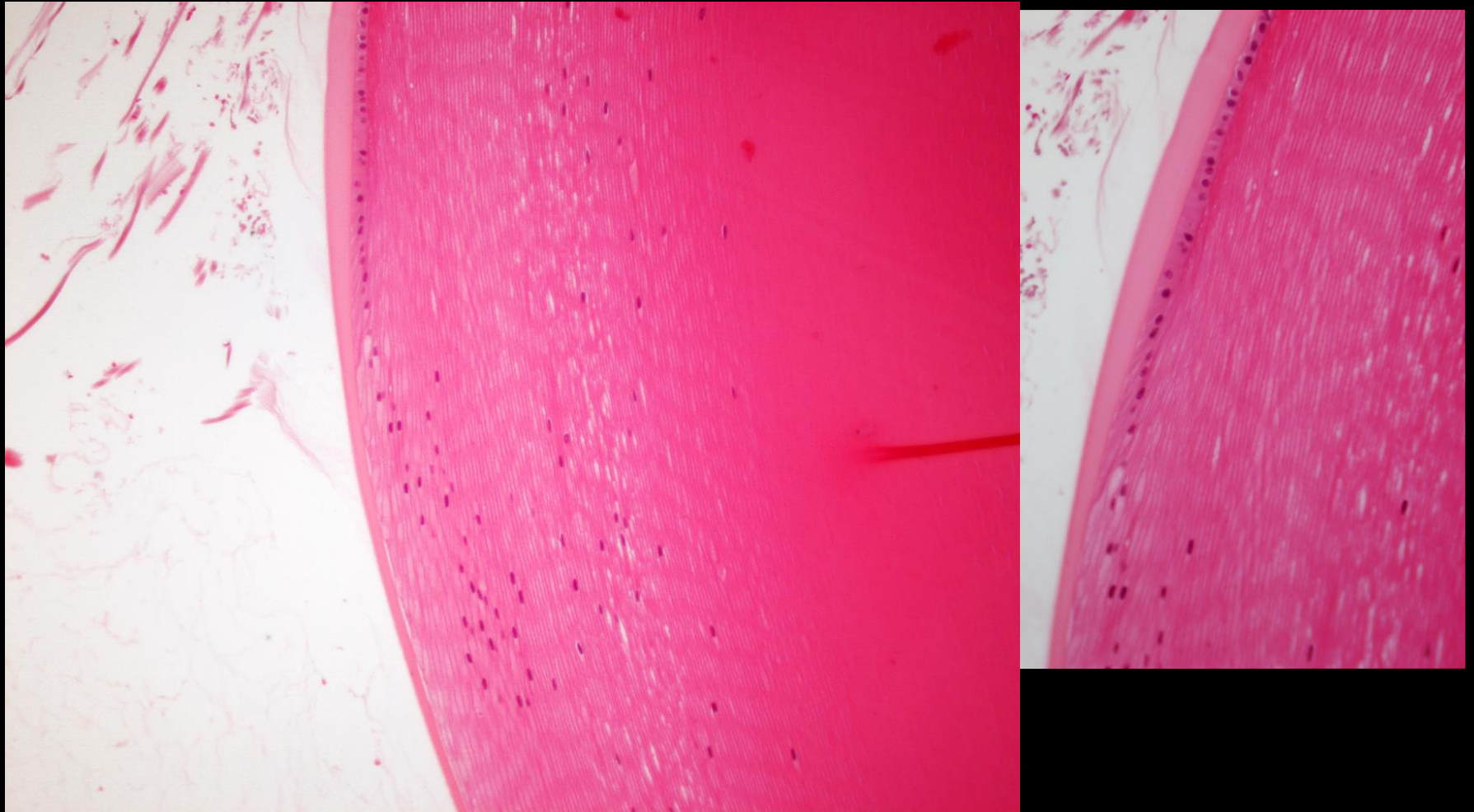
# Normal Lens Anatomy

- Lens Capsule
  - Basement membrane of lens epithelium
  - Elastic properties
- Lens Epithelial Cells
  - Proliferation zone
- Nuclear Bow
  - Elongation and turning of LEC
- Lens Fibers
- Lens Sutures
- Anatomic Variations
  - Annular pad
  - The spherical lens

# Normal Lens Morphology

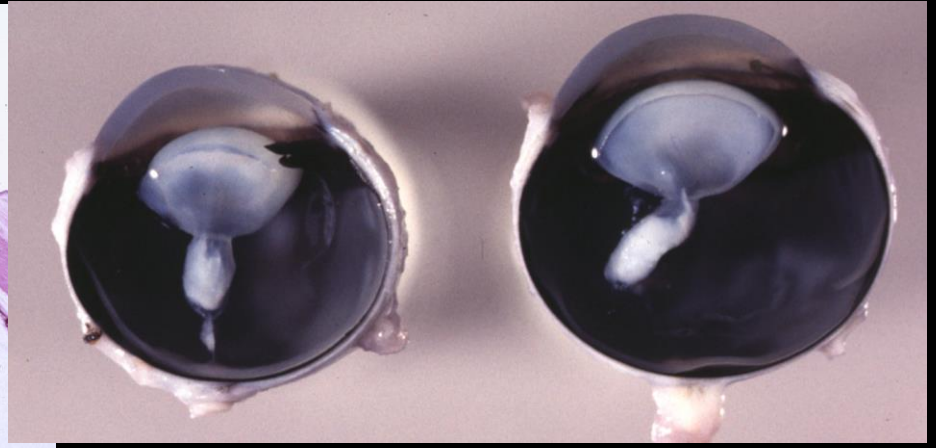
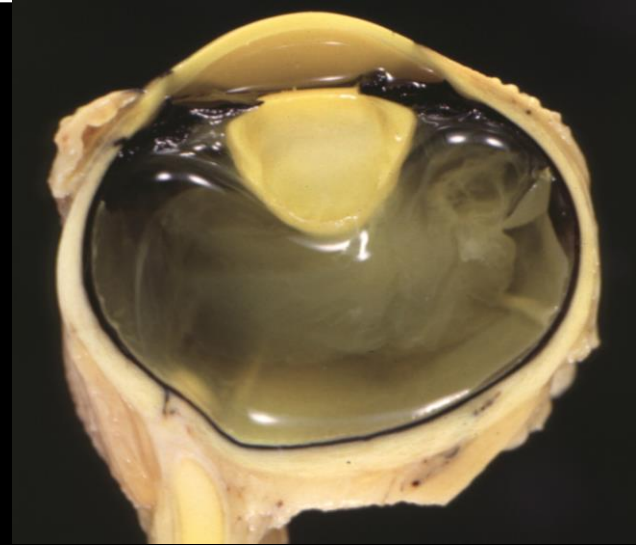


# Normal Lens Morphology



# Abnormal Lens Shape

## Lenticonus





# Abnormal Lens Shape



Microphakia



Congenital lens coloboma

# Cataract Definition

Any reduction in the optical clarity of the lens with or without reduction of vision.

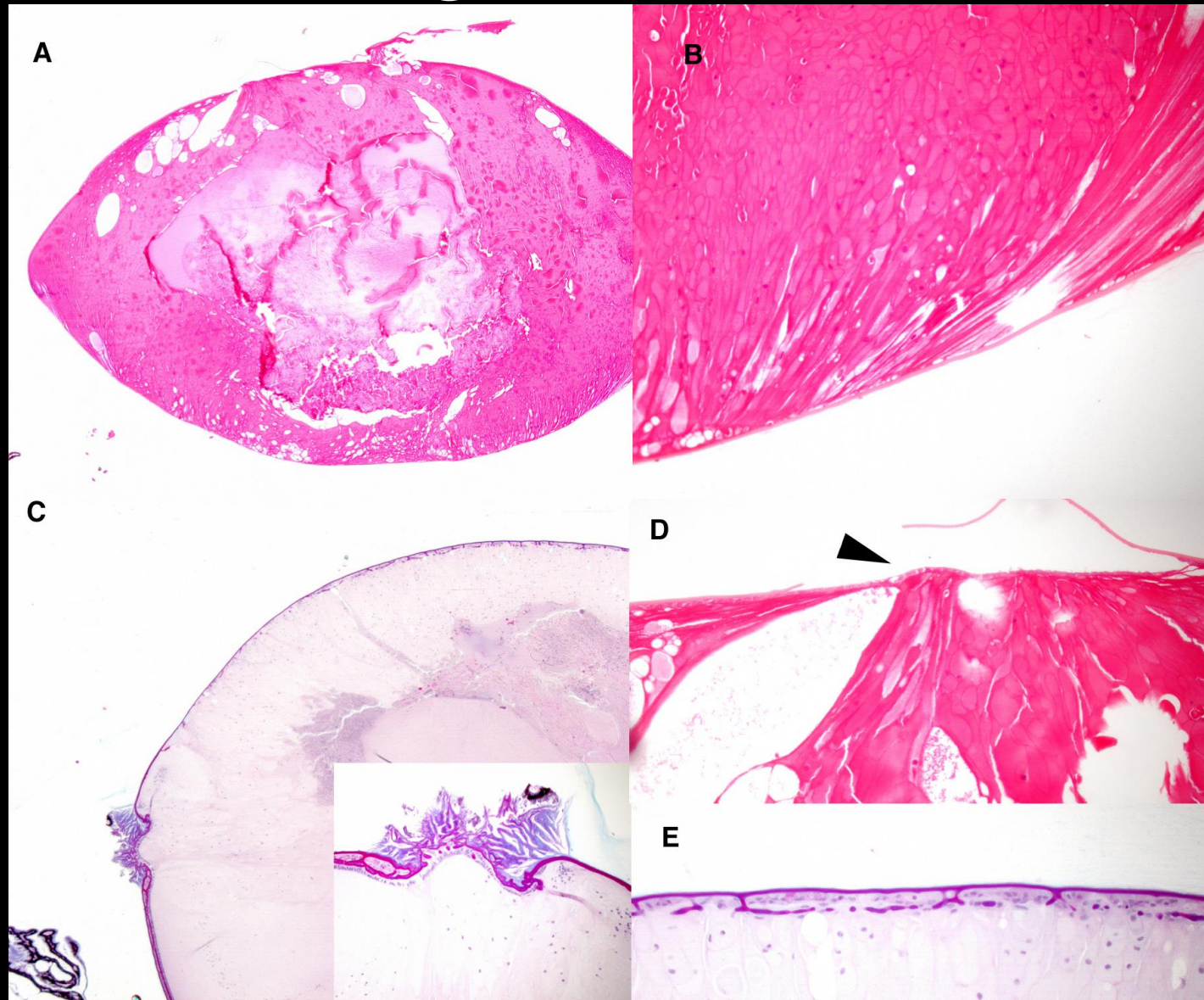
# Cataract Causes

- Advanced age
- Hereditary
- Trauma
- Diet
- Diabetes & other metabolic disorders
- Vitreous disorders
- Retinal disorders
- Inflammation
- Toxic

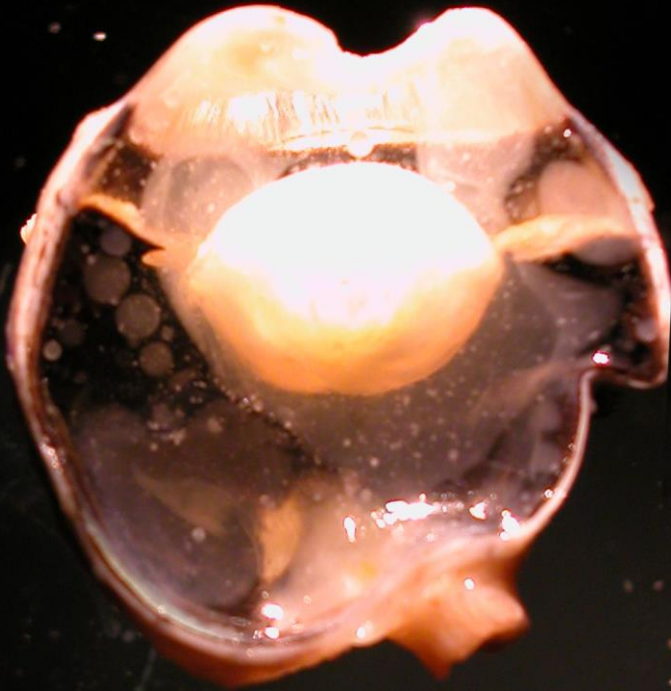
# Cataract Morphologic Types

- Congenital cataract
- Intumescent cataract - swollen
- Early cortical cataract
- Mature cortical cataract
- Hypermature cortical cataract
- Morgagnian cataract
- Anterior subcapsular cataract
- Posterior subcapsular cataract
- Nuclear cataract
  - Nuclear cataract is a protein degeneration with no morphological features

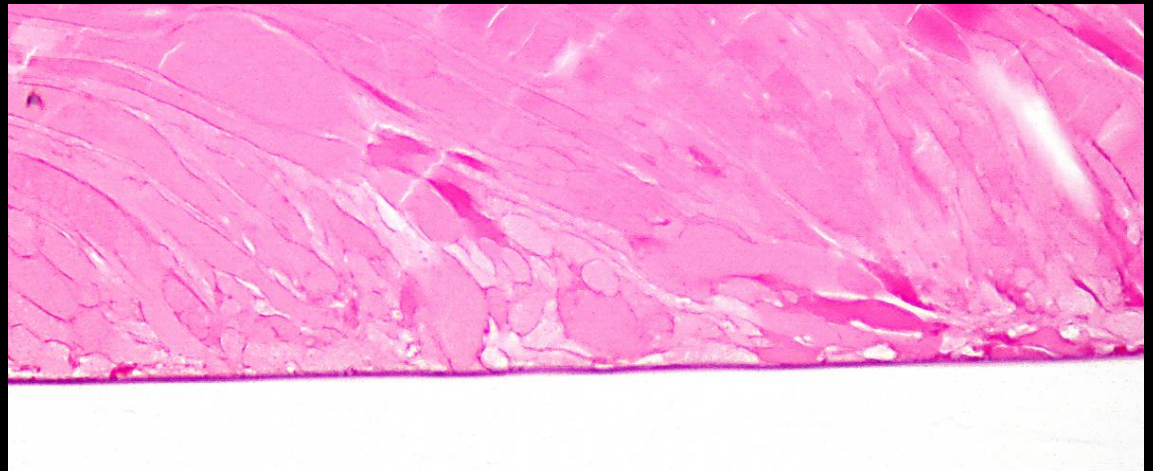
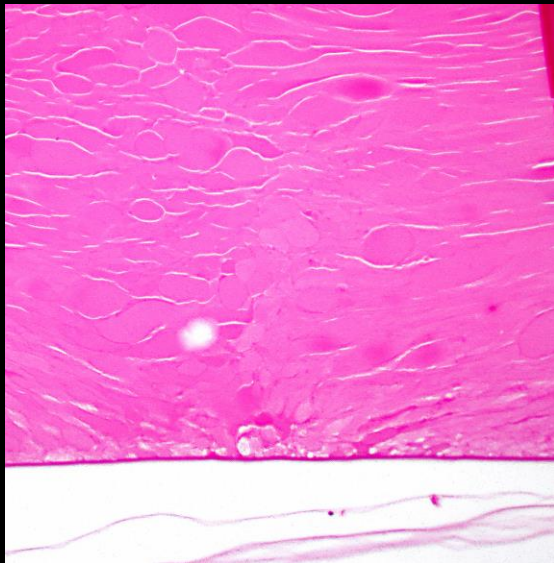
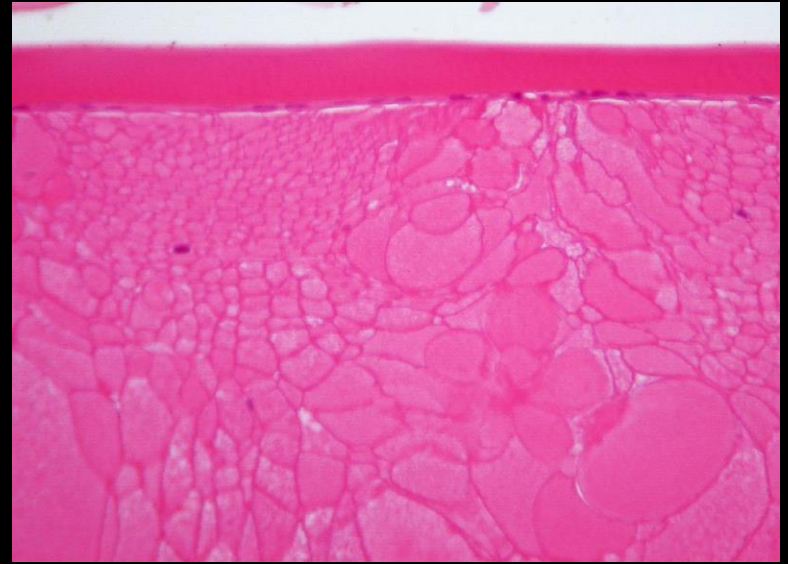
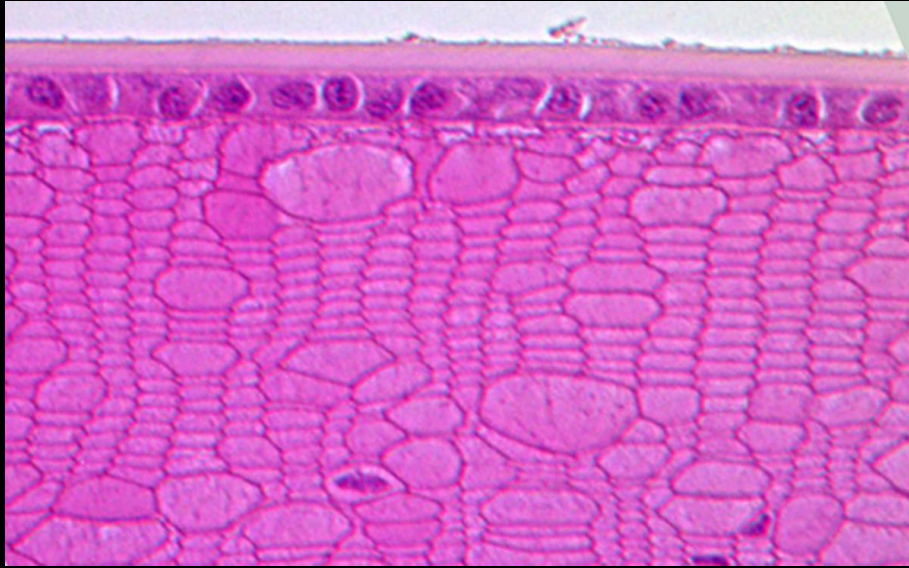
# Congenital cataract



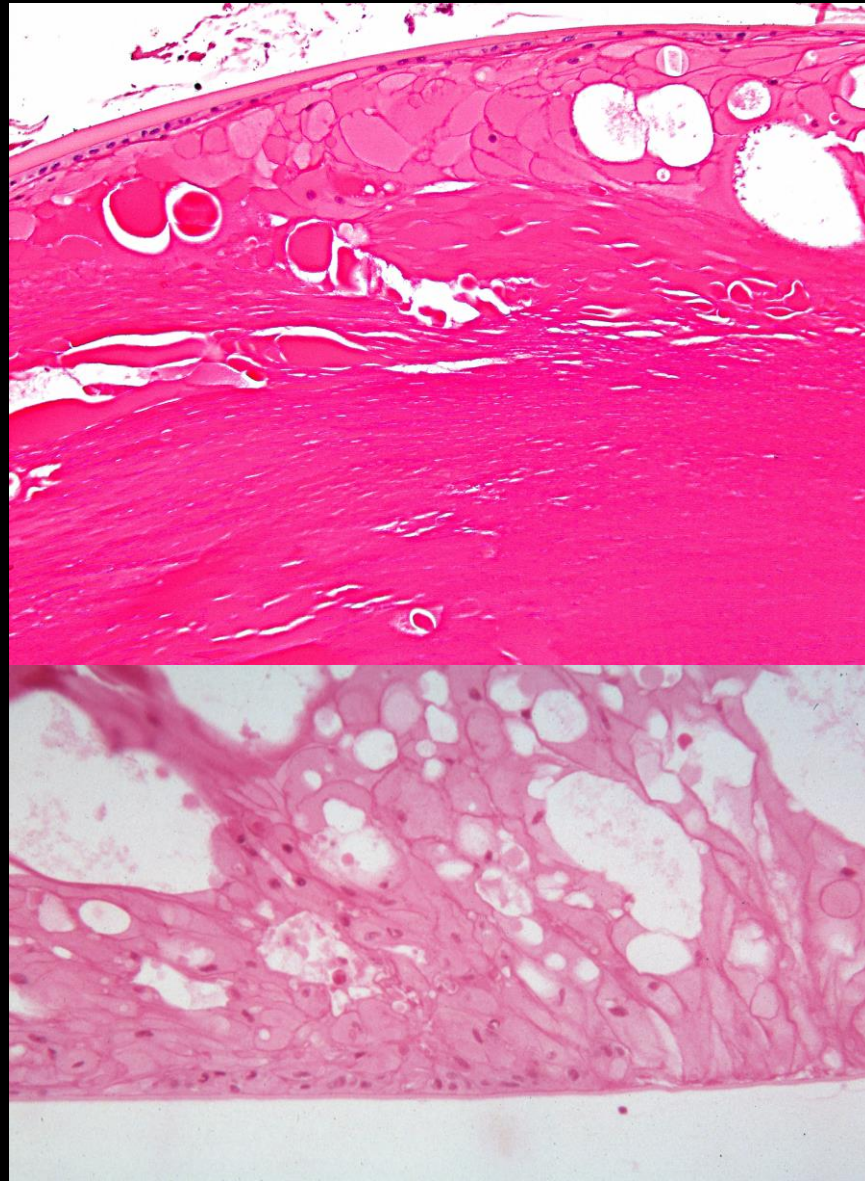
# Intumescent Cataract



# Early Cortical Cataract

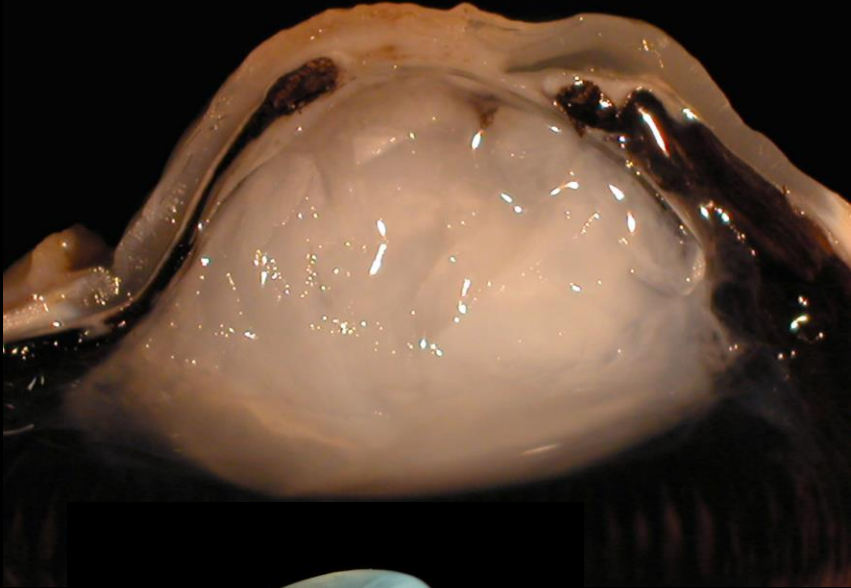


# Mature Cortical Cataract

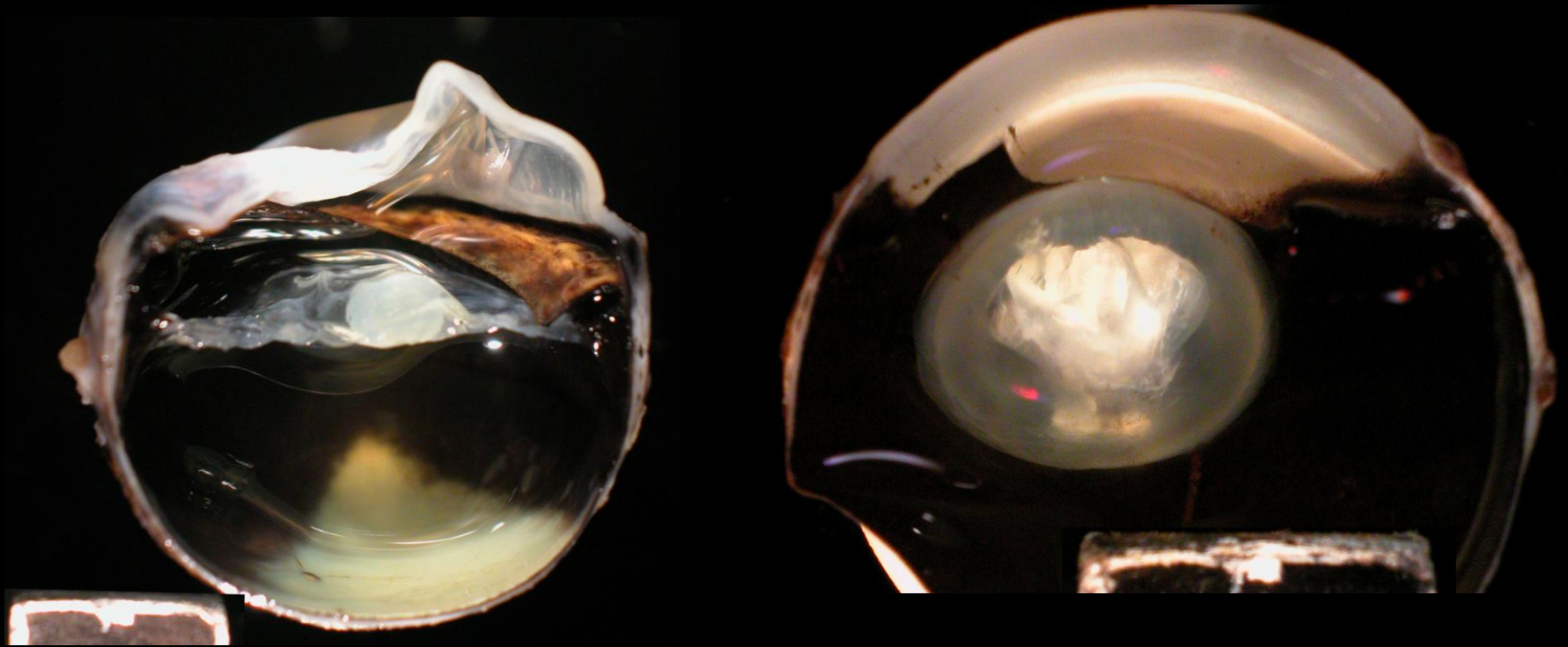




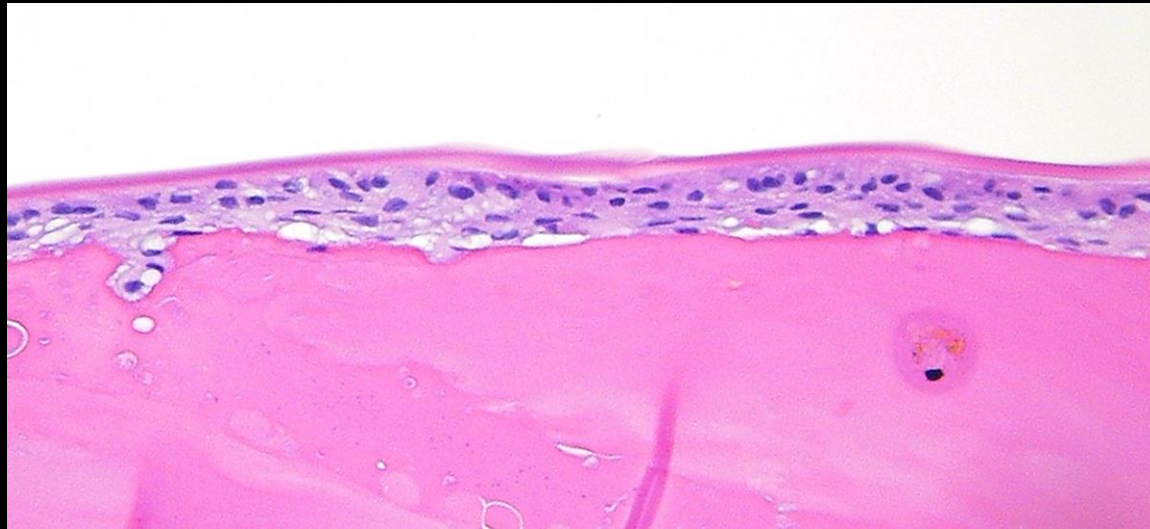
# Hypermature cortical cataract



# Morgagnian cataract



# Anterior subcapsular cataract



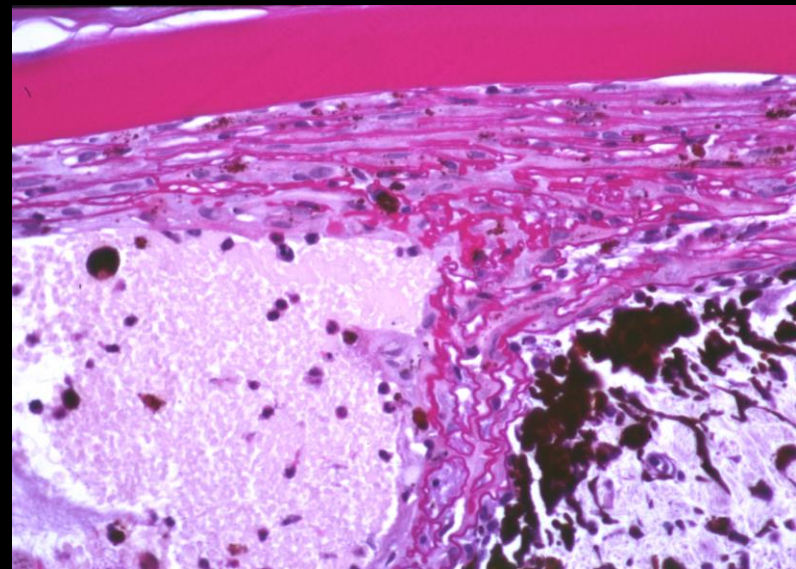
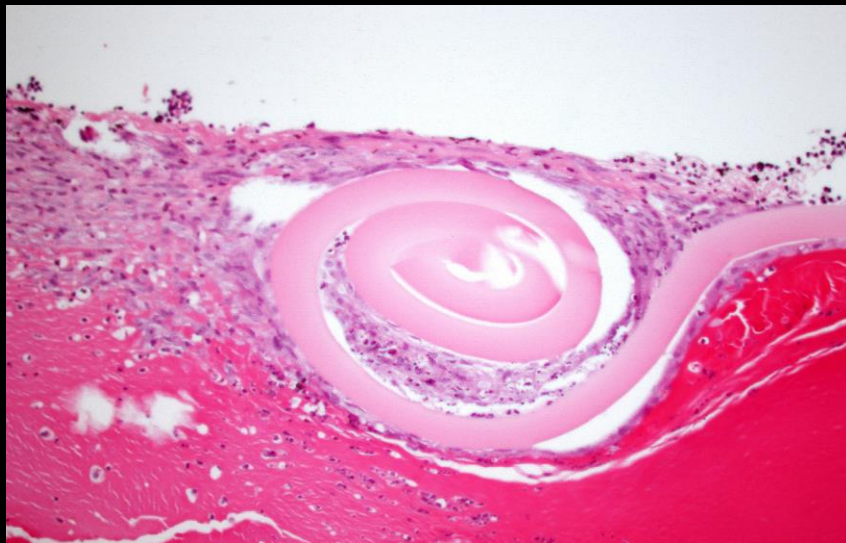
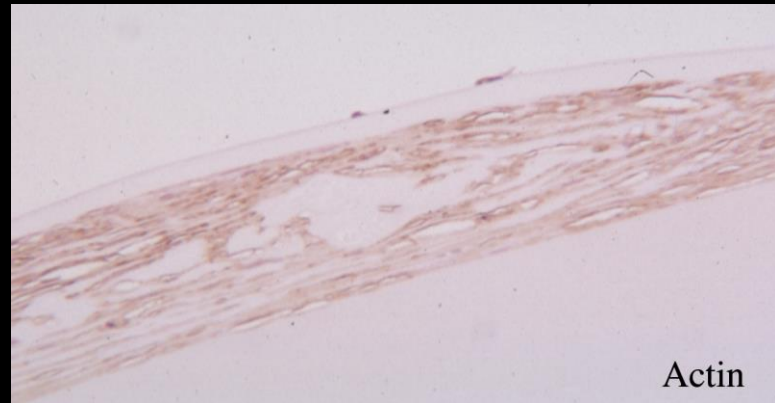
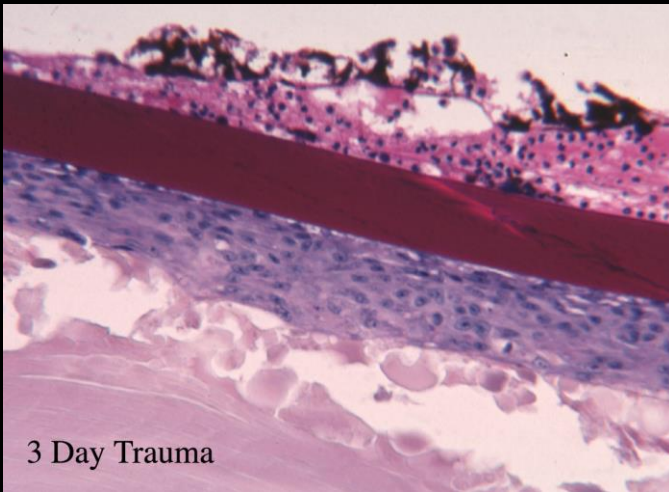
# The causes of cataract

- Previously clear lens fibers become opaque
  - Osmotic changes
  - Contusion or trauma disrupting lens fibers
- Formation of new opaque lens fibers
  - Congenital cataract
  - Toxic or radiation cataract where LEC is damaged
- Fibrous metaplasia (subcapsular cataract)
- Mineralization

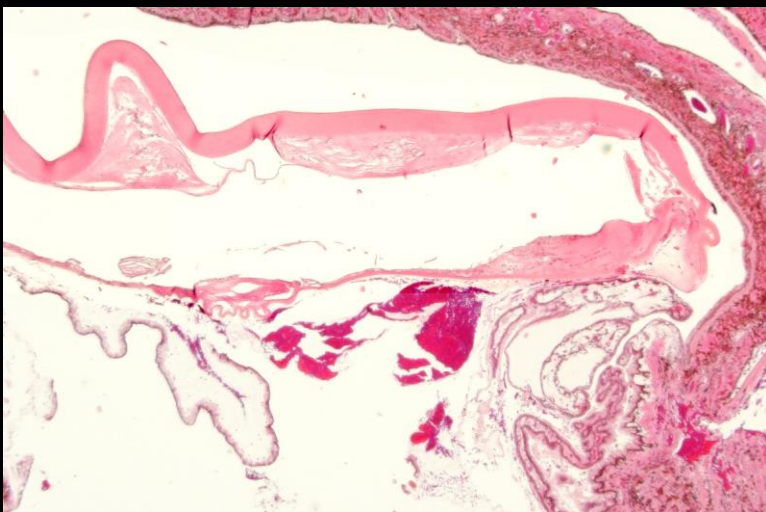
# Consequences of trauma on the lens

- Cataract
- Lens luxation
- Lens epithelial proliferation
- Feline Post-traumatic sarcoma

# Lens epithelial cell metaplasia, proliferation, and migration following trauma



# Complications after cataract surgery due to lens epithelial cells proliferation and fiber re-growth



Soemmerring's Ring (Rabbit)

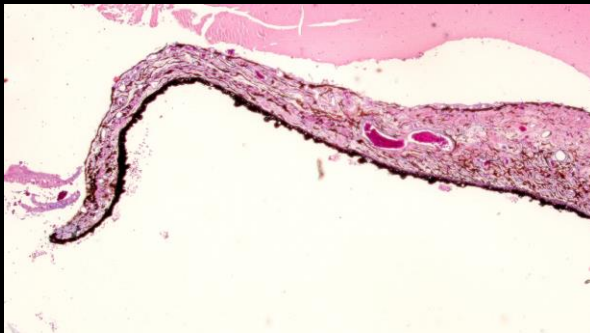
# Lens Luxation

- Zonular ligament
  - Fibrillin is the glycoprotein subunit that makes up the back bone of the zonule fiber (not collagen)
- Trauma
- Buphthalmos
- Uveitis
- Marfans like syndromes
- Primary lens luxation in dogs
  - Jack Russell Terriers & similar terrier breeds, Chinese Crested , Shar-Pei, Australian Blue Heeler,

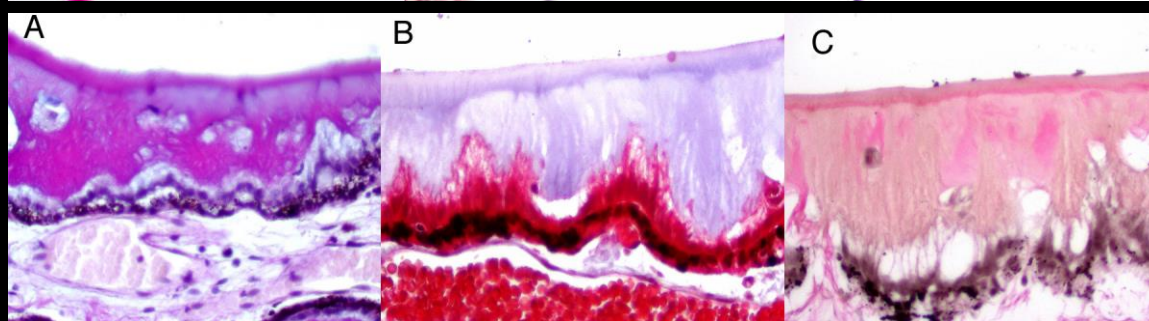
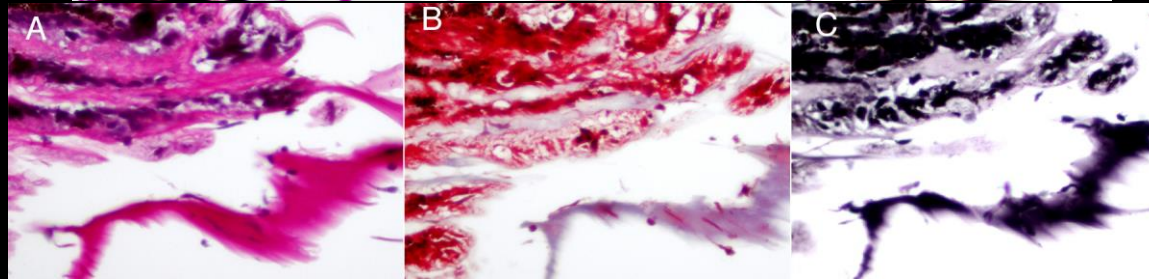
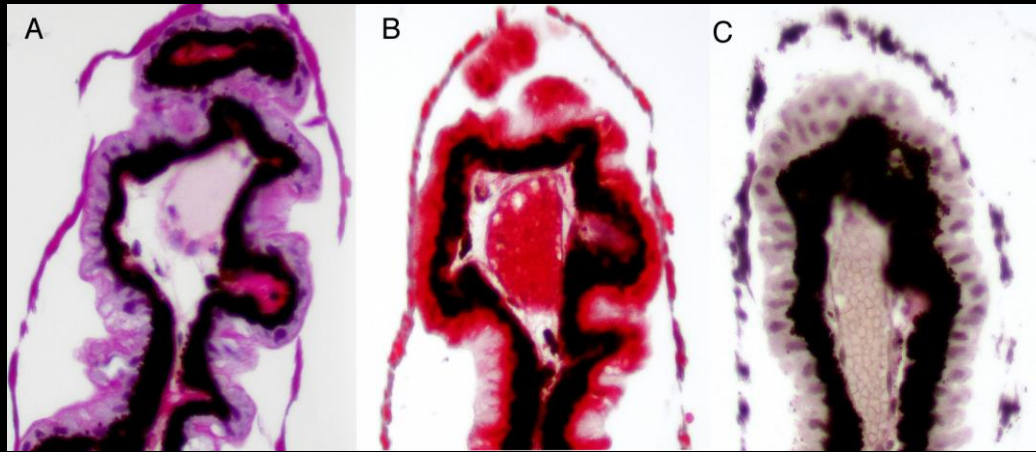


# Hints to recognizing lens luxation in a pathological submission

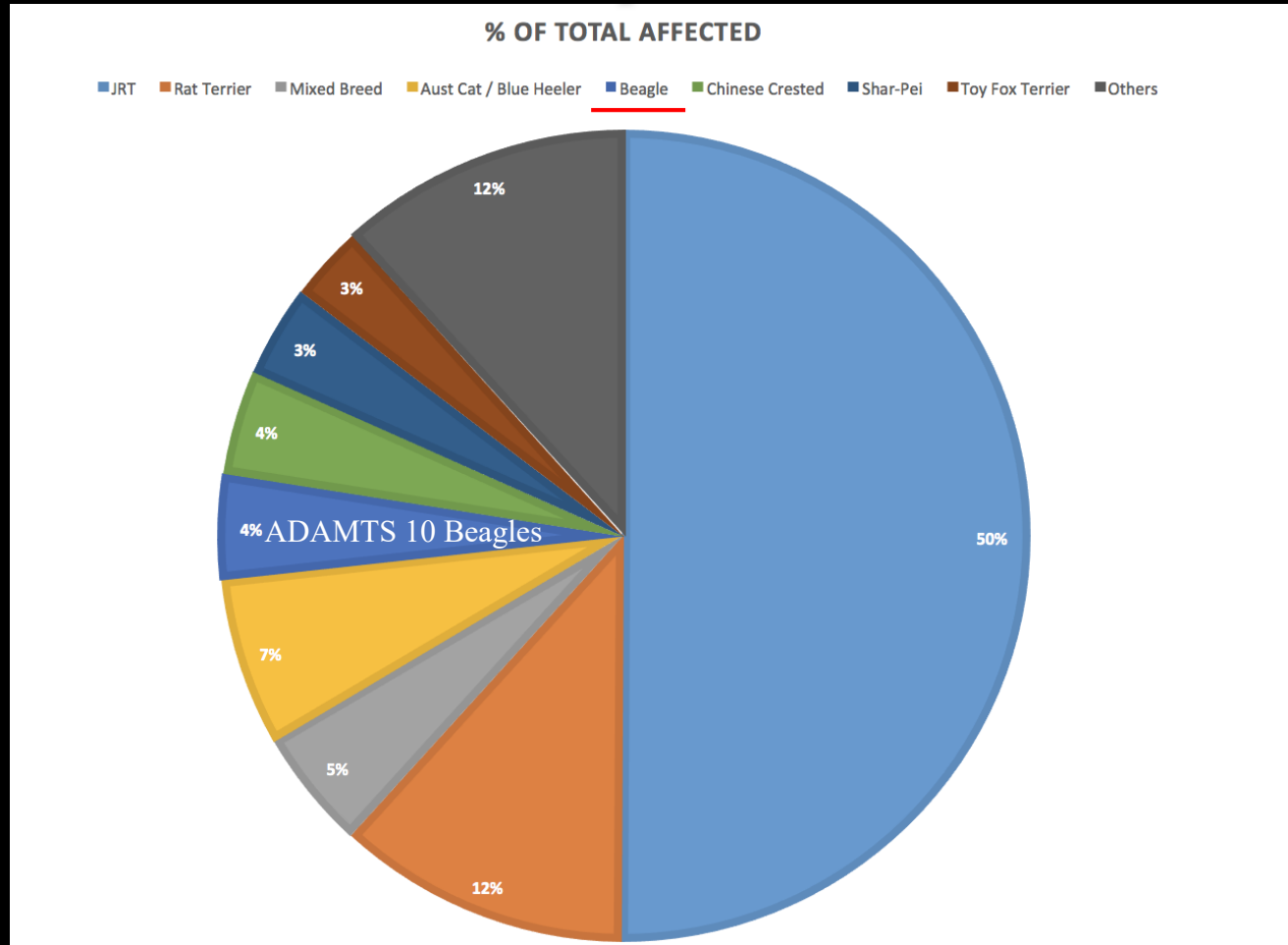
- In the history (best way)
- Observation at the time of grossing the globe (2nd best way)
- Distorted angle of the iris leaflet
- Atrophy of the ciliary processes
- Position of the lens on the histoslide (very poor)



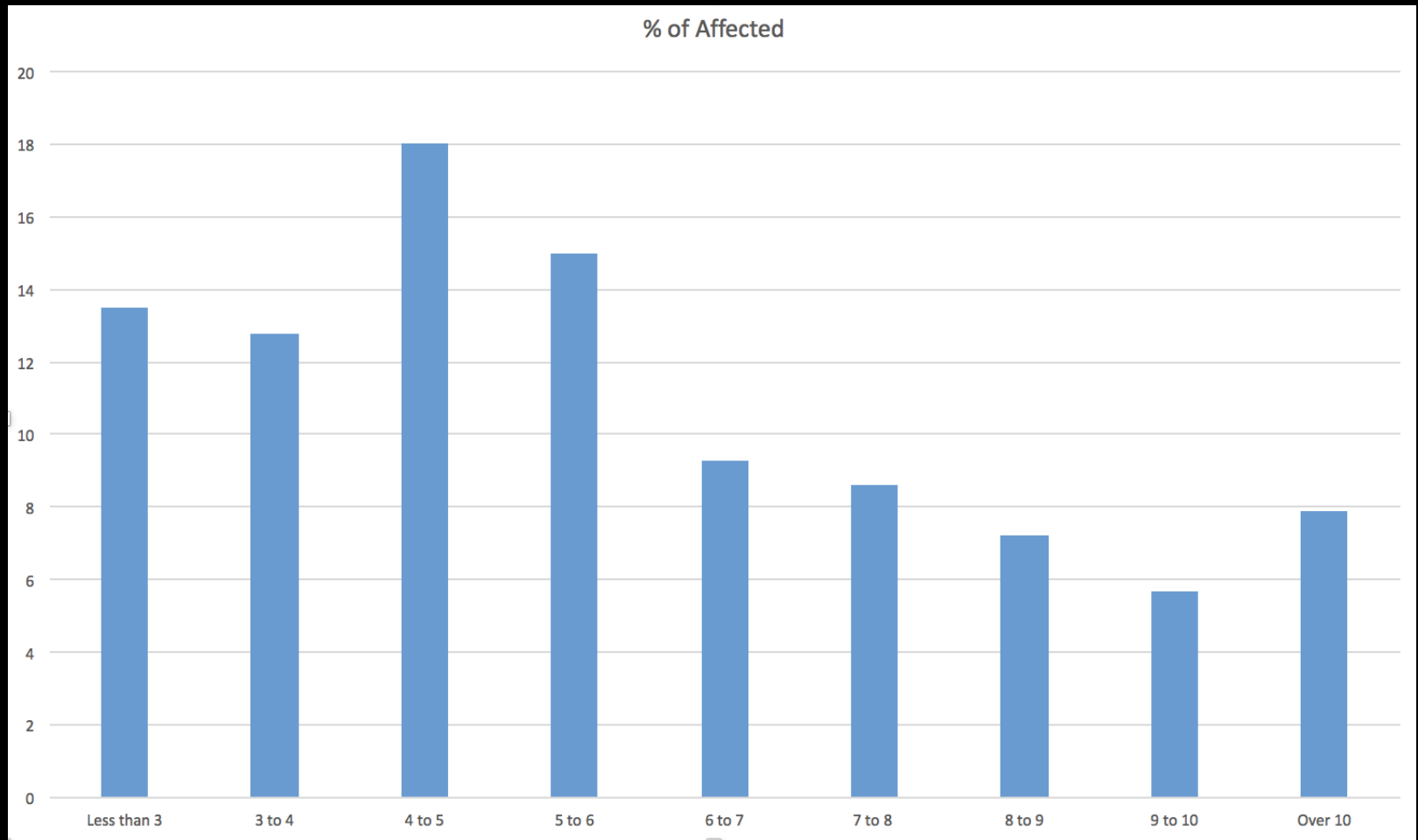
# Primary lens luxation ADAMTS 17 mutation



# Primary lens luxation ADAMTS 17 mutation

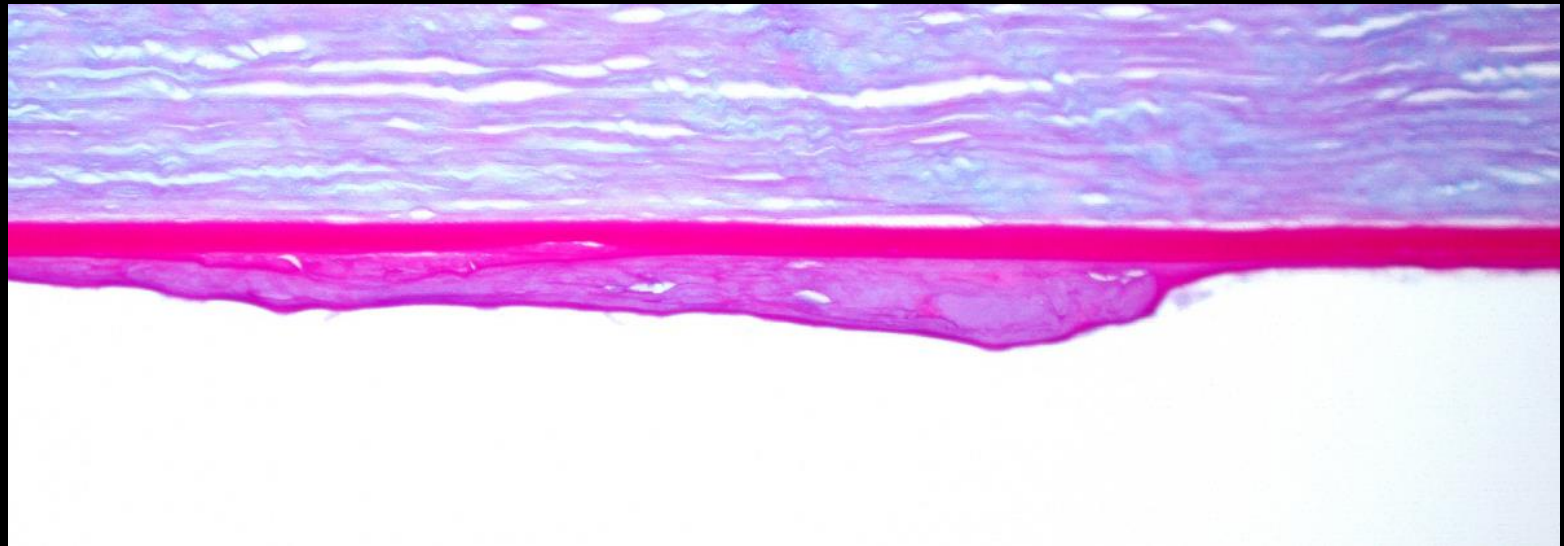


# Primary lens luxation ADAMTS 17 mutation



# Consequences of lens luxation

- Glaucoma
- Vitreous degeneration
- Corneal endothelial atrophy
- Retrocorneal membrane formation



# Lens Induced Inflammation

## The Phacitis Syndromes

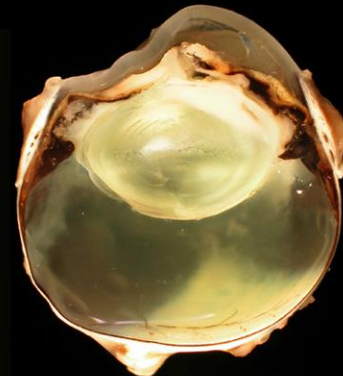
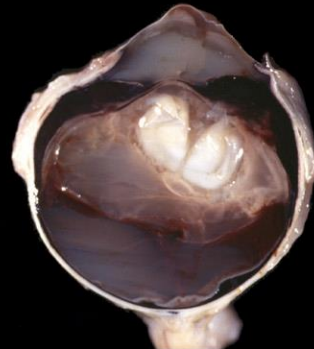
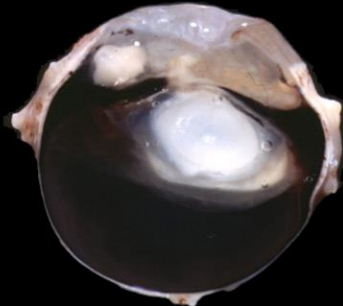
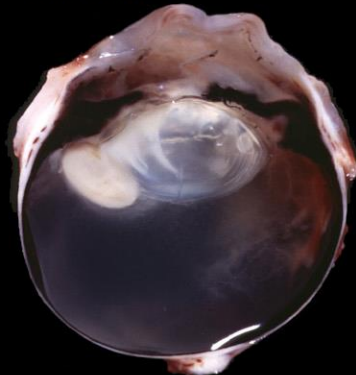
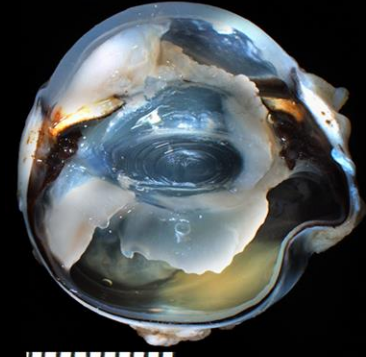
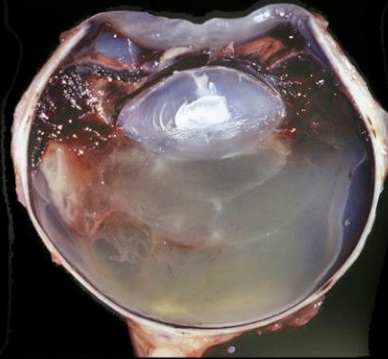
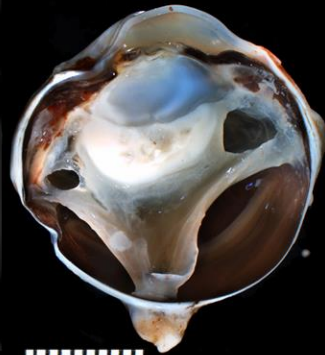
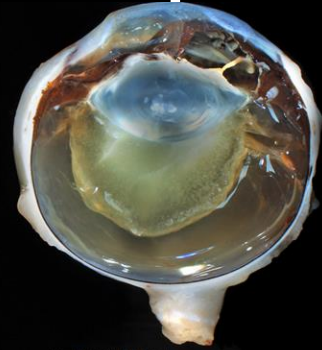
- Lens Induced Uveitis (Phacolytic Uveitis)
  - Hypermature cataract
  - Results in synechia followed by possible glaucoma
- Septic implantation syndrome
  - Cat scratch
  - Bacteria embedded in the lens tissue
- Phacoclastic uveitis
  - Bland phacophagocytic inflammation
    - Lens capsule rupture or post operative exposure of lens protein
    - Purely a bland macrophage response
  - Asymmetric Uveitis – Non-diabetic
    - Robust pyogranulomatous reaction
      - Carpeting of the uvea, retina, lens, or cornea
      - Small breed dogs with the Poodle being the most common
  - Asymmetric Uveitis – Diabetic variant
    - Robust pyogranulomatous reaction identical to above
    - Miniature Schnauzers are the most common breed

# Septic Implantation Syndrome

- 20 cats and 46 dogs
- Disease duration average 6 weeks
- History of a traumatic event in 20% of cats and 39% of dogs
- 100% of traumatic events reported are a cat scratch
- Organisms identified in the lens in 70% of cats and 65% of dogs

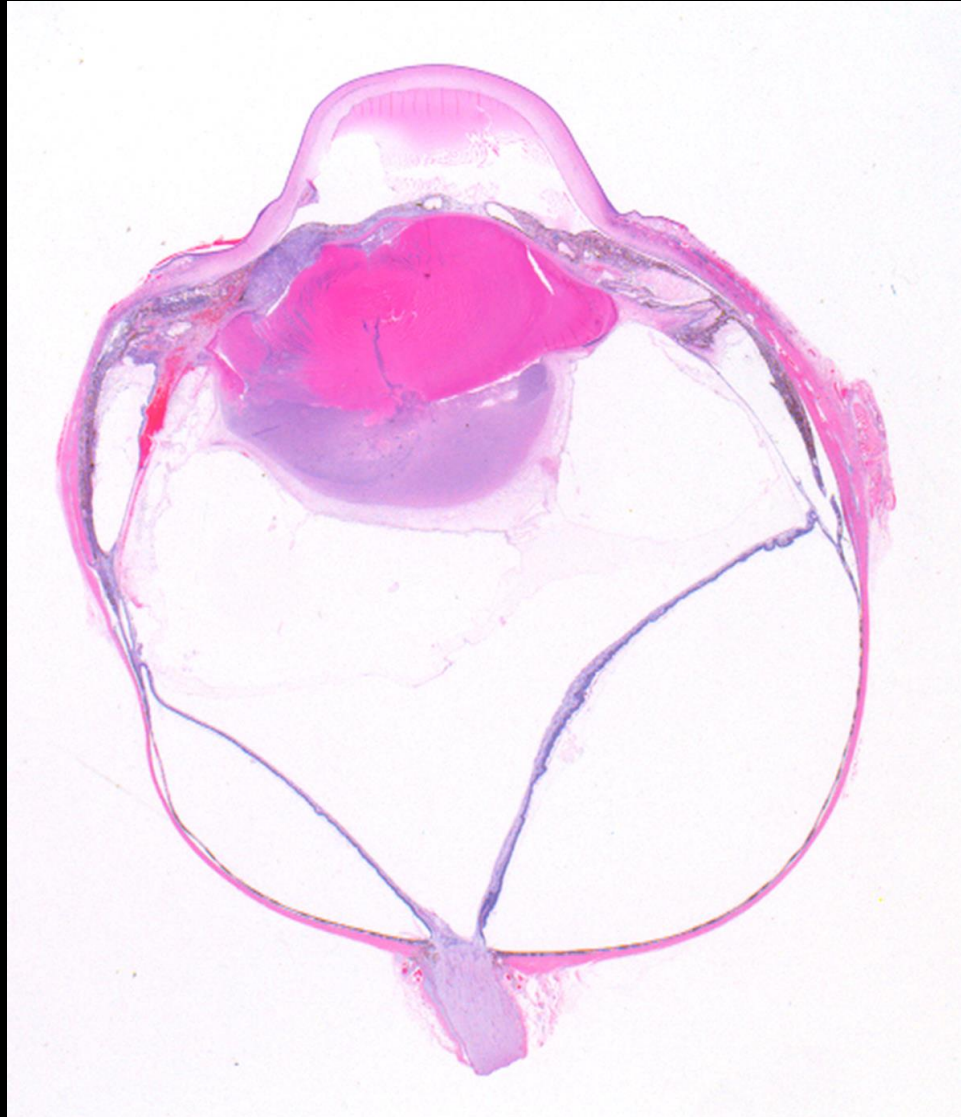
Cindy Bell and Simon Pot

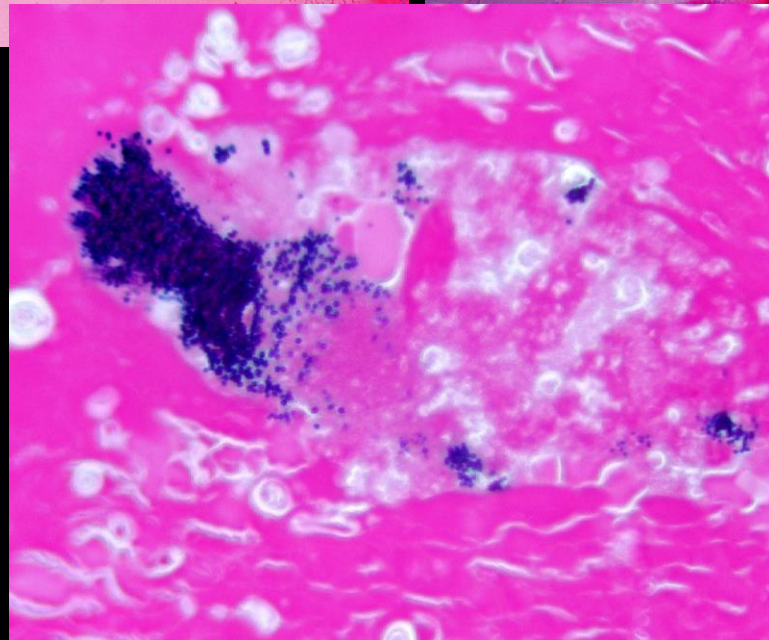
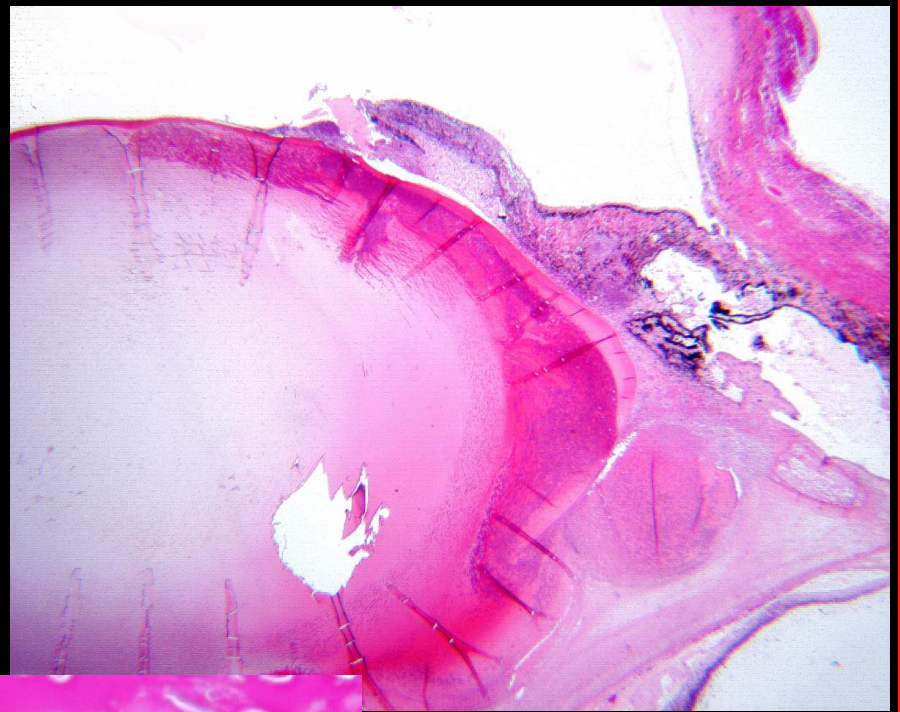
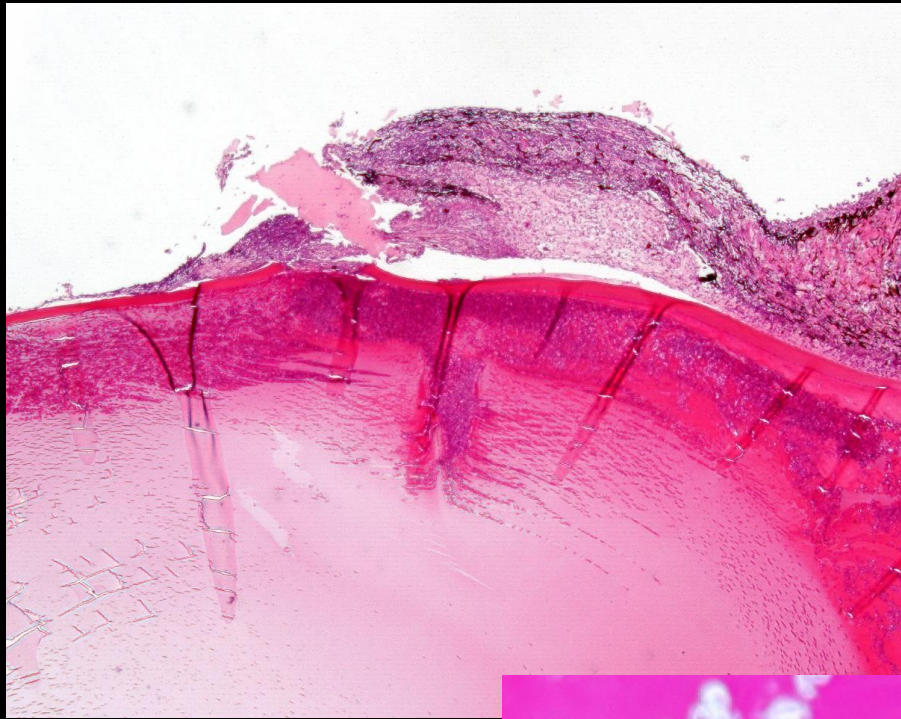
# Septic Implantation Syndrome





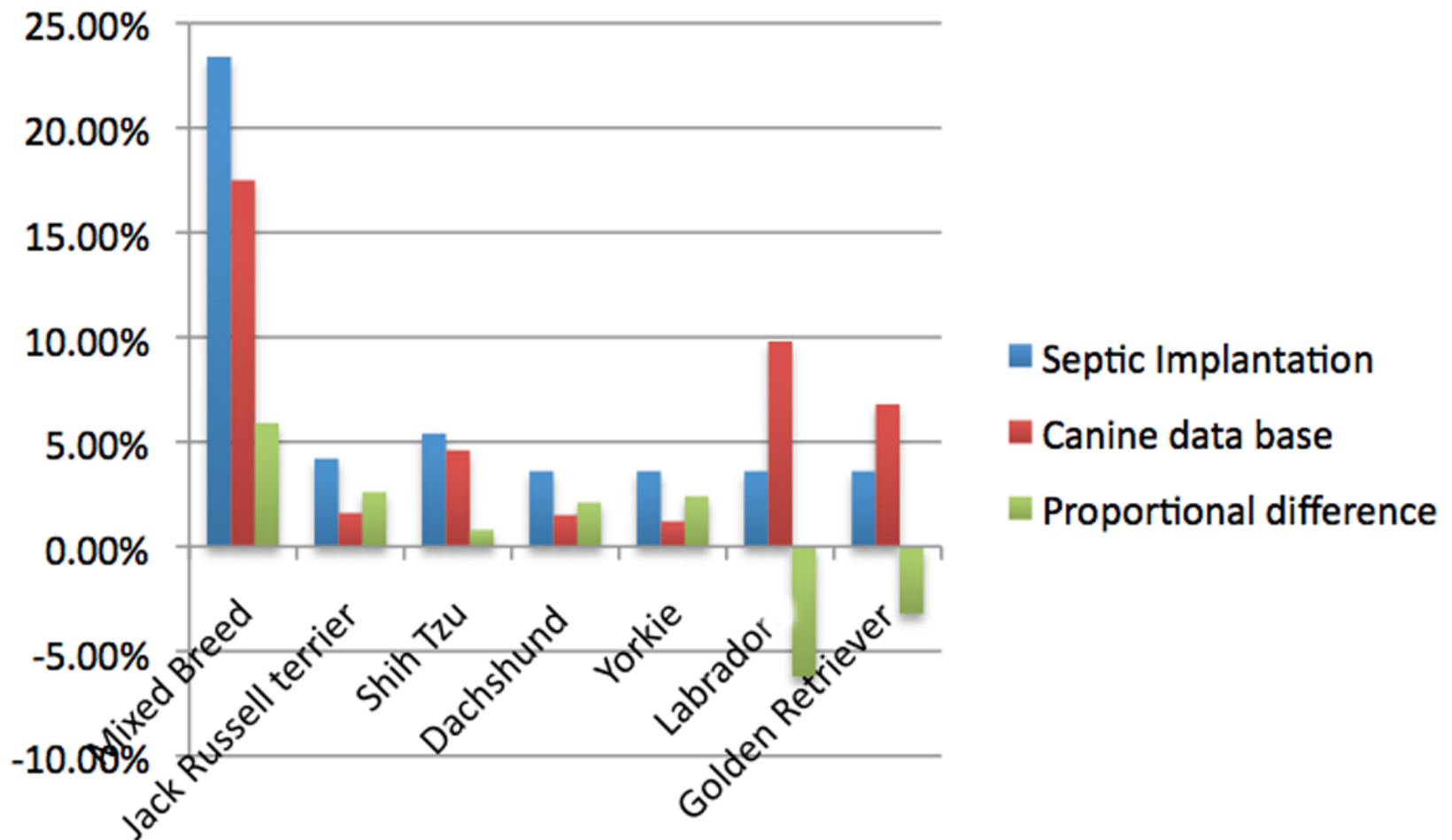
# Septic Implantation Syndrome



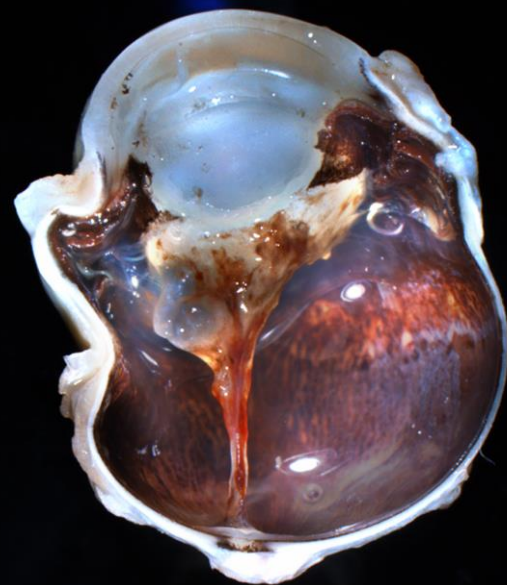
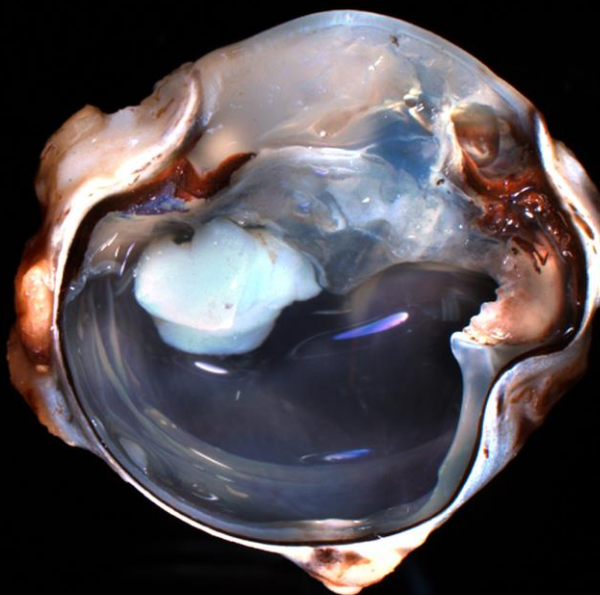
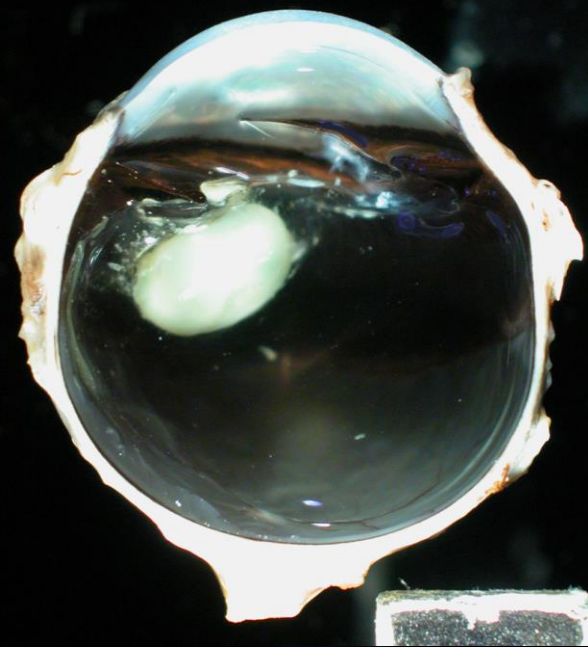


# Septic Implantation Syndrome by Breed

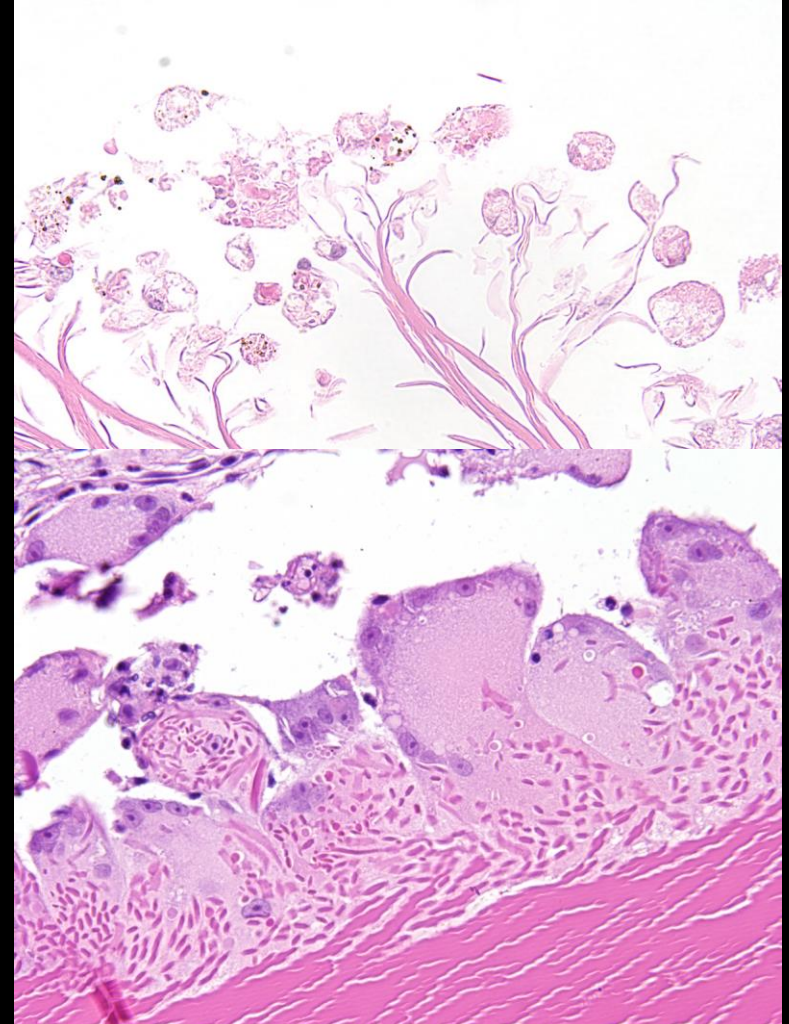
Database = 29,822 cases  
Affected dogs = 167 cases



# Lens Induced Uveitis Phacolytic



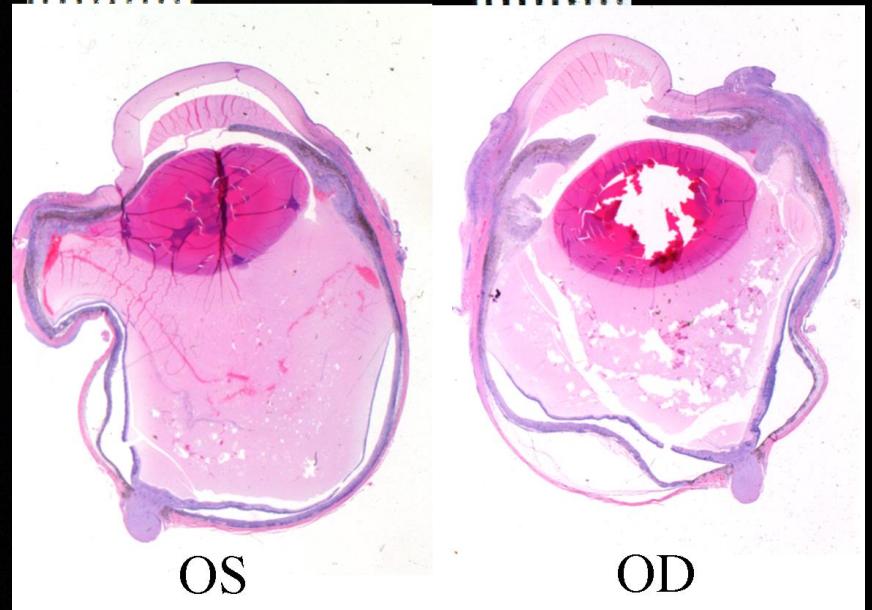
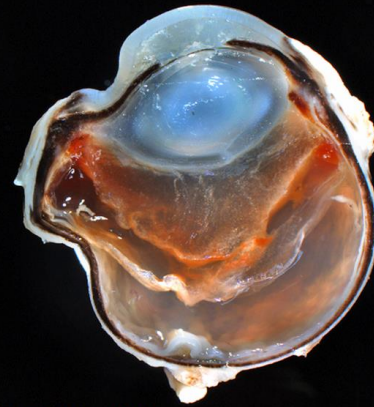
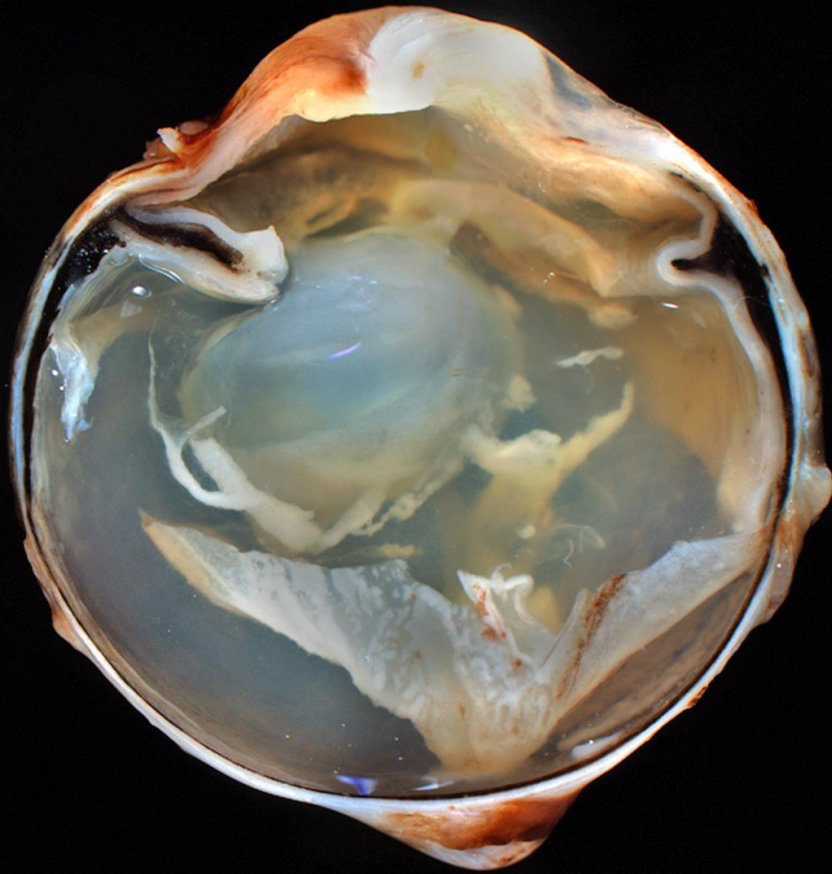
# Bland Phacoclastic Uveitis



# Asymmetric Uveitis

- Pyogranulomatous carpeting of the uvea, retina. Posterior cornea, or lens
- Typical Breeds (Small Breeds), Total = 168 cases
  - Poodle: 39
  - Mixed Breed: 20
  - Dachshund: 13
  - Schnauzer: 12
- Typically occurs first in one eye then the other
- Can be prevented or delayed with immune modulation
- A second form with exactly the same pathology occurs in diabetics but usually both globes at about the same time
- Breeds for Diabetic-variant, Total = 73 cases
  - Schnauzer: 22
  - Mixed Breed: 10

# Asymmetric Uveitis



# Asymmetric Uveitis

