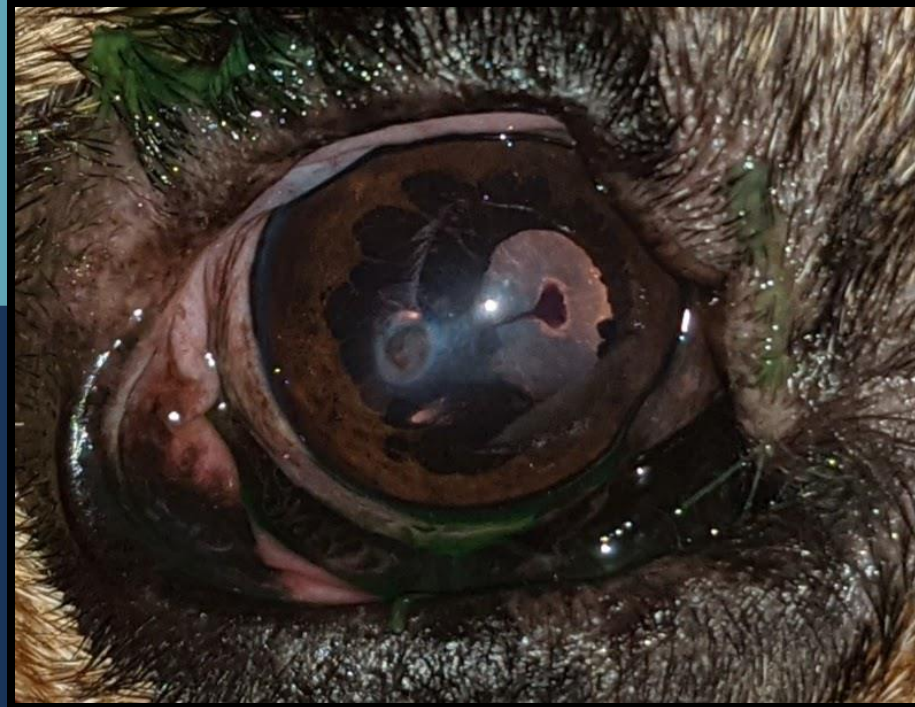


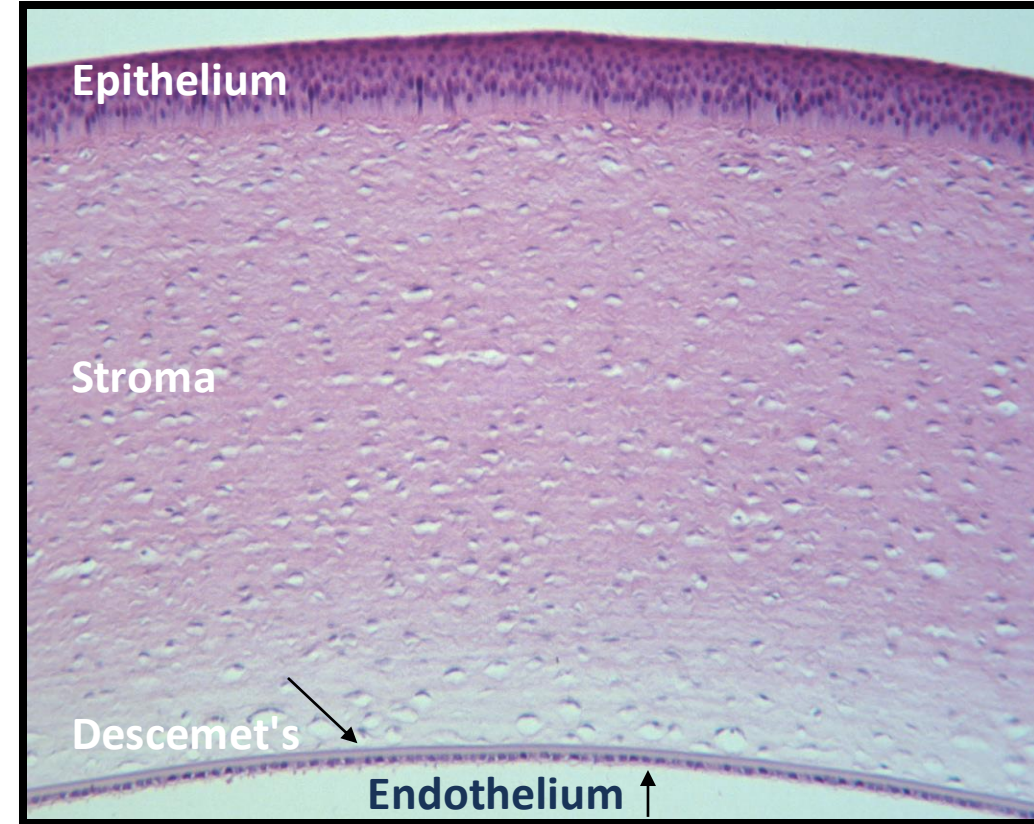
# Management of Corneal Ulcers



Heather Kaese, DVM, MS, DACVIM, DACVO

# Corneal Anatomy

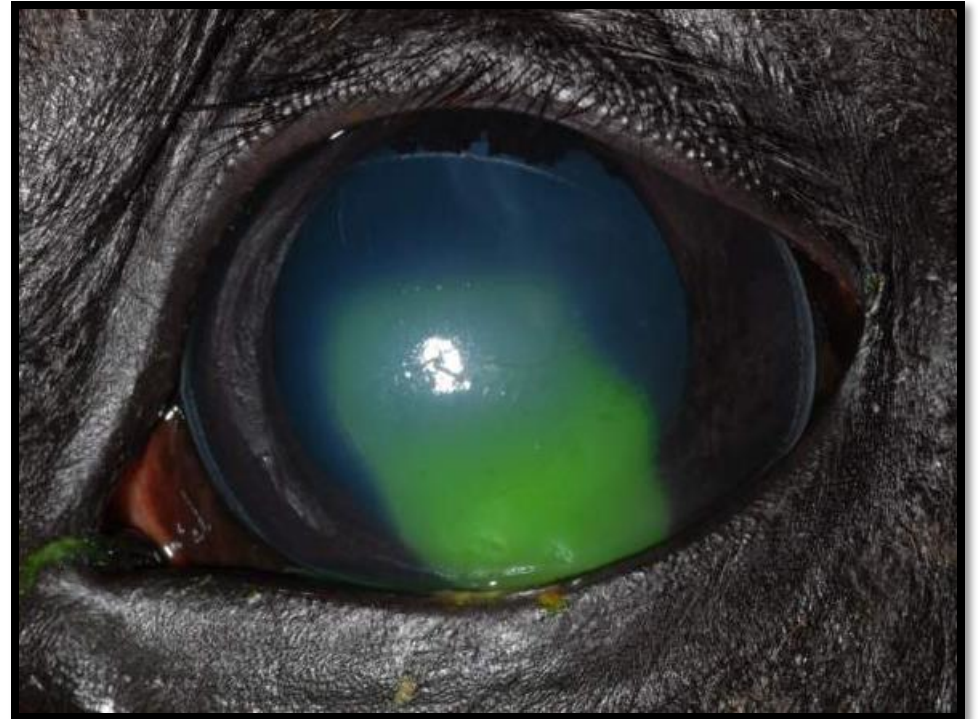
- Epithelium
  - Effective Barrier Tissue
  - Tightly Adhered to Underlying Stroma
- Stroma
  - 90% of Corneal Thickness
- Endothelium
  - Single Layer of Cells
  - Produce's Desemet's Membrane



[http://www.vetmed.ucdavis.edu/courses/vet\\_eyes/images/archive/s\\_4015\\_a.jpg](http://www.vetmed.ucdavis.edu/courses/vet_eyes/images/archive/s_4015_a.jpg)

# Corneal Healing

- If the epithelium is removed
  - Replacement in 48-72 hrs
    - Epithelial cell “sliding” & mitosis
  - Slower in larger eyes
  - Initially thinner than normal



# Corneal Healing

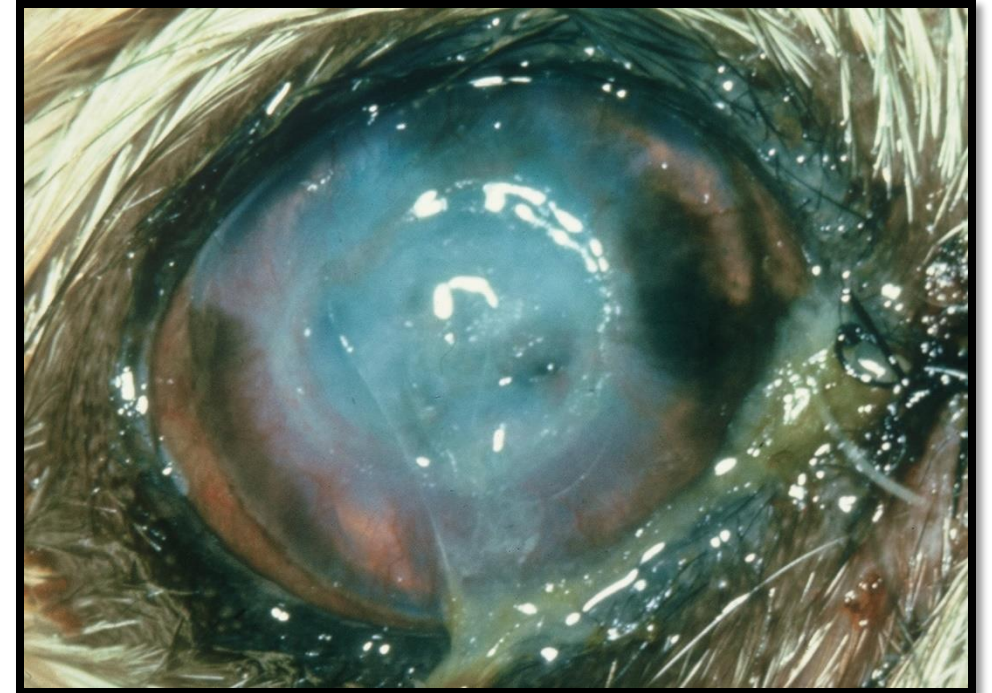
- Balancing Act

Protease/Collagenase Release

vs

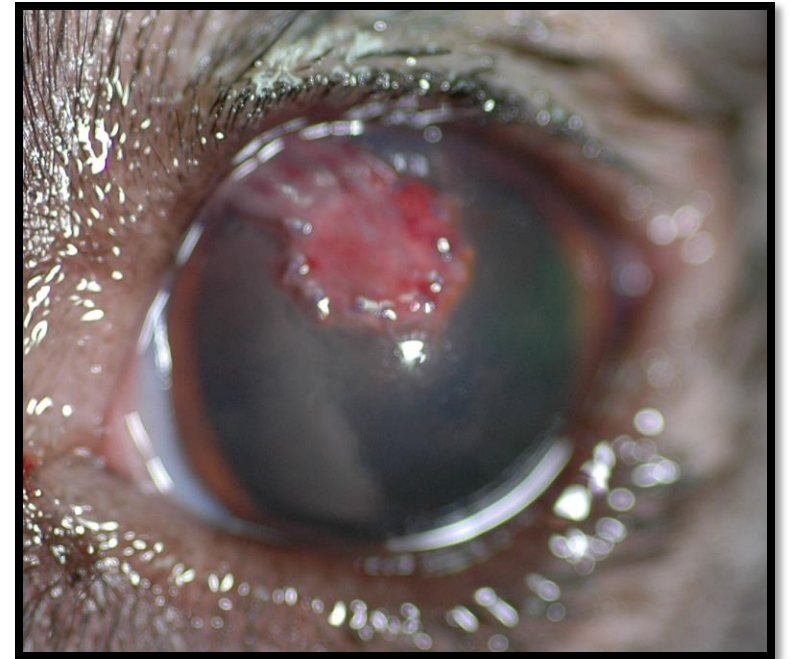
Protease/Collagenase Inhibitors

- Pathologic degradation can occur



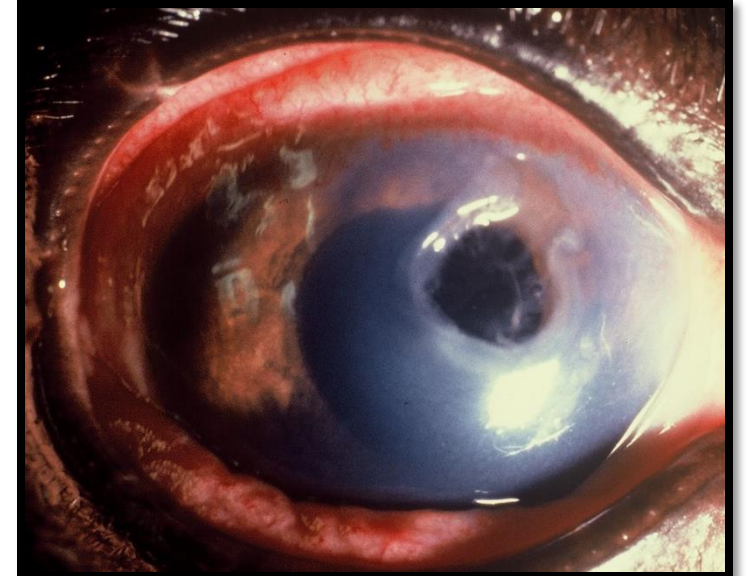
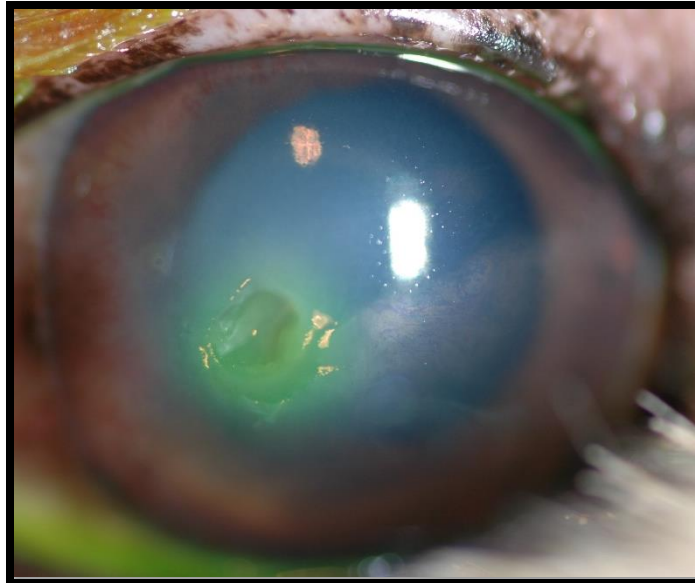
# Stromal Healing

- Fibrovascular infiltrate is needed for stromal healing
- May occur naturally with enough time
- Can facilitate healing with a graft



# Determining Deep vs Superficial

- Sharp staining of superficial ulcer
- Hazy appearance of stromal stain adherence
- No Stain of Descemet's Membrane



# Corneal Ulcer Classification

## Complicated vs Non-Complicated

- Non-Complicated
  - Normally Traumatic
  - Rapid resolution via
    - Epithelial Cell sliding & mitosis
  - Should heal in 48-72 hours
    - w/supportive care



# Treatment: Uncomplicated Ulcers

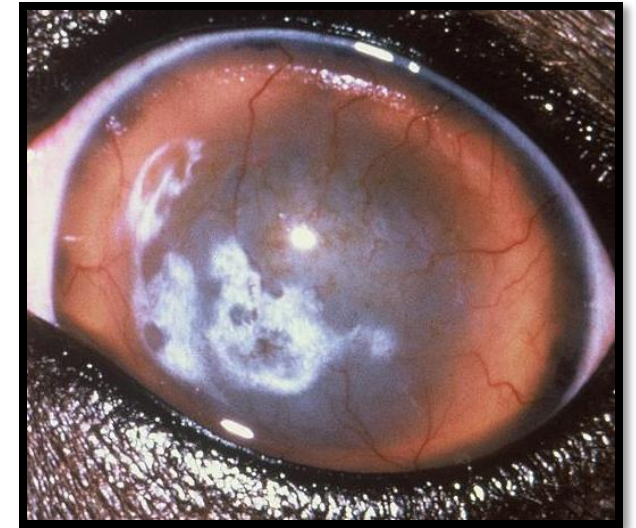
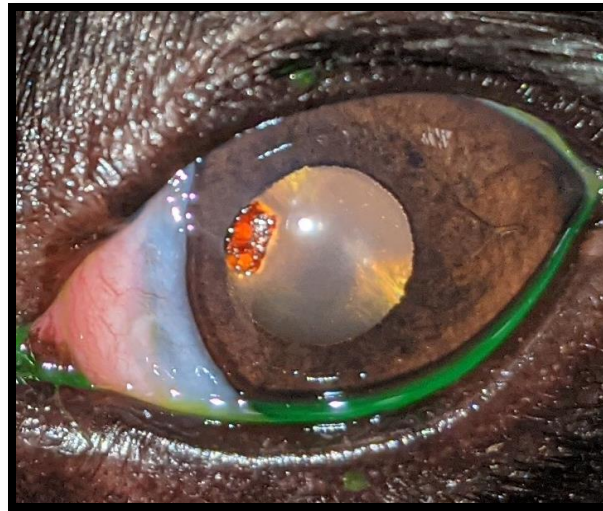
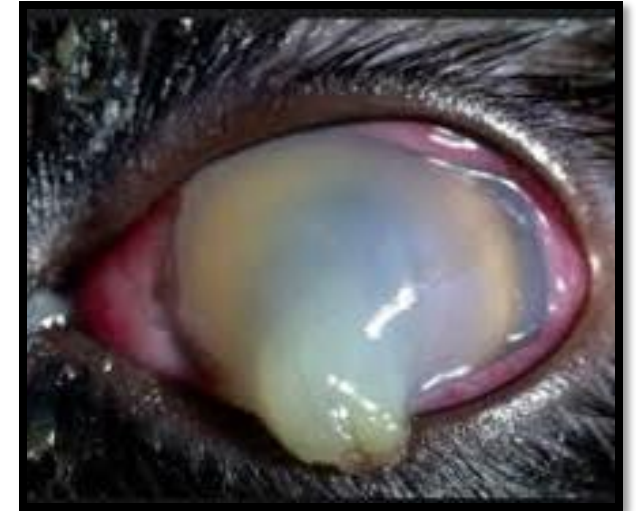
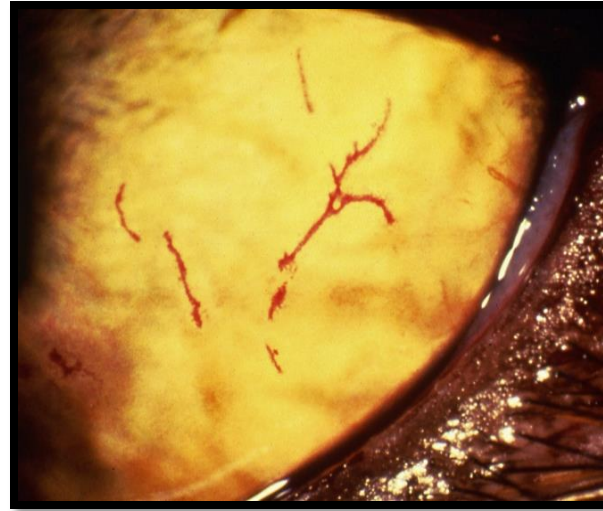
- Topical broad spectrum antibiotic therapy
- Pain management
  - NSAID
  - Gabapentin/buprenorphine
- Prevent Self-trauma
- Supportive Care
- Resolution in 48-72 hours





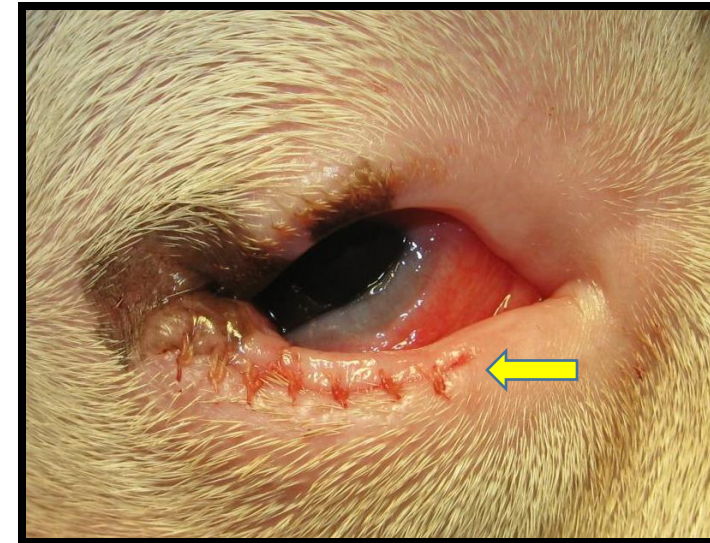
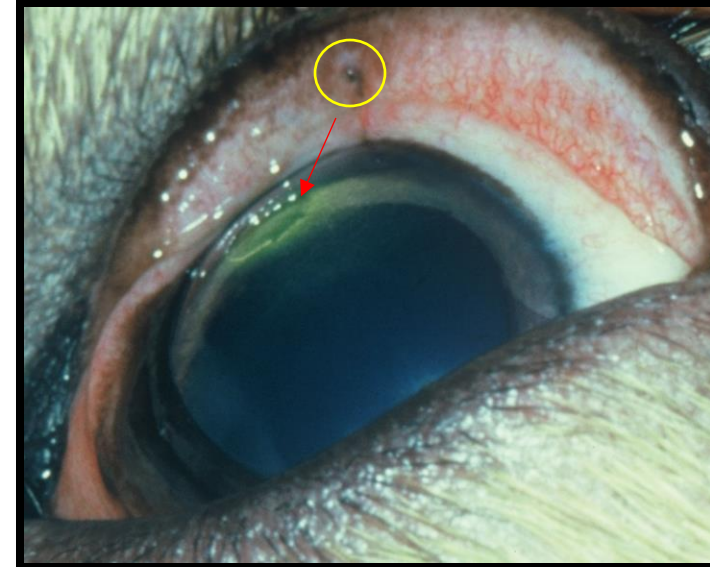
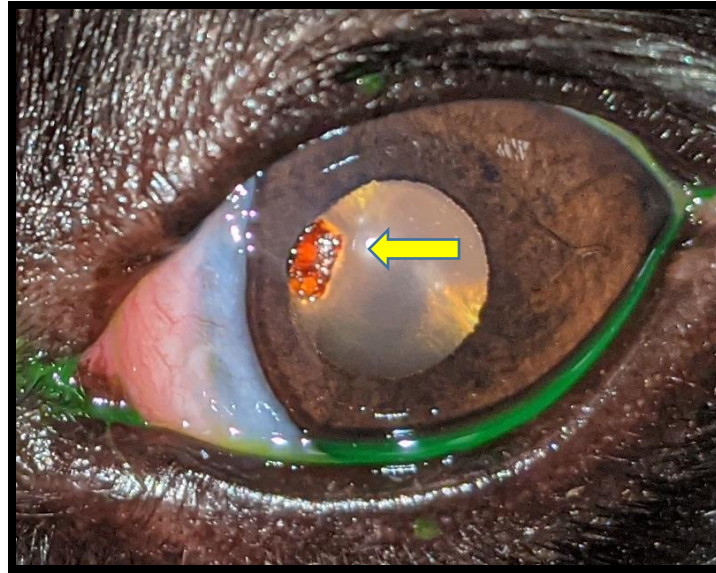
# Complicated Corneal Ulcers

- Inciting Cause:
  - Infection
  - Entropion
  - Ectopic Cilia
  - Foreign Body
  - Nerve Damage
  - Dry Eye
  - Degenerative disease



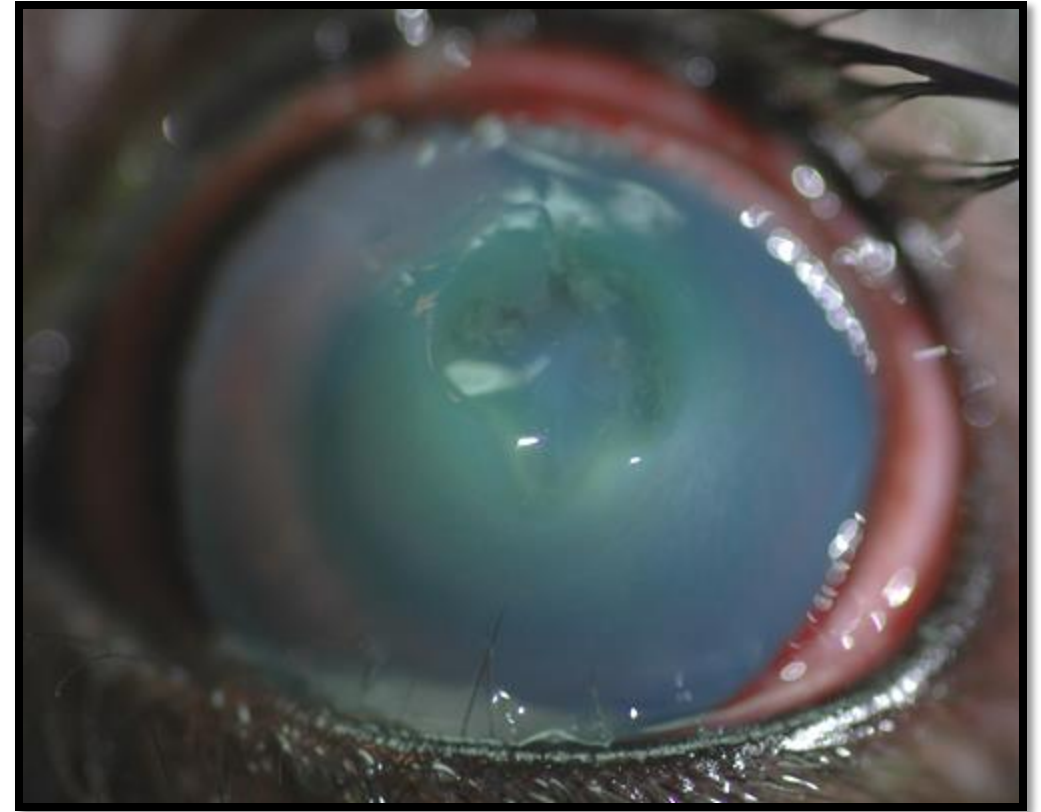
# Treating a Complicated Ulcer

- Fix the primary problem
  - Entropion
  - Ectopic Cilia
  - Foreign Body
  - Dry Eye
- Provide Supportive Care



# What not to use on Ulcers

- Topical NSAIDS
  - Rarely associated with malacia
  - Potentially delay healing
- Topical Corticosteroids
  - Immunosuppressive
  - Definitely delay healing



# Survey Question #1

**Uncomplicated corneal ulcers should?**

**A: Be encouraged to heal with a linear grid keratotomy**

**B: Heal by mitosis and “sliding” in 2-5 days**

**C: Heal once the primary cause is removed**

**D: Heal when treated with topical NSAIDS**

**E: None of the Above**

# Survey Question #1

## Answer

Uncomplicated corneal ulcers should?

A: Be encouraged to heal with a linear grid keratotomy

**B: Heal by mitosis and “sliding” in 2-5 days**

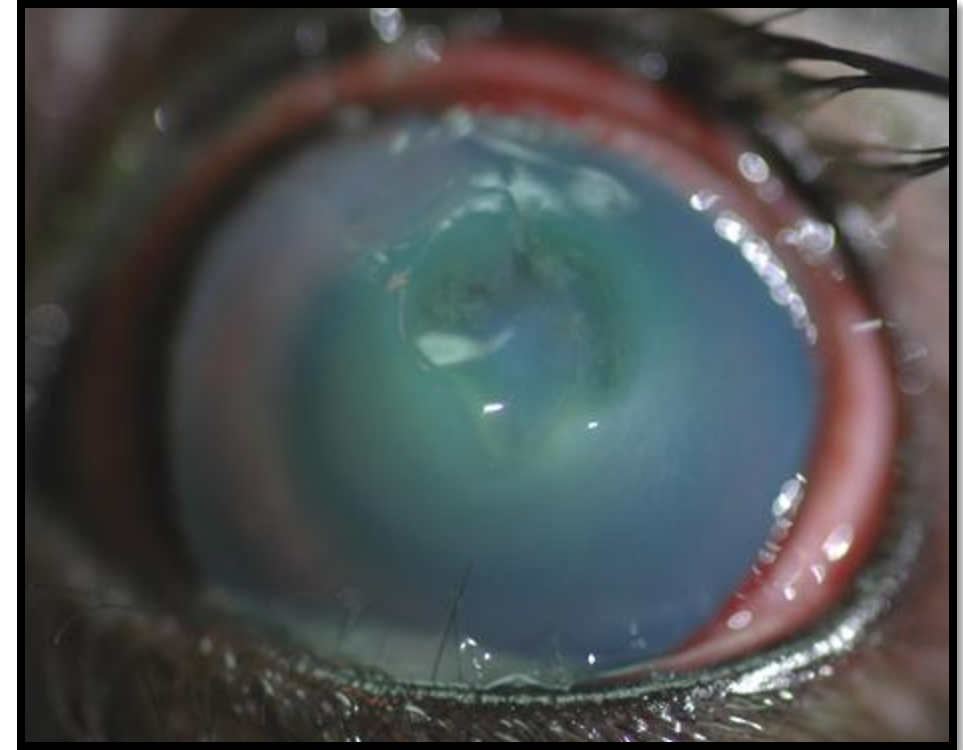
C: Heal once the primary cause is removed

D: Heal when treated with topical NSAIDS

E: None of the Above

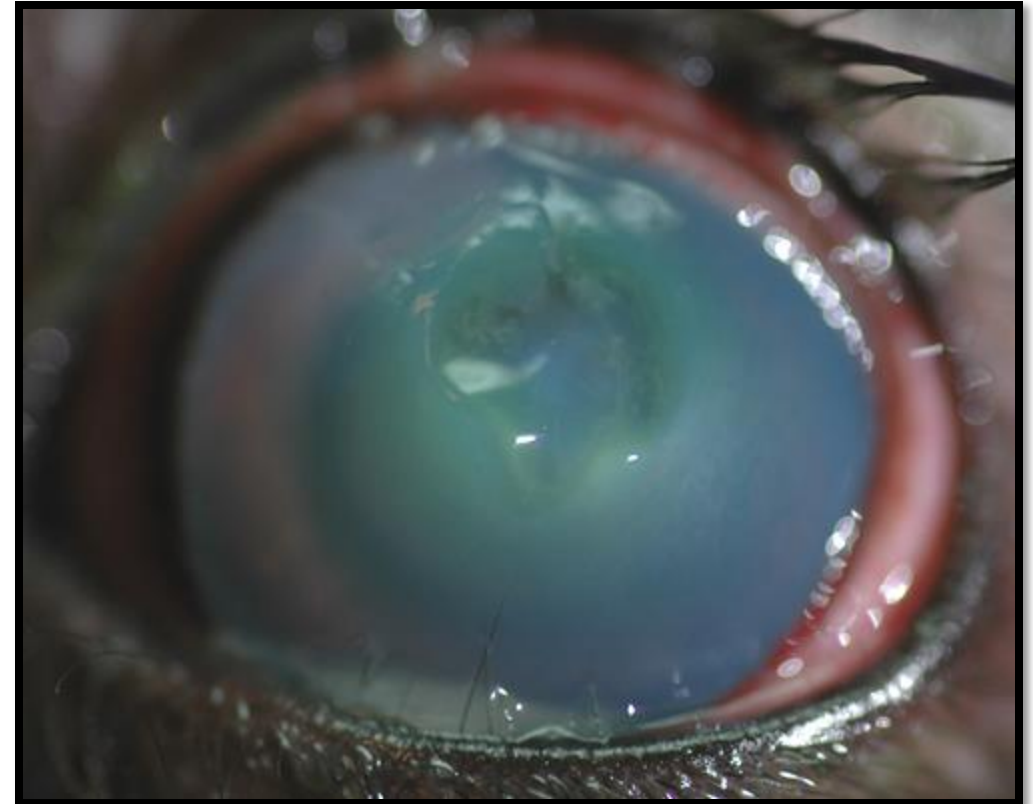
# Bacterial Corneal Ulcer – Work Up

- Cytology
  - Gram positive cocci
    - Cephalosporin
  - Gram negative rods
    - Ofloxacin, or polymyxin b, or tobramycin
- Culture
  - Helpful – it just takes time



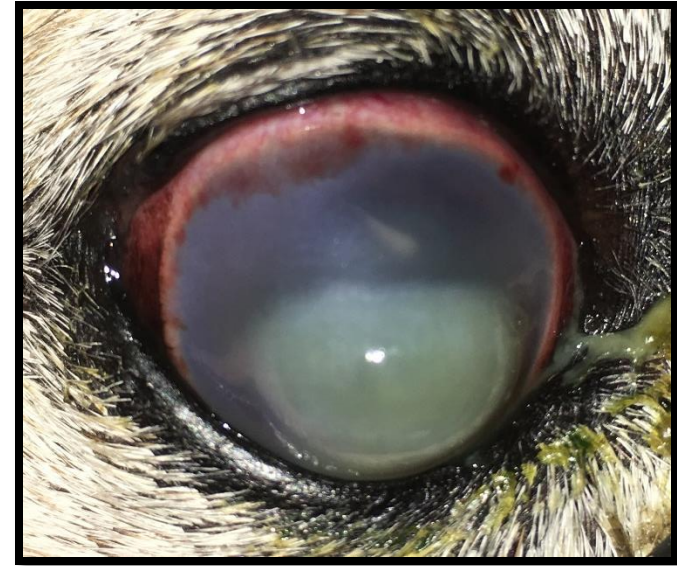
# Bacterial Corneal Ulcer: Treatment

- Topical Antibiotic(s)
- Systemic
  - Antibiotic
  - Anti-inflammatory
  - Pain Control
- E-Collar
- Hygiene
- Supportive Care



# Melting Corneal Ulcer

- Release of Collagenases/Proteases
  - Bacteria
  - White blood cells
  - Corneal stromal cells
- Breakdown > Repair
- Common in Brachycephalic Breeds





# Melting Corneal Ulcer: Treatment

- Medical – stop the melting
  - Topical
    - Serum (autologous/donor)
    - Antibiotics
  - Oral
    - Antibiotics
    - Anti-inflammatory & Pain
- E-collar
- Hygiene



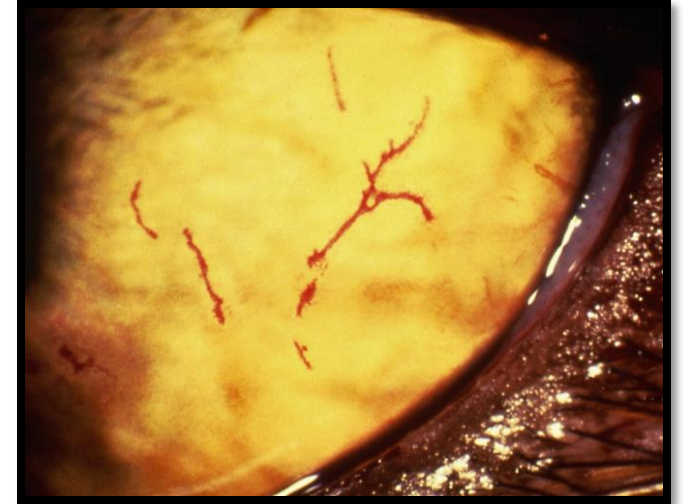
# Serum Soapbox:

- **TWO** Applications
  - Melting ulcers
  - Dry Eye w/ulcers
- Waste of effort otherwise
- Autologous or Donor ok
- Freezing decreases efficacy



# Viral Corneal Ulcer (Feline > Canine)

- Topical Antiviral
  - Cidofovir
- Prophylactic Antibiotic
  - Topically or oral doxycycline
- Oral Famciclovir
  - ~90mg/kg PO bid (feline dose)



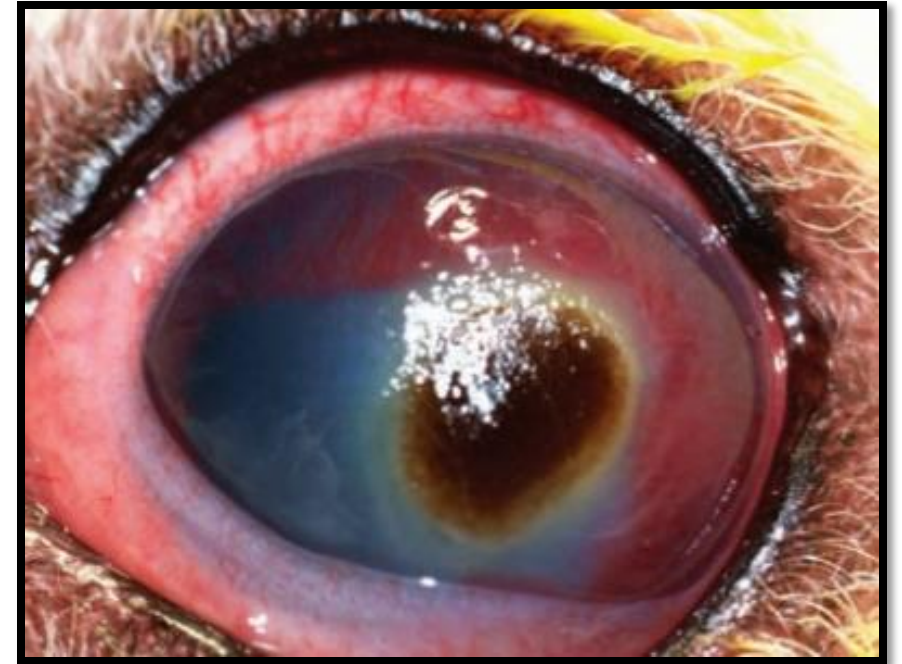
# Fungal Corneal Ulcer

- Diagnosis
  - Lack of response to antibiotics
  - Appearance (cake Frosting)
  - Cytology
- Topical Anti-fungal
  - Voriconazole/itraconazole/fluconazole
- Supportive Care
  - Broad spectrum antibiotic
  - Anti-inflammatory
  - Pain Management



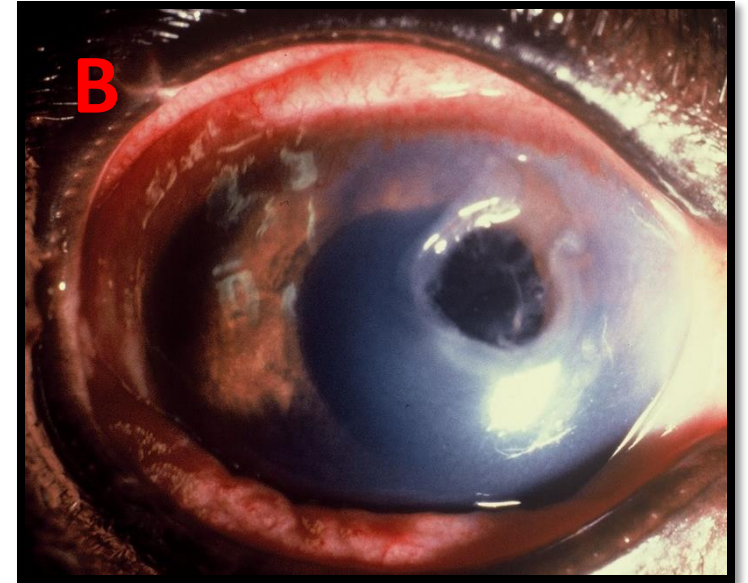
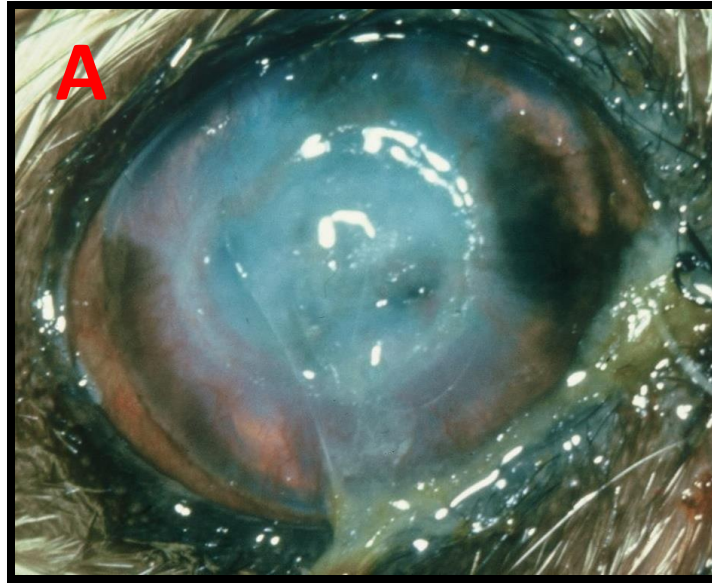
# Dematiaceous Fungal Ulcers

- Presentation
  - Non-Healing Corneal Ulcer
  - Unique Corneal Color Changes (yellow/brown)
  - Exquisitely Painful
- Treatment
  - Superficial Keratectomy
  - Topical Voriconazole



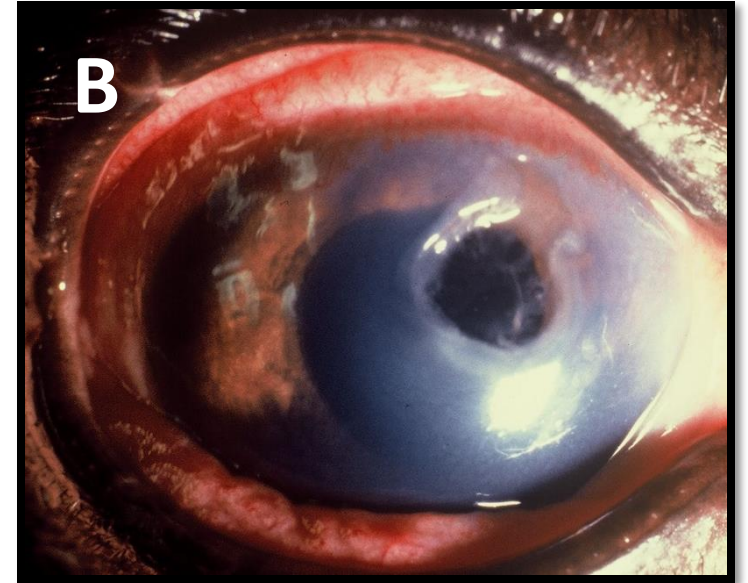
# Survey Question #2

Which of the ulcers would benefit from treatment with Autologous Serum, A, B or C?



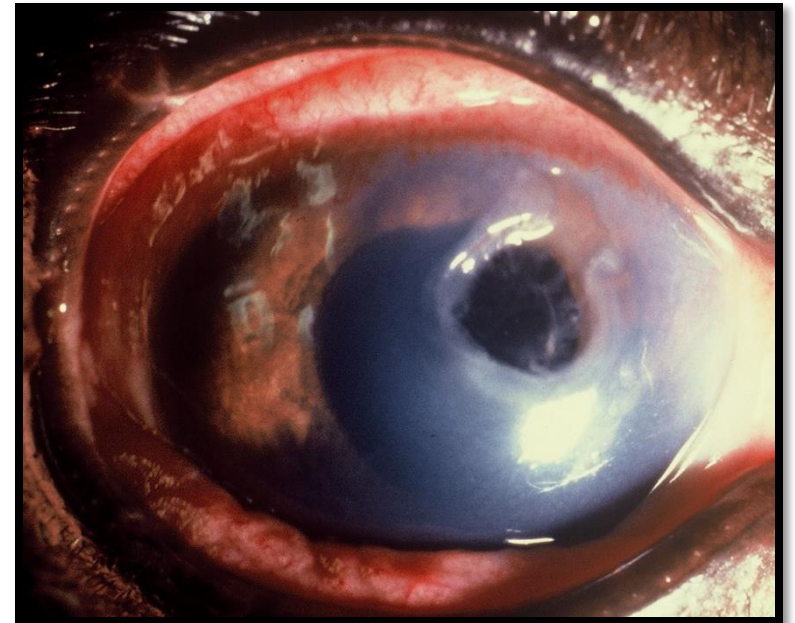
# Survey Question #2 Answer

Which of the ulcers would benefit from treatment with Autologous Serum, A, B or C?



# Deep Ulcer / Rapidly Progressive Ulcer

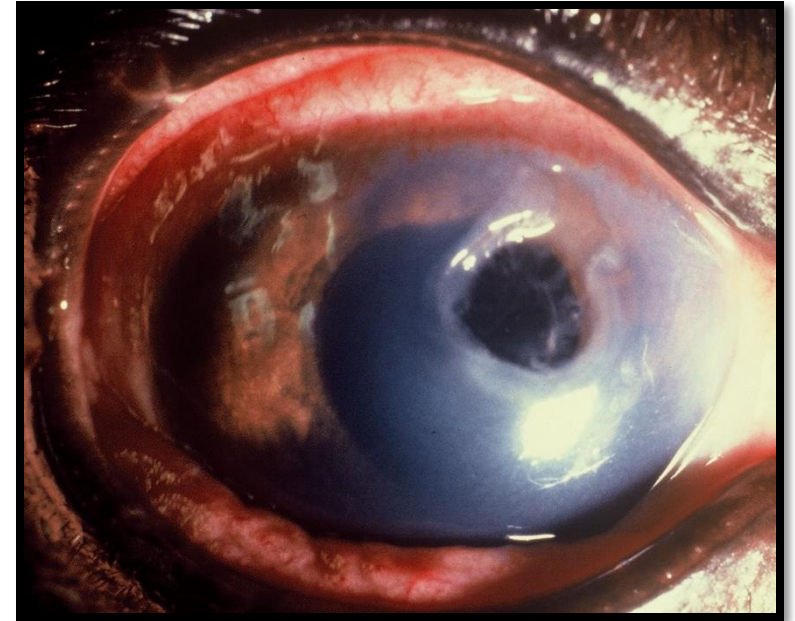
- Any Ulcer 50% depth or Rapidly Progressive
- Need Tectonic Support
  - Conjunctival Pedicle Graft
  - Acellular/Matrix/Amnion Graft
  - Corneal Conjunctival Transposition
  - Corneal Transplant
  - Direct Closure





# Deep Stromal Ulcer /Descemetocoele: Considerations

- Treat the Whole Animal
- Handle with Care
  - If struggling do not hold tightly
- Sedation is beautiful
  - Prior to eye exam
  - Prior to intravenous catheter placement



# Conjunctival Pedicle Grafts



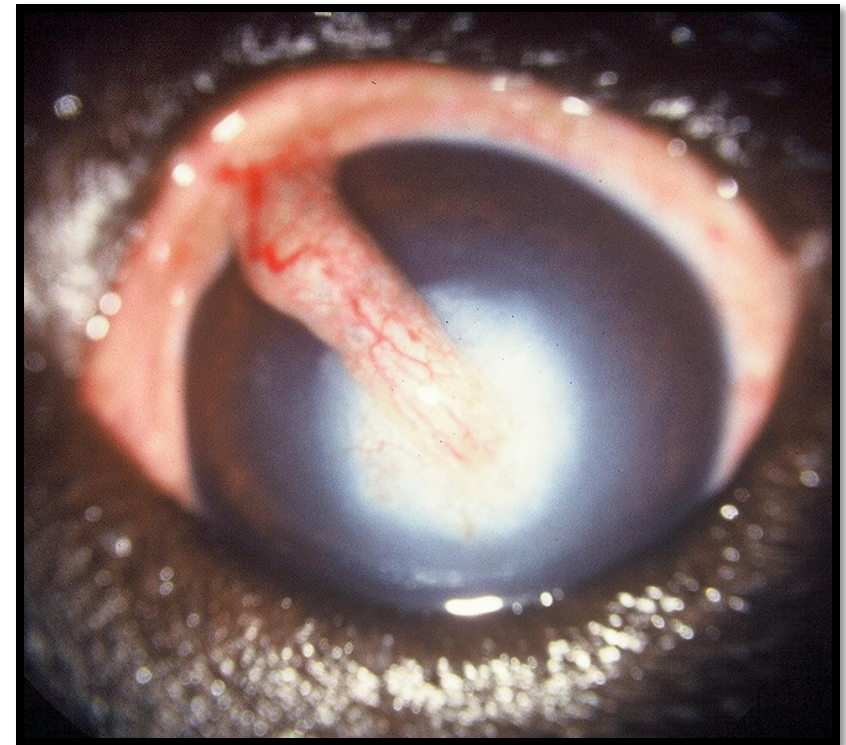
# Post-operative management

- Topical treatments as for any ulcer
  - Antibiotic / Anti-inflammatory/ Pain control/ E-collar
- Restricted activity - harness a good idea
- Can consider severing graft after 6-8 weeks
- Judicious use of steroid to reduce scarring after graft healed



# Does graft need to be severed?

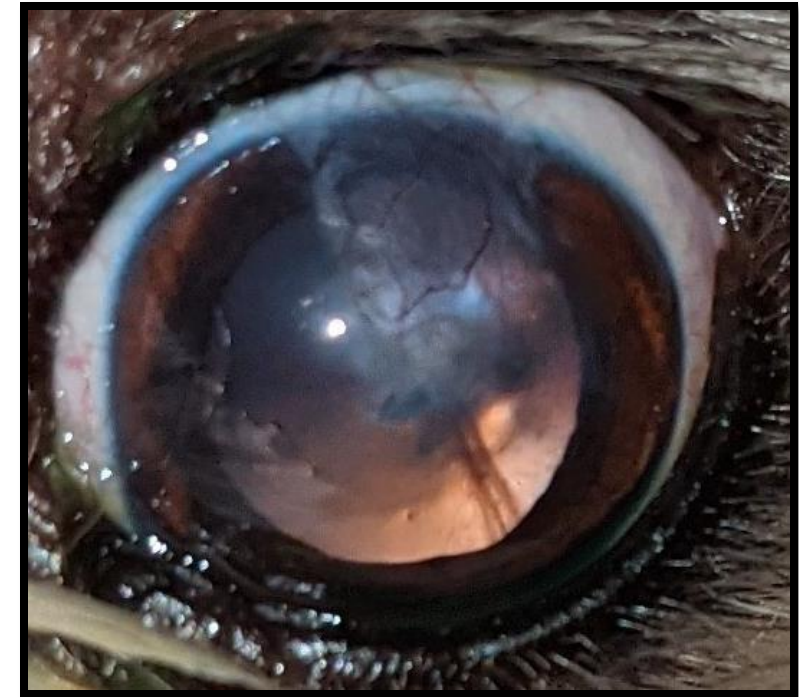
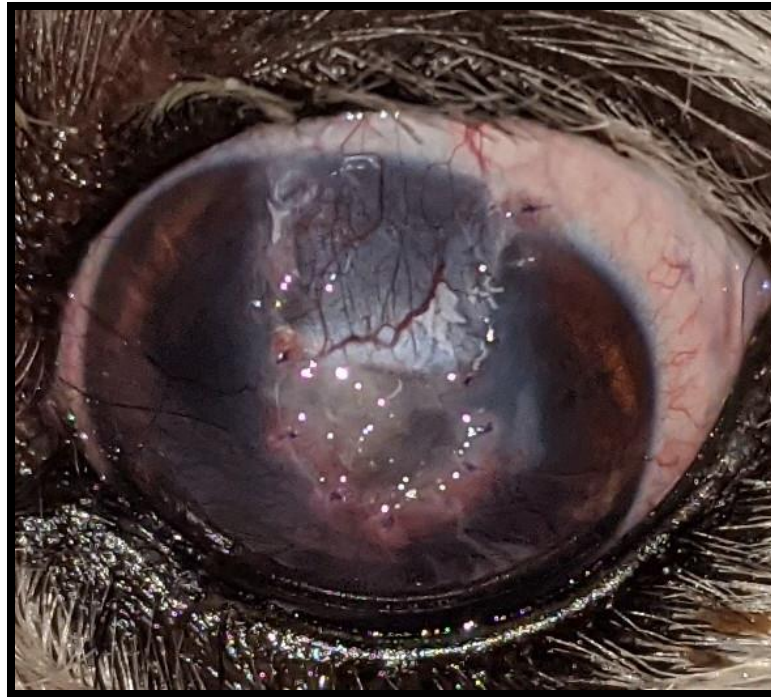
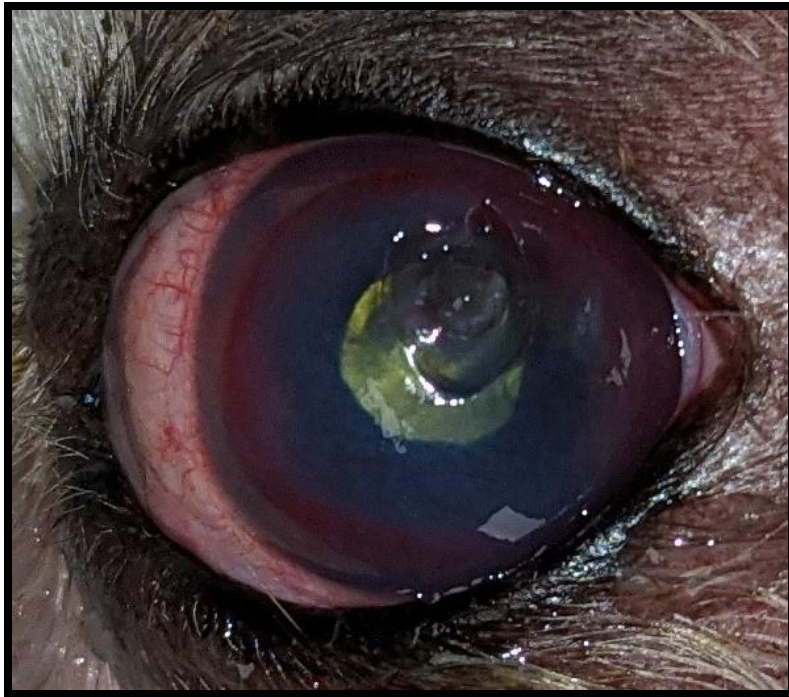
- Done to reduce scarring and improve visual axis
- Cosmesis
- Rarely causes re-ulceration
- Avoid severing grafts
  - Cases of KCS
  - Cases of corneal degeneration



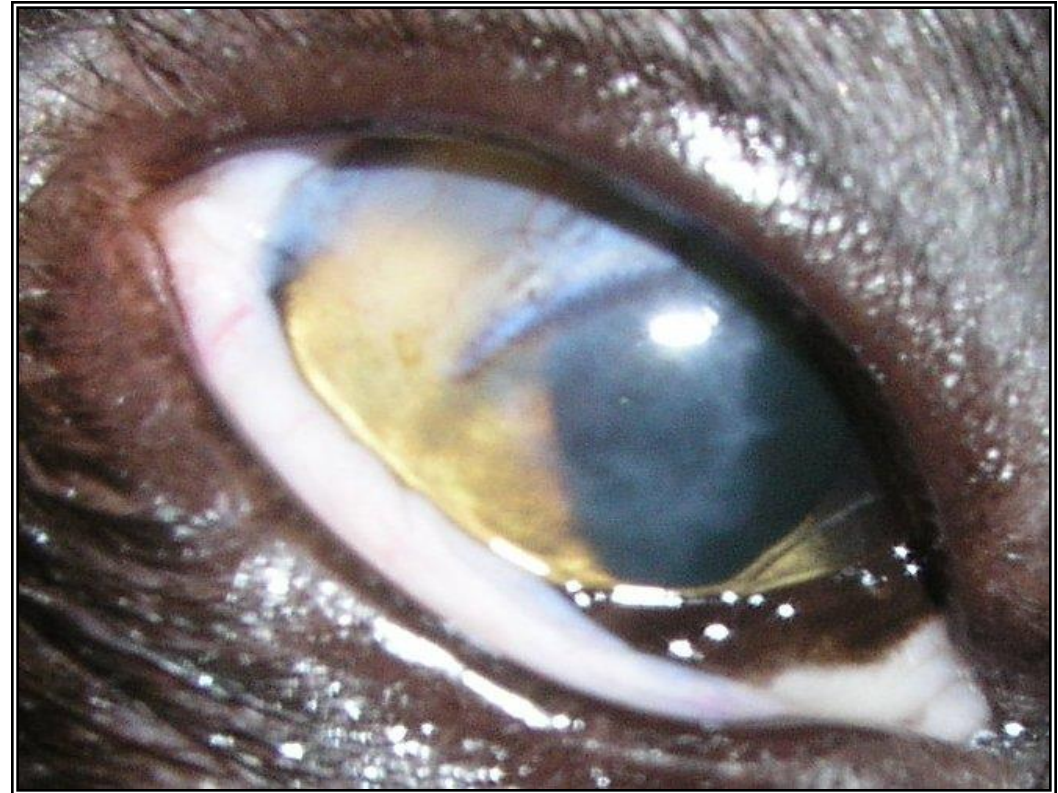
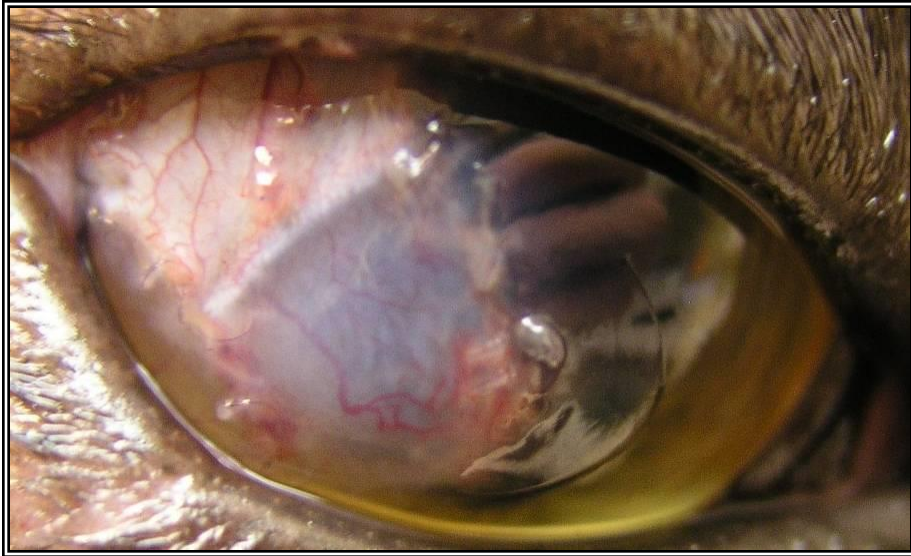
# Descemetocoele?



# Descemetocoele or Corneal Rupture? Corneal Conjunctival Transposition

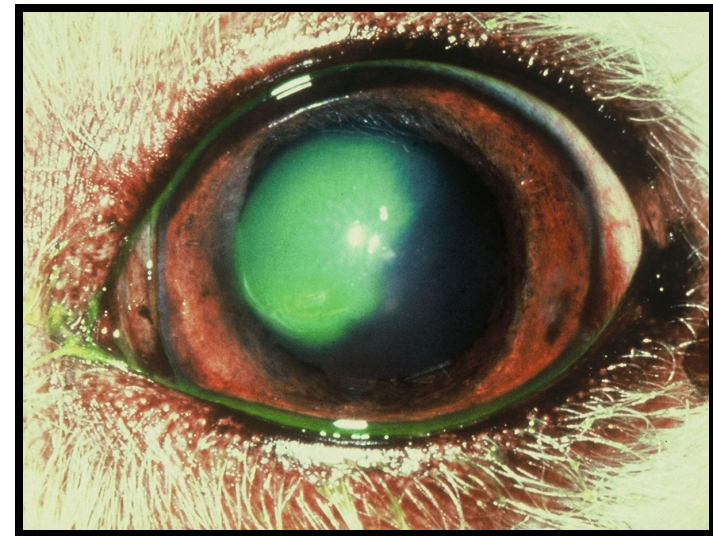
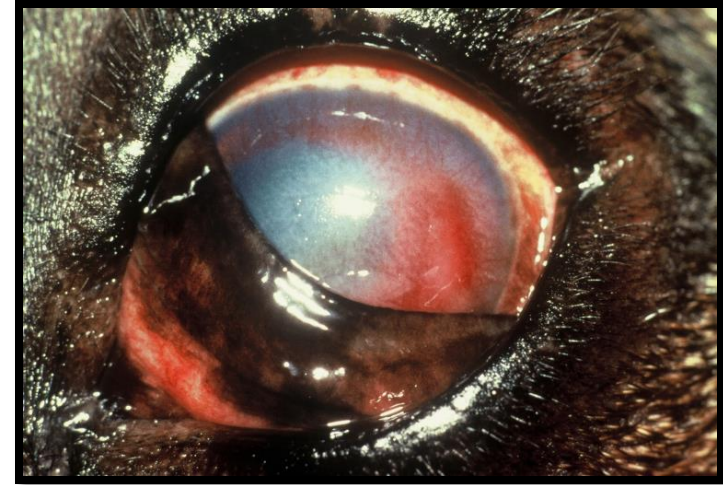


# Corneal Conjunctival Transposition



# Spontaneous Chronic Corneal Epithelial Defects

- Breed predilection
- Middle-aged to geriatric dogs
- Can persist months
- Raised epithelial edges
- Variable vascular infiltrates





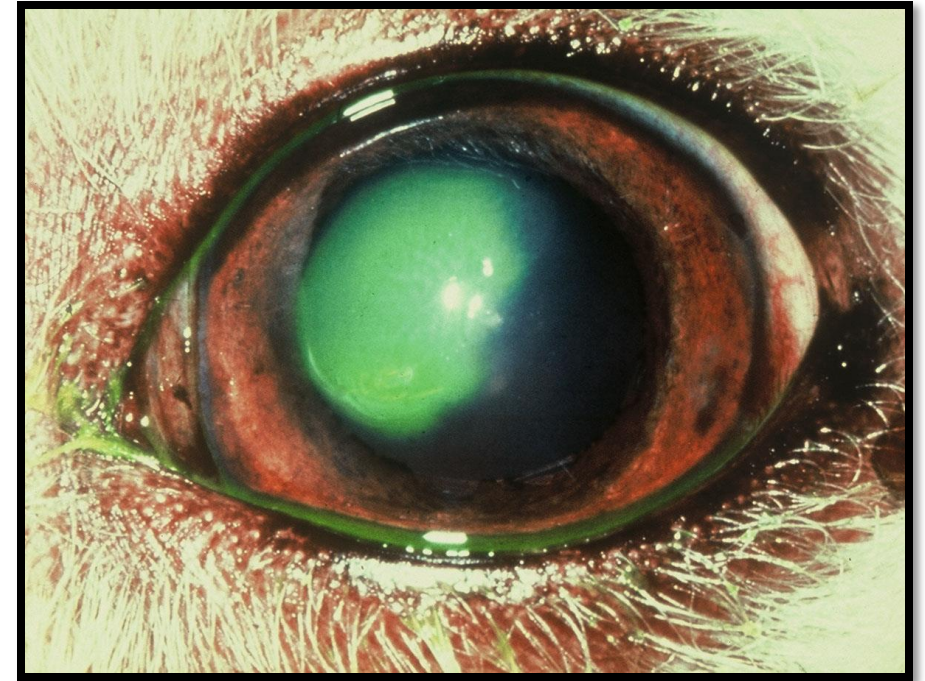
# SCCED / Indolent Ulcer

- Superficial ulcer surrounded by a lip of loose epithelium
- Varying degrees of vascularization
- Varying degrees of edema
- Characterized by:
  - Abnormal basement membrane
  - Dysmature epithelium
  - Hyaline layer



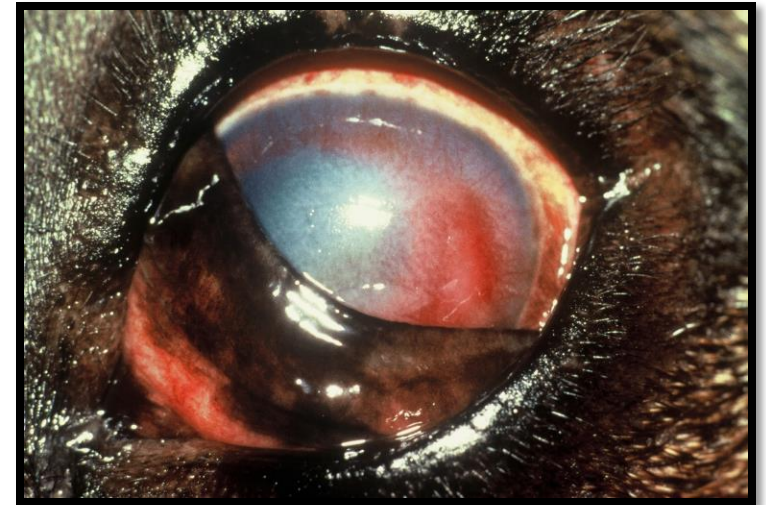
# SCCED - Indolent Ulcer Treatment

- Q-tip Corneal Debridement
  - 50% of dogs heal within 14d
- Medical tx as for any superficial ulcer
  - Antibiotic
  - Anti-inflammatory
  - Pain control
  - E-collar
  - Supportive Care



# SCCED – Indolent Ulcer Treatment

- If not healed after 10-14 days:
  - Linear Grid / Superficial Punctate/ Diamond Burr
    - 80% of dogs heal w/in 14 days of keratotomy
  - Superficial Keratectomy under general anesthesia
    - Nearly 100% heal within 14 days



# When not to “Grid”

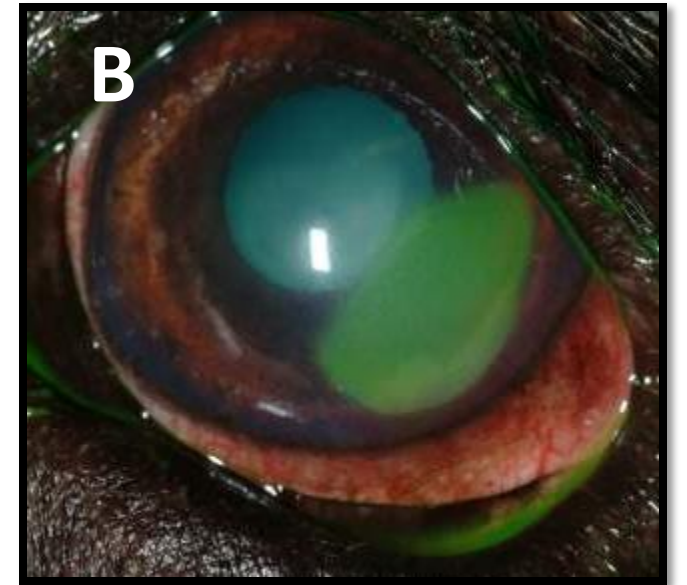
- Any Sign of Infection
- Any Stromal Involvement
- Severe Edema
- Take Pause if Brachycephalic



# Survey Question #3

Which of these three ulcers  
would benefit from a linear  
grid keratotomy?

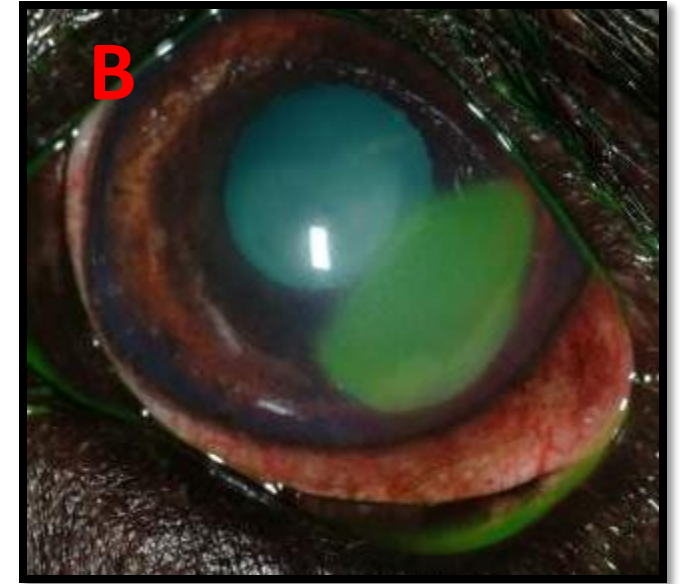
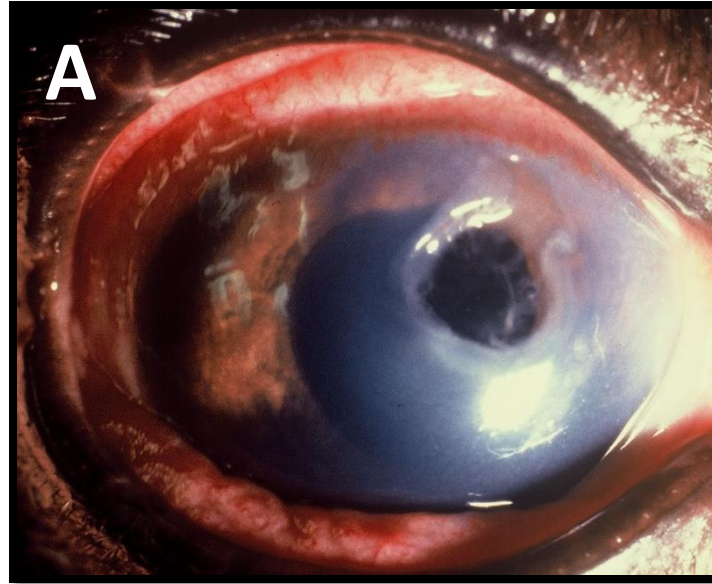
A, B or C?



# Survey Question #3 Answer

Which of these three ulcers  
would benefit from a linear  
grid keratotomy?

A, B or C?

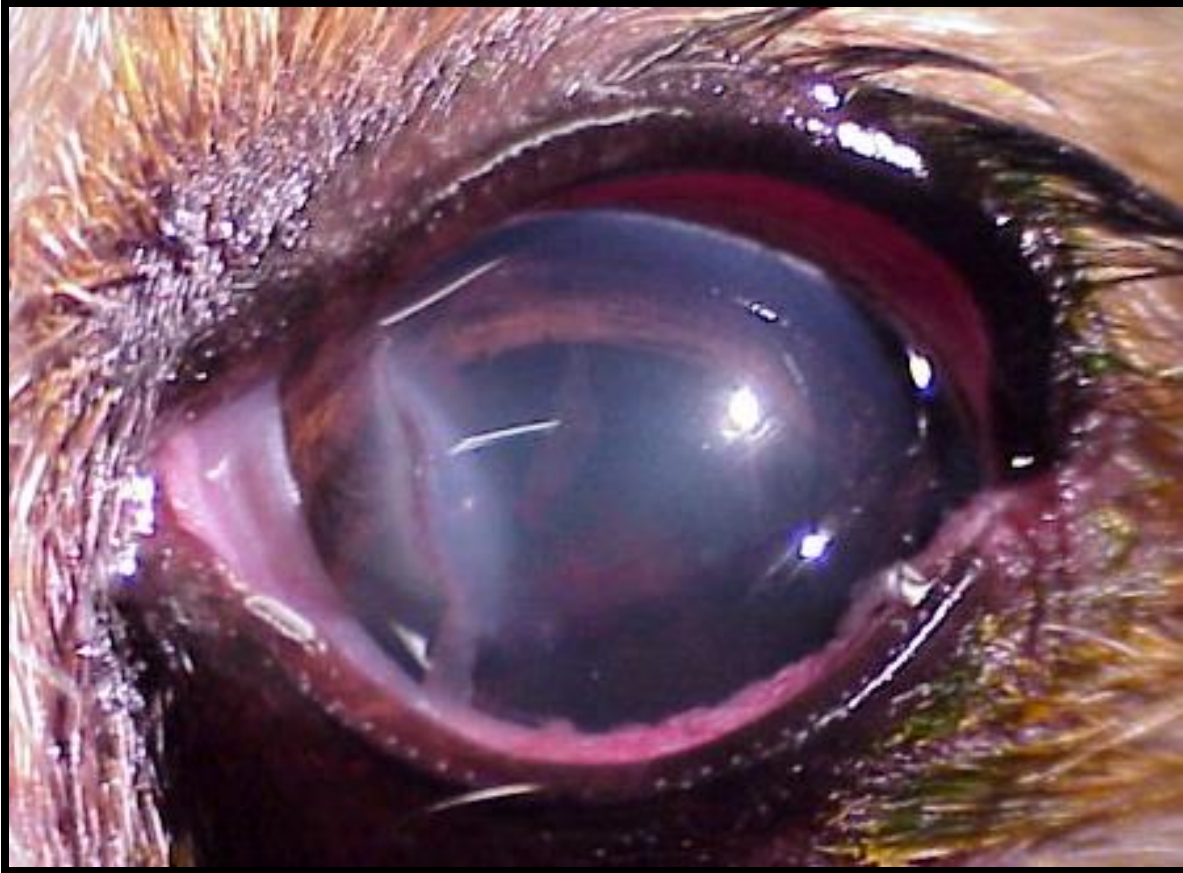


# Cat Claws

- Aggressive Antibiotic Therapy
  - Topical and Systemic
- Frequent Rechecks
- Client Education
  - Young animals do not menace
  - Puppy's and Cats do not mix
  - Yellow & Green needs to be seen



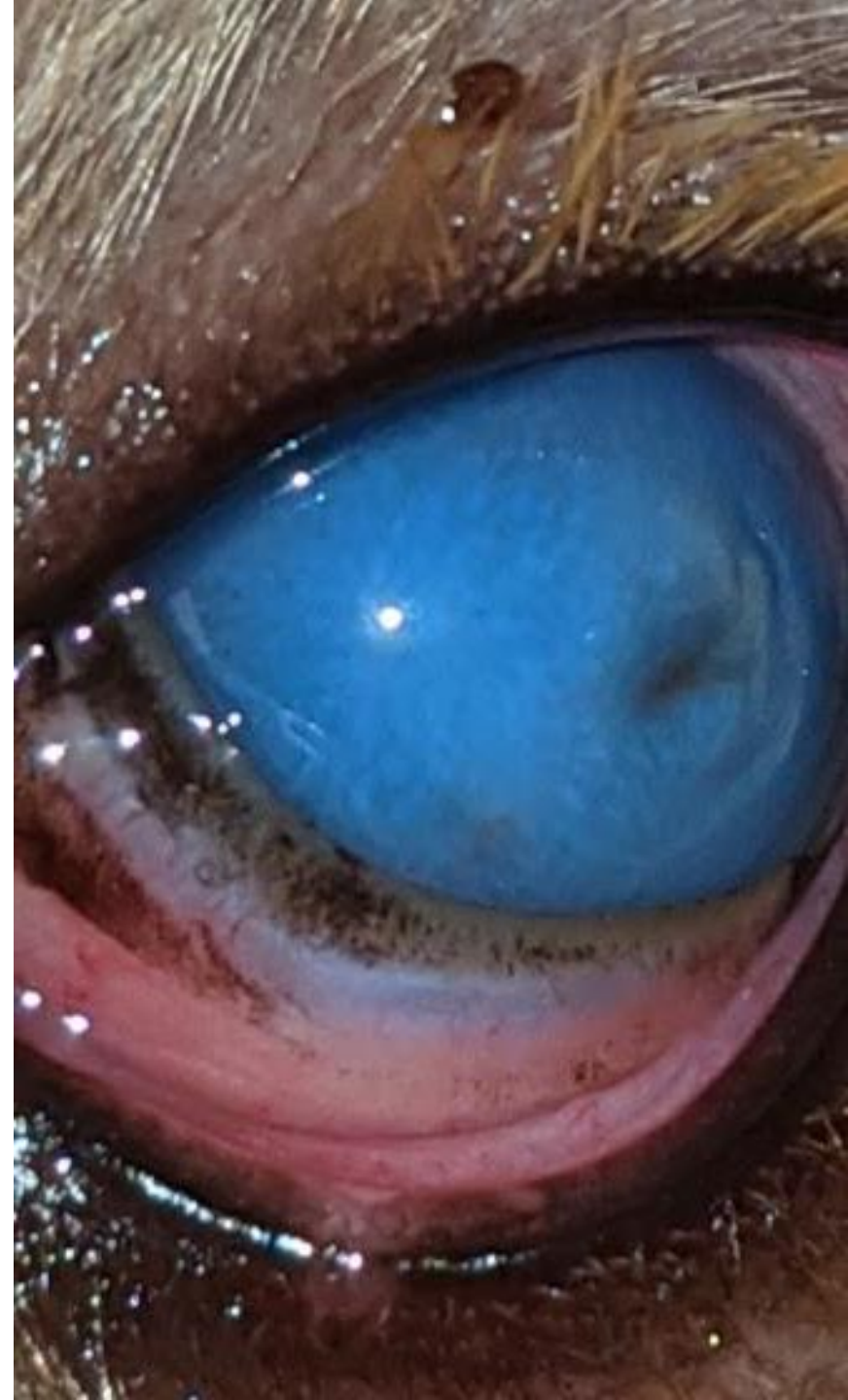
# Cat Scratch – Note the age



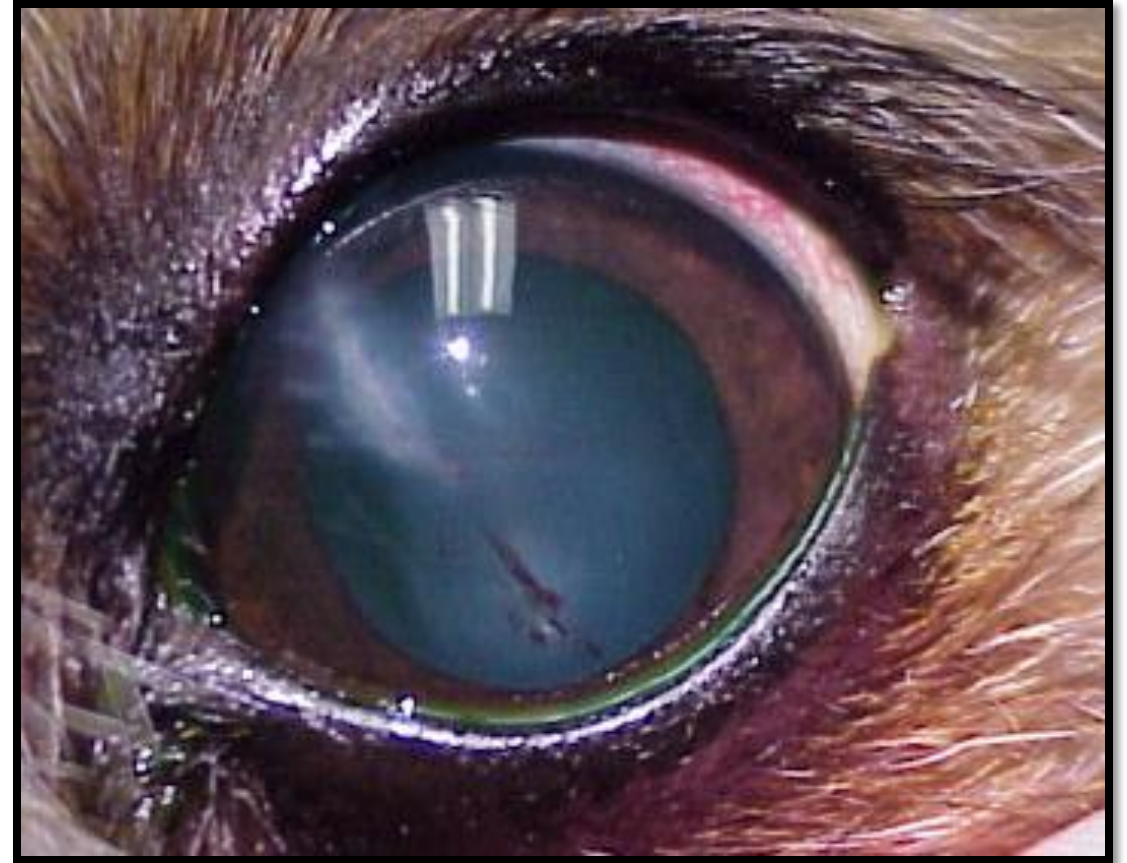


# Cat Scratch Trauma

- Normally Young Dogs
- Menace = learned response
- Two Concerns
  - Corneal Healing
  - Lens Trauma
- Aggressive Medical Management
- Surgery may be necessary

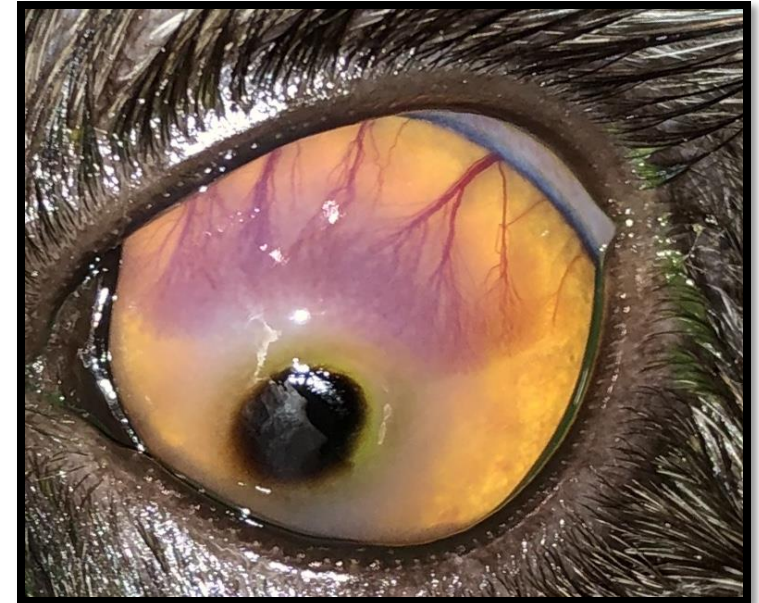


# Initial Injury and Six Weeks Post Repair



# Feline Corneal Sequestrum

- Sequestered Dead Corneal Tissue
  - Chronic irritation
  - +/- Herpes related
  - Linear Grid Keratotomy
- Brachycephalic Predisposed
- Spectrum of presentations
  - Brunescence (amber corneal haze)
  - Brown/black plaques
- Vascularization variable



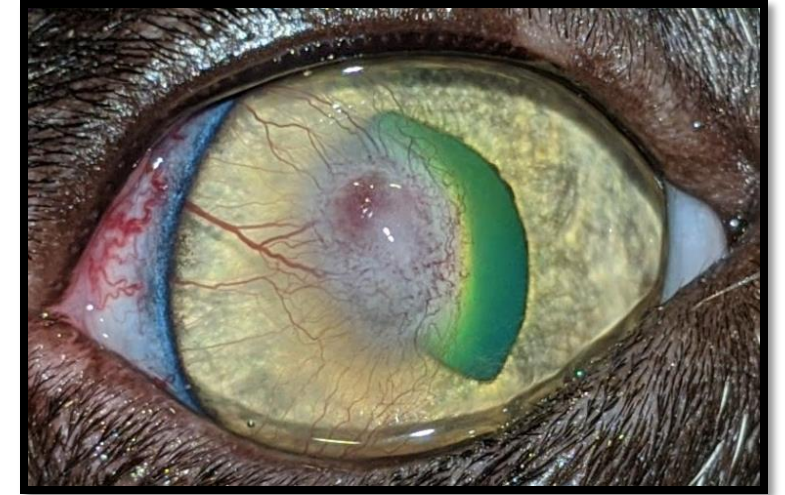
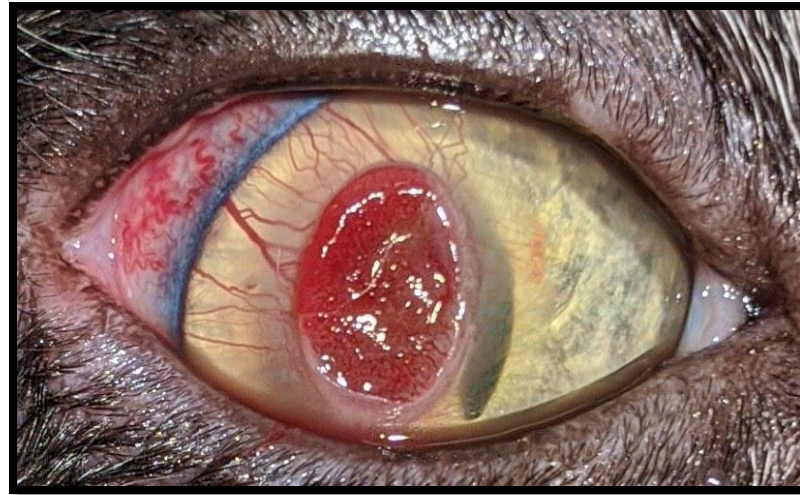
# Medical Treatment of Corneal Sequestrum

- Early Changes
  - Topical Sodium Hyaluronate
    - I-drop Vet (Imed Animal Health)
    - An-HyPro (Anvision)
    - Blink Contacts (OTC)
- Interferon in Tears
  - 3000u/mL



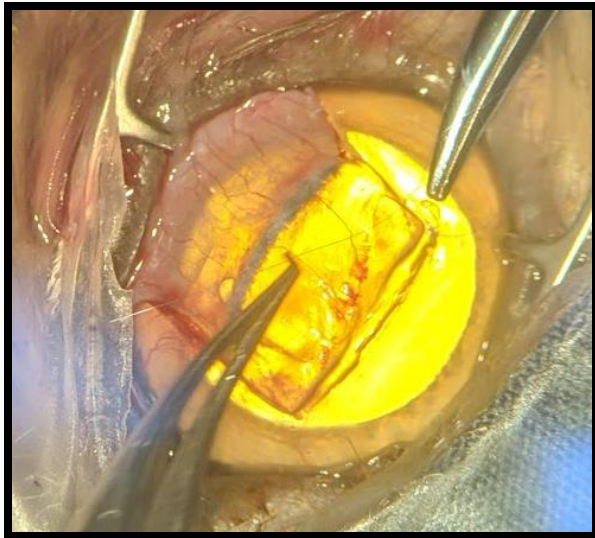
# Surgical Treatment of Corneal Sequestrum

- Superficial Plaque Removal
- Post Op Management
  - Antibiotic / Anti-inflammatory / Pain Control/ Interferon in Tears



# Keratectomy +/- Grafting

- Superficial vs Deep Keratectomy
- Greater than 50% depth = graft
- CCT give best visual outcome
- May decrease recurrence?



## Survey Question 4:

Which of the following statements regarding Feline Corneal Sequestrum is true?

**A: Are most common in Brachycephalic breeds**

**B: Can be directly caused by linear grid keratotomy**

**C: In early stages may respond to medical management**

**D: If greater than 50% of corneal depth require grafting**

**E: All of the above**

## Survey Question 4: Answer

Which of the following statements regarding Feline Corneal Sequestrum is true?

A: Are most common in Brachycephalic breeds

B: Can be directly caused by linear grid keratotomy

C: In early stages may respond to medical management

D: If greater than 50% of corneal depth require grafting

**E: All of the above**



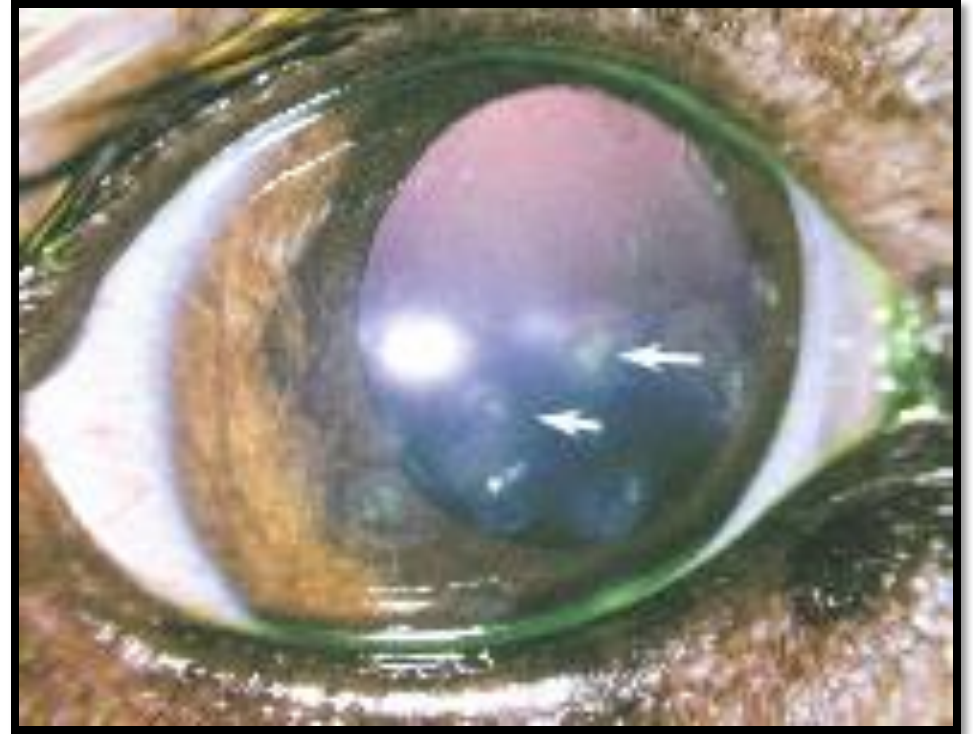
# Corneal Endothelial Degeneration

- Endothelial Barrier
  - Prevents Corneal Stromal Hydration
- Breed Predilection
  - Boston Terrier/Chihuahua
- Hypertonic Sodium Chloride Ointment
- Ulcers Slow to heal and painful
- Sx often necessary



# Superficial Punctate Keratitis

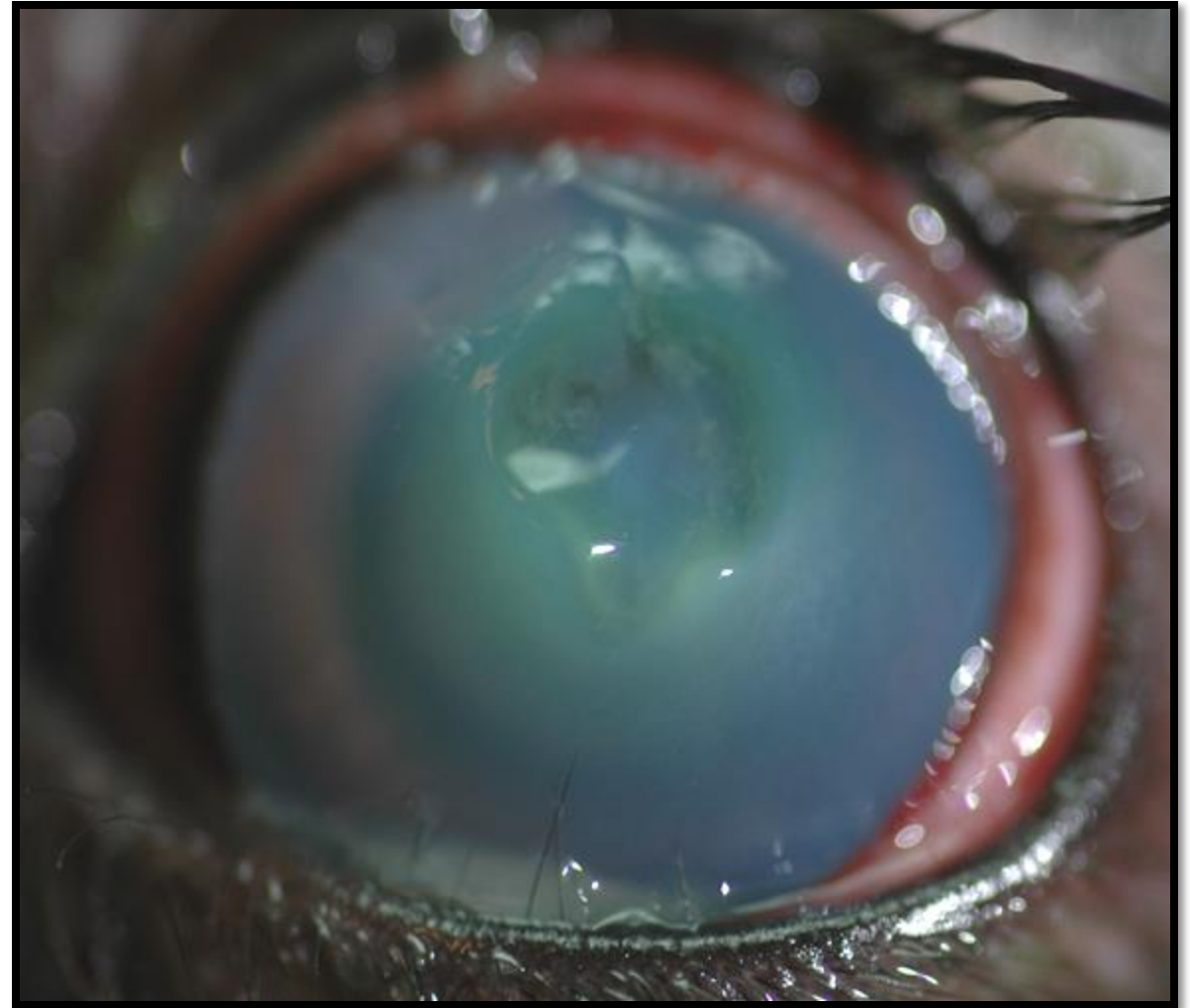
- Immune Mediated Keratopathy
- Punctate Ulcers
- Surrounding Cornea Cloudy
  - Cellular infiltrate
- Variable Corneal Degeneration
- Variable Corneal Vascularization
- Treatment
  - Tacrolimus/Cyclosporine



## Survey Question 5:

5 yr old F/S Shih Tzu presents for a 4-day history of tearing, squinting, and worsening green ocular discharge. Corneal cytology revealed degenerate neutrophils and intra and extracellular cocci that were too numerous to count. Topical treatment of choice would be?

- A: Diclofenac alone
- B: Cefazolin fortified tears & serum
- C: Diclofenac & serum
- D: Ofloxacin & serum
- E: Remend<sup>®</sup> & serum



## Survey Question 5:

5 yr old F/S Shih Tzu presents for a 4-day history of tearing, squinting, and worsening green ocular discharge. Corneal cytology revealed degenerate neutrophils and intra and extracellular cocci that were too numerous to count. Topical treatment of choice would be?

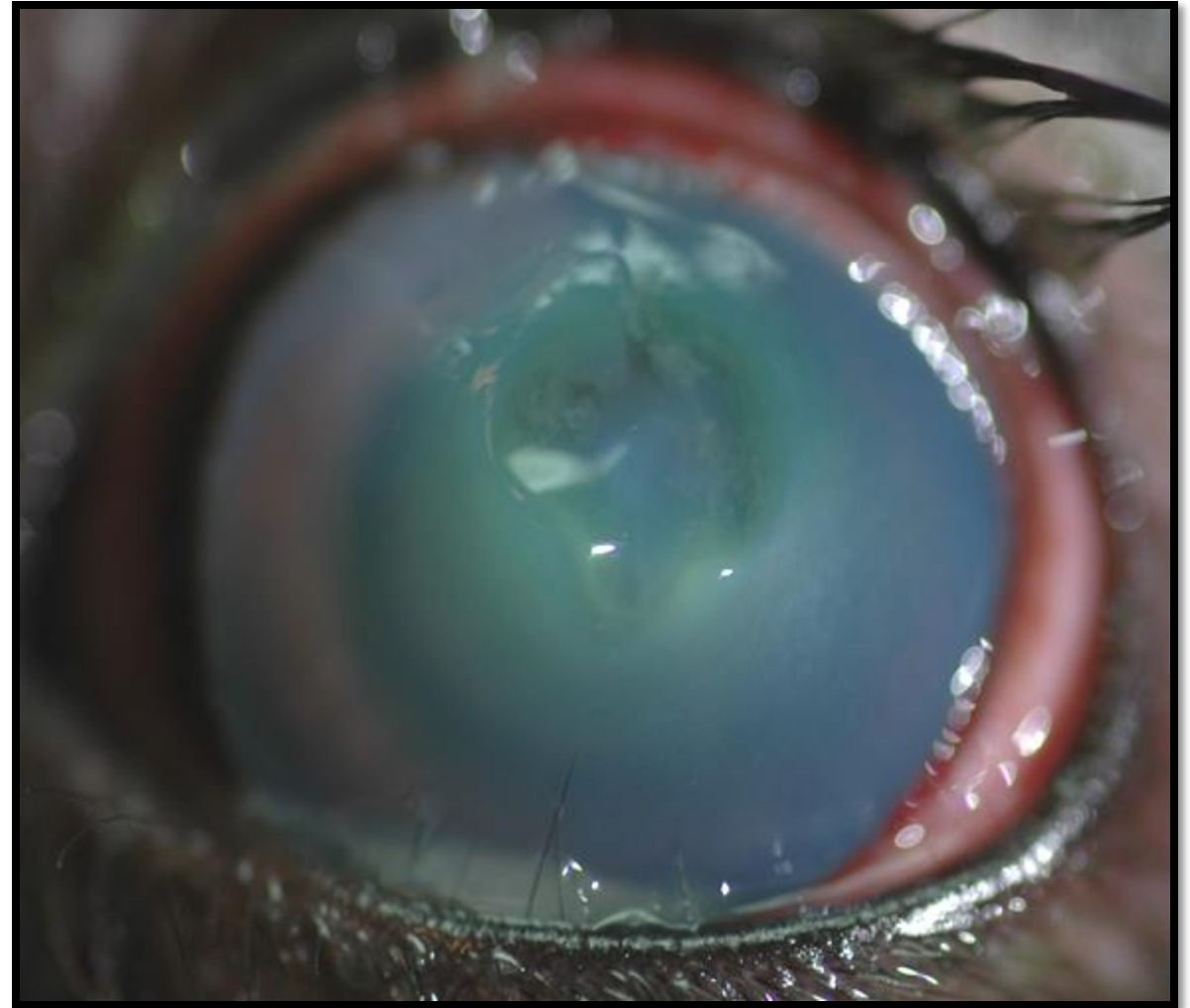
A: Diclofenac alone

**B: Cefazolin fortified tears & serum**

C: Diclofenac & serum

D: Ofloxacin & serum

E: Remend<sup>®</sup> & serum



# Questions?

