

School of
Veterinary Medicine
UNIVERSITY OF WISCONSIN-MADISON

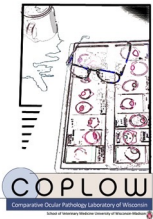
AAPSP
Australian Animal Pathology
Standards Program

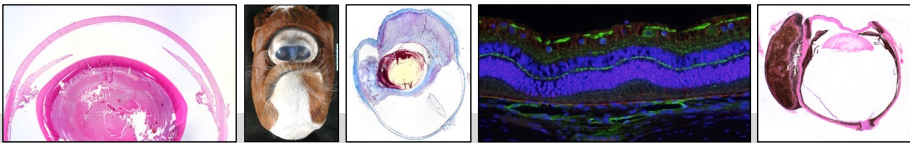
Davis-Thompson
Foundation

Veterinary Pathology Roadshow
2026

The Comparative Ocular Pathology Laboratory of Wisconsin

2. Pathology of the Eyelids, Conjunctiva and Orbit





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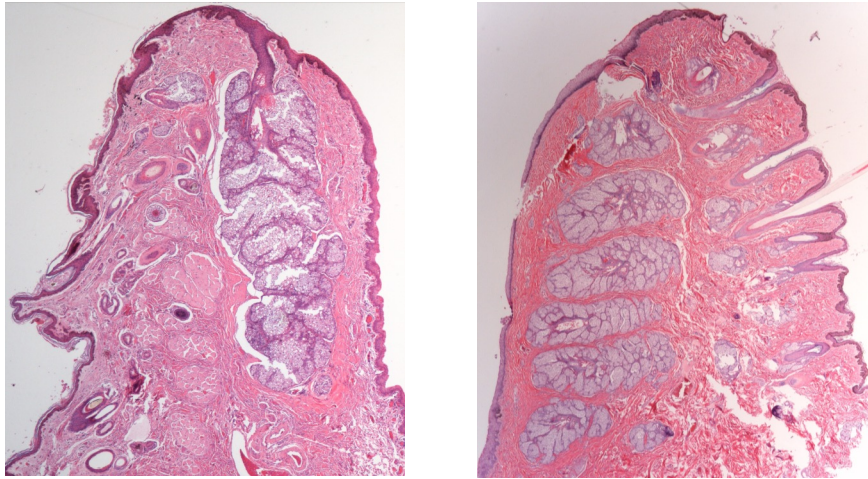
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Overview

- Inflammatory diseases of the eyelid margin
- Inflammatory diseases of the conjunctiva
- Inflammatory diseases of the orbit
- [Inflammatory diseases of the eyelid skin]

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Eyelid Margin



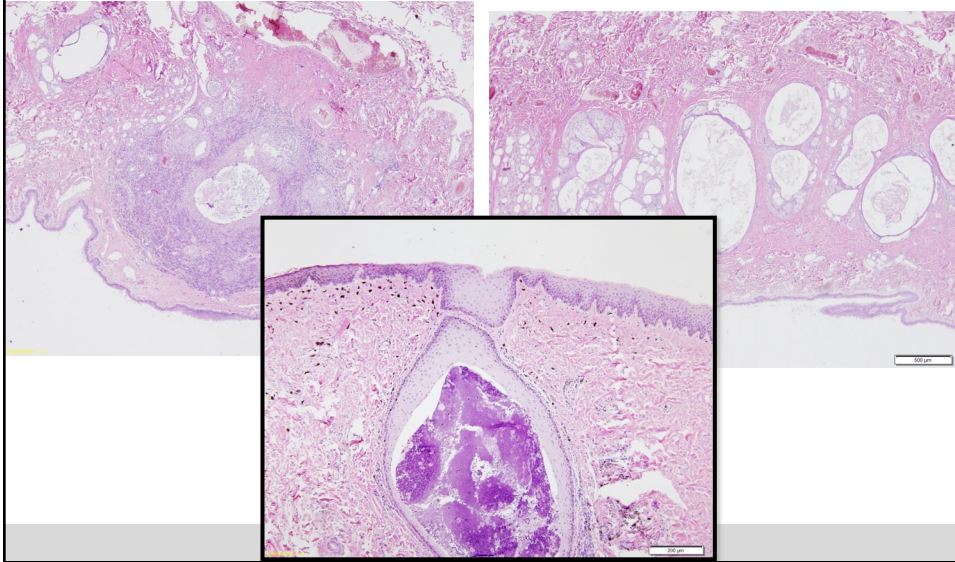
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Meibomitis

- Meibomian adenitis
 - Usually bacterial
 - Single or multiple glands
 - Type of inflammation depends on duration
 - Neutrophils early
 - Macrophages if gland ruptures

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Blepharitis meibomitis



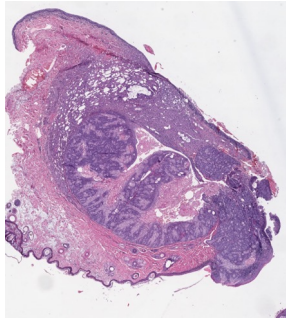
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Chalazion

- Meibomian adenitis
- Lipogranulomatous inflammation, nodular
- Macrophages and multinucleated giant cells
- Secondary to leakage of meibomian secretions, most often from neoplasia
- Acicular cytoplasmic clefts on HE, refractile/birefringent material

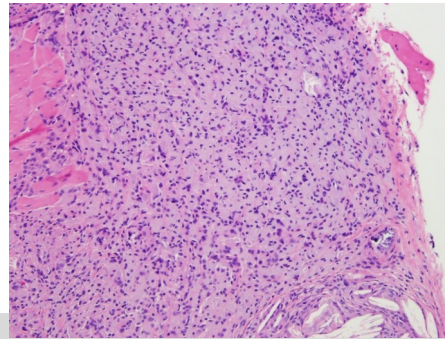
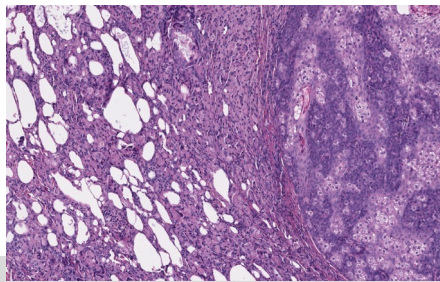


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Chalazion

Courtesy of Dr. Chris Reilly



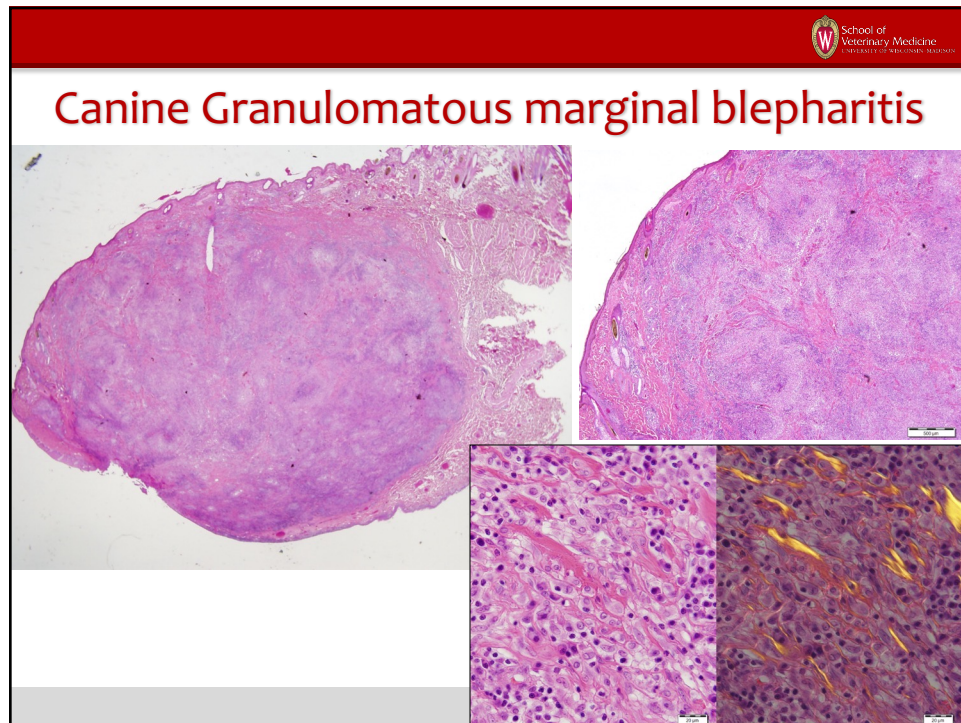
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Canine Granulomatous marginal blepharitis

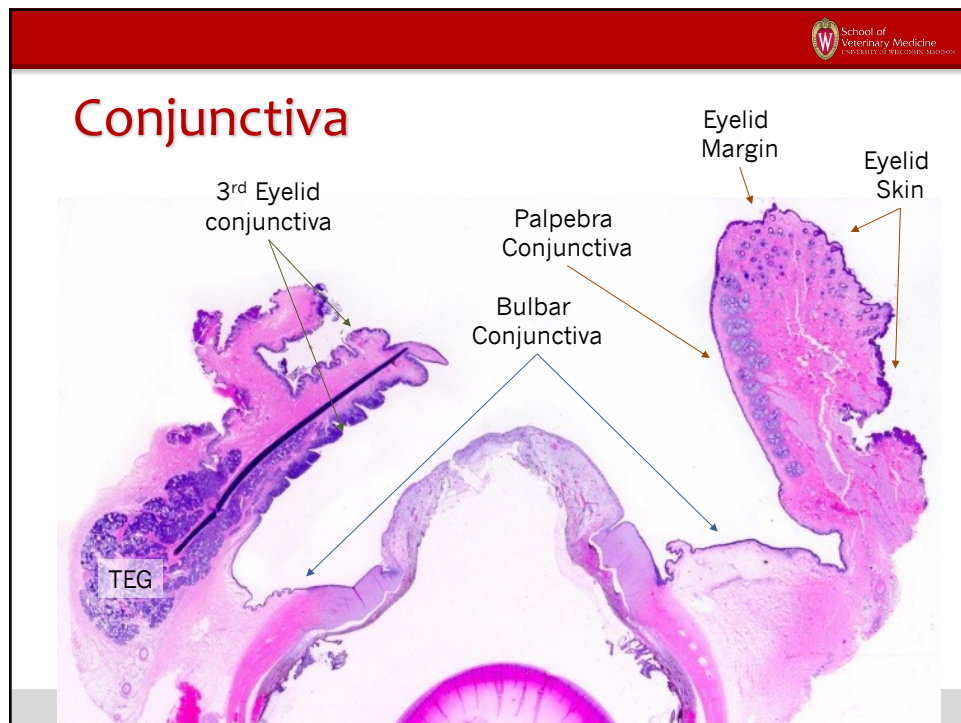
- Sterile granuloma syndrome
 - Conjunctival (Sypniewska BMC Vet Res 2026)
- Typically forms a mass effect, but can be poorly circumscribed or diffuse
- Can be bilateral
- Granulomatous to pyogranulomatous inflammation
- Granulomas/pyogranulomas
- Unknown etiology
- No microorganisms (HE or special stains)

Teixeira and Njaa. Special senses. Pathology of Domestic Animals. 2026.
Labelle P. The Eye. Pathologic Basis of Veterinary Disease. 2022.

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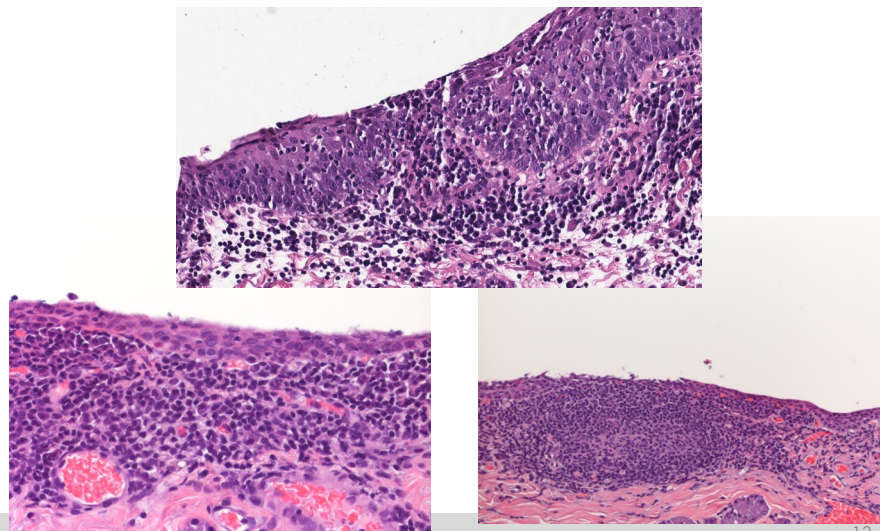
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Histologic Diagnosis of Conjunctivitis

- Conjunctiva has limited ways in which it responds to injury
- Conjunctival biopsies rarely identify a specific cause for the conjunctivitis
- Only a few specific entities
- Some uncommon presentations
 - Cactus - *Dowler KK et al. VO 2020*
 - Cuterebra - *Schlesener BN et al. J Feline Med Surg 2022*
 - Calcinosis circumscripta - *Robin MC et al. VO 2021*
- Biopsies are taken late in the disease process, often after treatment
- Biopsy size is often a limiting factor

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Lymphoplasmacytic conjunctivitis



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Conjunctival Infectious Diseases

- **Dogs**
 - Bacterial
 - Onchocerciasis/parasitic
 - Leishmaniasis
- **Cats**
 - Bacterial
 - Feline herpesvirus
 - Histoplasmosis
- **Horses**
 - Bacterial
 - Herpesvirus
- **Ruminants**
 - Infectious bovine keratoconjunctivitis
 - Infectious bovine rhinotracheitis
 - Infectious keratoconjunctivitis of small ruminants

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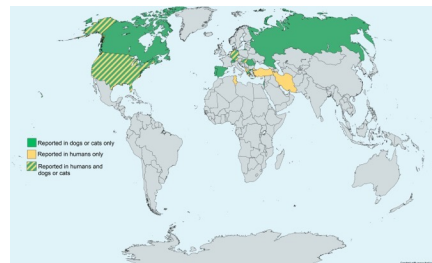
Parasitic Conjunctivitis

- Histopathologic findings are non-specific
- Unlikely to be biopsied
- **Thelaziosis** (*Thelazia callipaeda*)
 - Dogs, cats, rare
 - Subclinical to severe, also keratitis
- **Dirofilariasis** (*Dirofilaria repens*)
 - Dogs, rare

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Conjunctival/Orbital Onchocerciasis

- *Onchocerca lupi*
- Dogs and cats
- Endosymbiotic bacteria *Wolbachia*
- Larval development in blackflies
- Coyotes as reservoir (Roe 2020)



Rojas A et al. Yale J Biol Med 2021

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Conjunctival/Orbital Onchocerciasis

- Subconjunctival or periscleral/orbital nodules
- Granulomatous inflammation
- Eosinophils may be present in large numbers, there may be fibrosis
- Parasites may not elicit severe inflammation



Dr. Anastasia Komnenou

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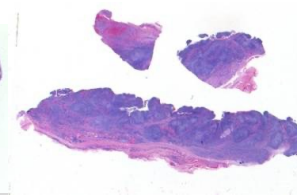
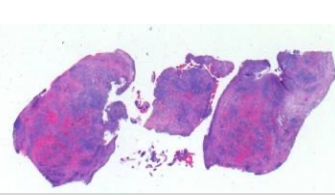
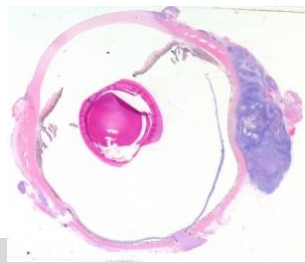
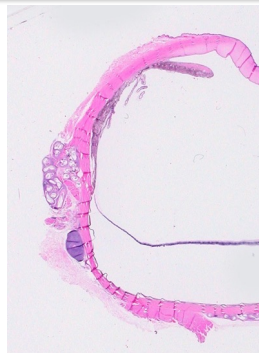
Conjunctival/Orbital Onchocerciasis

- Can be differentiated from other nematodes with microfilariae
- Annular/circumferential ridges distinguish from *Dirofilaria immitis*
- Association with onchocerciasis and glaucoma in humans, unclear in dogs and cats



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Histologic Features



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Histologic Features

- Morphologic features: low, rounded, circumferential external ridges and internal striae.
- Thelazia* sp do not have external ridges

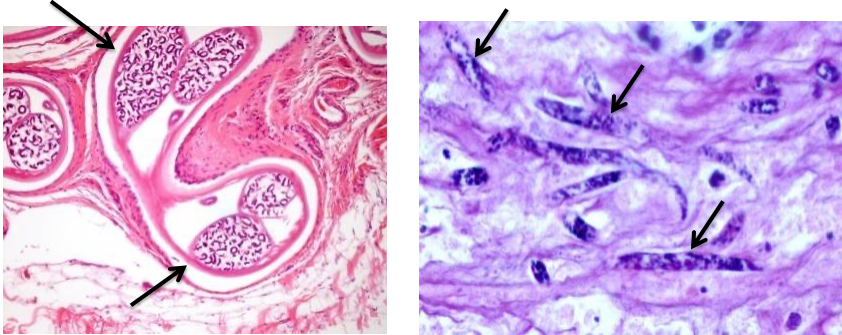


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Patent infections

7 of 19 contain gravid adult females
L3 infective stage

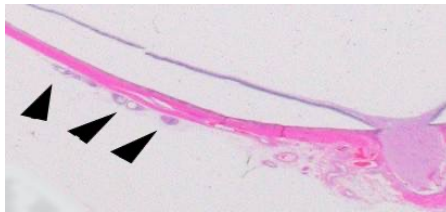
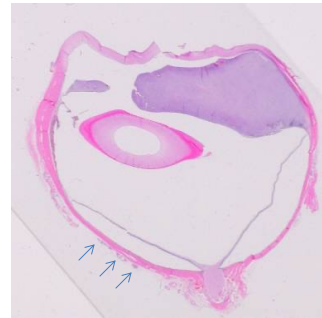
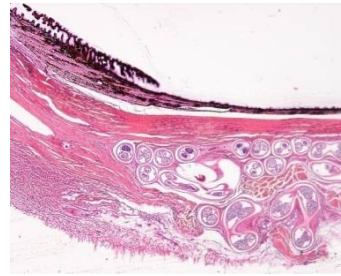


Live microfilaria in paired uteri

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SUBCLINICAL CASES

- Enucleation for other reasons
- Parasites found incidentally
- Minimal inflammation
- Other subclinical cases in endemic regions?



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Tight Geographic distribution



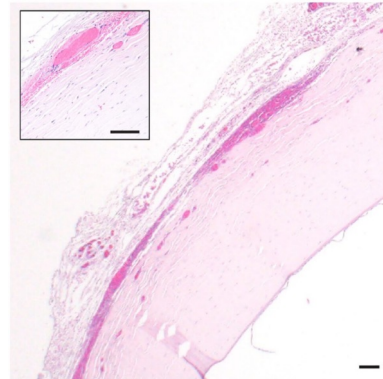
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Herpes Keratoconjunctivitis

- Cats, primarily kittens
- Unlikely to be biopsied
- Symblepharon

Shiraishi H et al. J Feline Med Surg 2023

- Window for inclusions is narrow
- May include eosinophils (ddx eosinophilic conjunctivitis)



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Herpes Keratoconjunctivitis

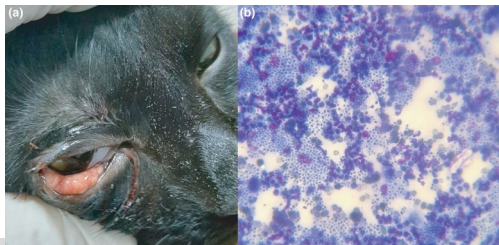
- Role of Herpesvirus in adult cats is unclear
- Clinical lesions suspected to be, diagnosed as, and treated for herpesviral infection lack any histologic evidence to specifically support a viral cause
- The presence of eosinophils is not a helpful feature

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Conjunctival Sporotrichosis

- *Sporothrix schenckii*
- Cats
- Subconjunctival nodules;
blepharoconjunctivitis

- Spinelli TP et al. VO 2021; Freitas HM et al. VO 2023;
- Chuenngam et al. JFMS Open Res 2026;
- Silva et al. Front Vet Sci 2025



Spinelli et al. 2021



Freitas et al. 2023

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Conjunctival Non-Infectious Diseases

- Trauma
- Immune-mediated conditions
 - Lymphoplasmacytic conjunctivitis
 - Eosinophilic conjunctivitis
 - Mastocytic conjunctivitis of cats
- Solar conjunctivitis
- Conjunctival overgrowth
- Ligneous conjunctivitis
- Lipogranulomatous conjunctivitis
- Conjunctival xanthogranuloma
- Nodular granulomatous episcleritis
- Triamcinolone granuloma

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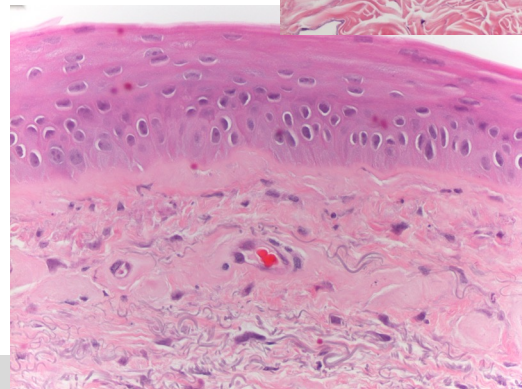
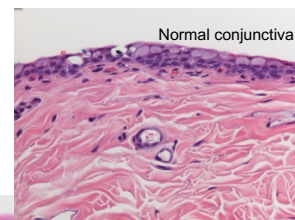
Solar Elastosis, Fibrosis and Vasculopathy

- Conjunctiva, not cornea
- “Solar conjunctivitis”
- Solar elastosis
 - Altered elastin fibers within the superficial substantia propria
 - New production +/- degradation of collagen and elastin
- Can form plaques in horses
- Overlaps with solar induced neoplasia
 - Often seen with conjunctival squamous cell carcinoma, hemangioma or hemangiosarcoma

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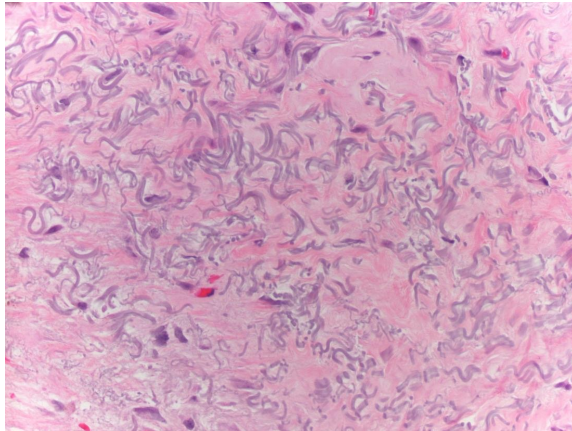
Solar Elastosis, Fibrosis and Vasculopathy

- Solar “fibrosis”
 - Altered collagen, pale, hypocellular (sclerotic)
 - Forms a band underlying the epithelium
 - Not true fibrosis
- Solar vasculopathy
 - Rare, more common in skin
 - Thickened hyalin vessel walls
 - May be endothelial swelling

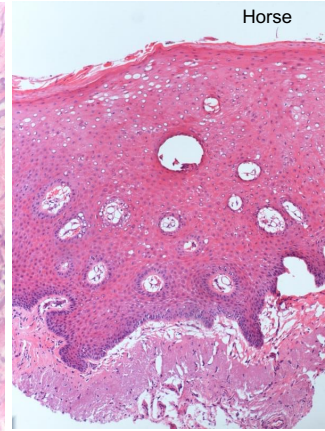


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Solar Elastosis, Fibrosis and Vasculopathy



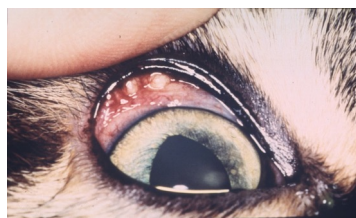
Degenerated elastic fibers – solar elastosis



Epithelial hyperplasia

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Feline Lipogranulomatous Conjunctivitis

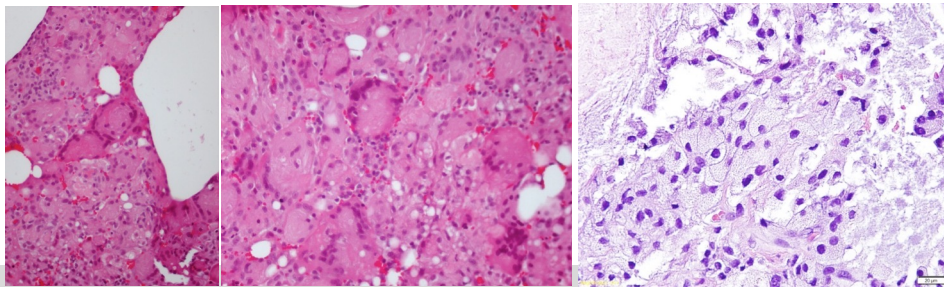


- Regional nodular disease which usually involves the palpebral conjunctiva from the lid margin to the fornix.
- Older cats with sparse periocular pigmentation.
- 81 cases at COPLOW:
 - 28/81 cases → concurrent neoplasm (17 SCC)
- Lipogranulomas and neoplasia may go together!
- Careful search to rule out neoplasia

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Feline Lipogranulomatous Conjunctivitis

- Nodular, and pale white to light yellow
- A bland granulomatous inflammatory reaction surrounding large, cell-free lakes of lipid dissolved during processing
- Large empty spaces which may be surrounded by inconspicuous multi-nucleated macrophages

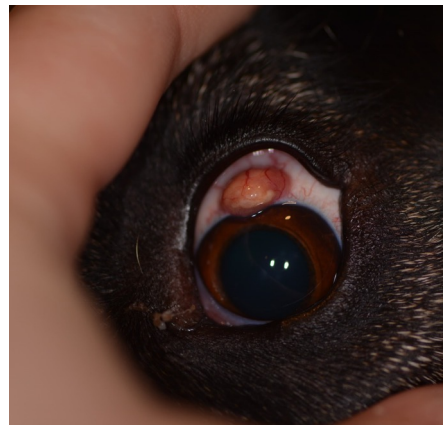


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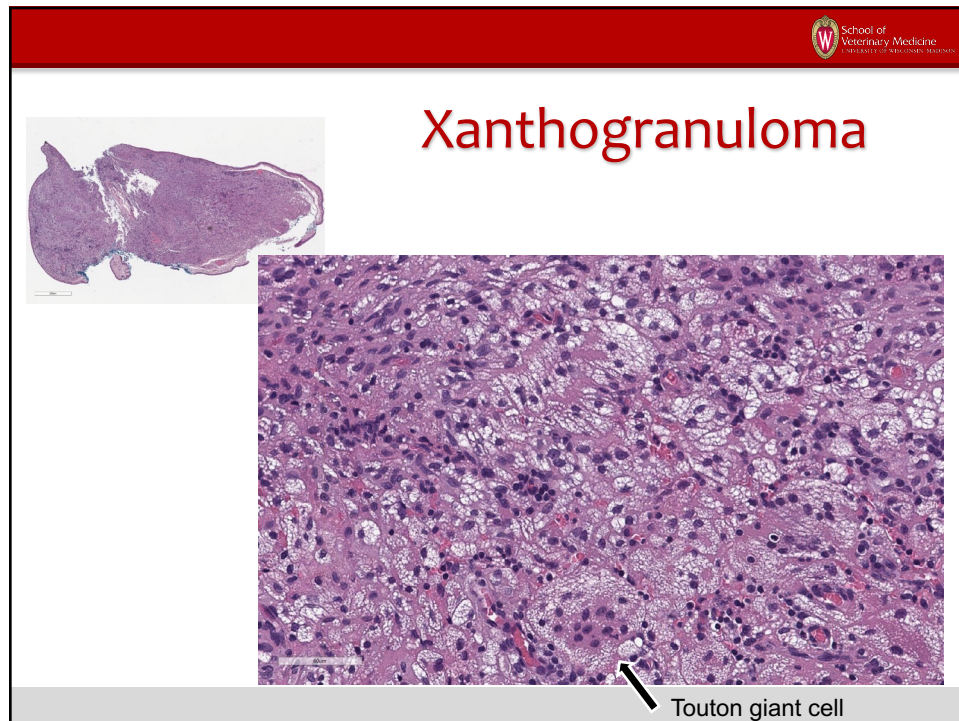
Xanthogranulomas

- Dogs
- Conjunctiva, limbus, cornea
- Nodular inflammation
- Macrophages with vacuoles, multinucleated giant cells

Harvey AM et al. VO 2020;
Ota-Kuoki J et al, J Vet Med Sci 2017;
Bergen A et al JAVMA 2024 (cornea)



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Nodular Granulomatous Episcleritis - NGE

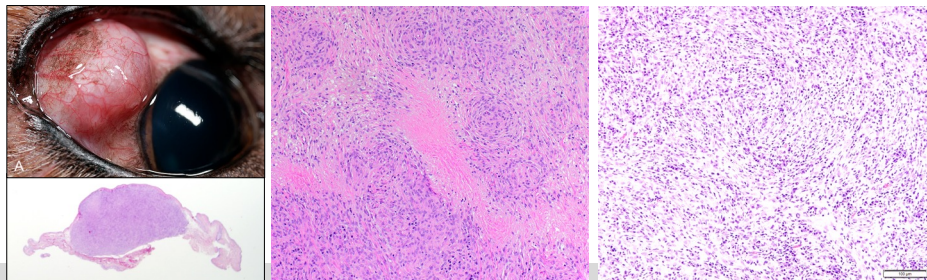
- Episclerokeratitis, episcleritis, NGE
- 345 cases in COPLOW
- Spectrum of histiocytic episcleral inflammatory / reactive diseases
- Unknown cause/unknown pathogenesis
- Smooth nodules to diffuse thickening
- Most often in the limbal conjunctiva
 - Also occurs in other conjunctival sites, orbit
 - Recent report of cases in the cornea

Barnes et al, VO 2010 (orbit);
Hamzianpour et al. VO, 2019 (cornea);
Grahn B. Vet Clin North Am Small Anim Pract. 2023 (review);
Pearsall et al, VO 2024 (posterior globe);
Hurn et al VO 2005 (third eyelid)

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Nodular Granulomatous Episcleritis - NGE

- **Main diagnostic features:**
 - Nodular well-delineated lesion
 - Location – Limbus / bulbar conjunctiva
 - Histiocytes > lymphocytes +/- eos and rare plasma cells
 - No distinct granulomas
 - Special stains for infectious organisms are always negative



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Feline Epitheliotropic Mastocytic Conjunctivitis

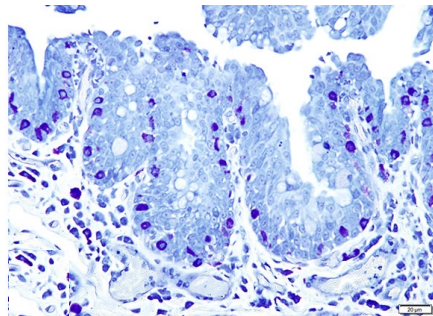
Original Article

Feline Epitheliotropic Mastocytic Conjunctivitis in 15 Cats

B. Beckwith-Cohen¹, R. R. Dubielzig², D. J. Maggs³,
and L. B. C. Teixeira²

Veterinary Pathology
1-6
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- In 2009 the COPLOW recognized a unique proliferative conjunctivitis in cats associated with *mast cell epitheliotropism*
- 234 cases in the COPLOW database in 2025
- Unknown cause but an allergic / hypersensitive reaction is suspected



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Feline Epitheliotropic Mastocytic Conjunctivitis

Clinical presentation

- Median age was 8 years (range: 7m–17y)
- No breed or sex predisposition
- Poorly delineated proliferative conjunctival lesion or well-delineated mass
- Third eyelid +/- bulbar or palpebral conj.
- Larger mass-like lesions need surgical excision
- Recurrence uncommon with combined surgical and medical treatment (cyclosporine, tacrolimus)



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Feline Epitheliotropic Mastocytic Conjunctivitis

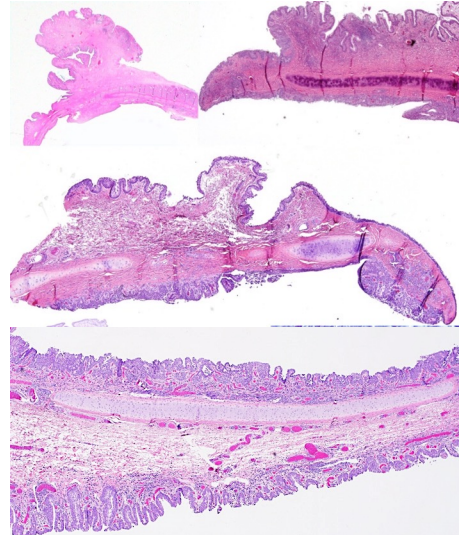


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Feline Epitheliotropic Mastocytic Conjunctivitis

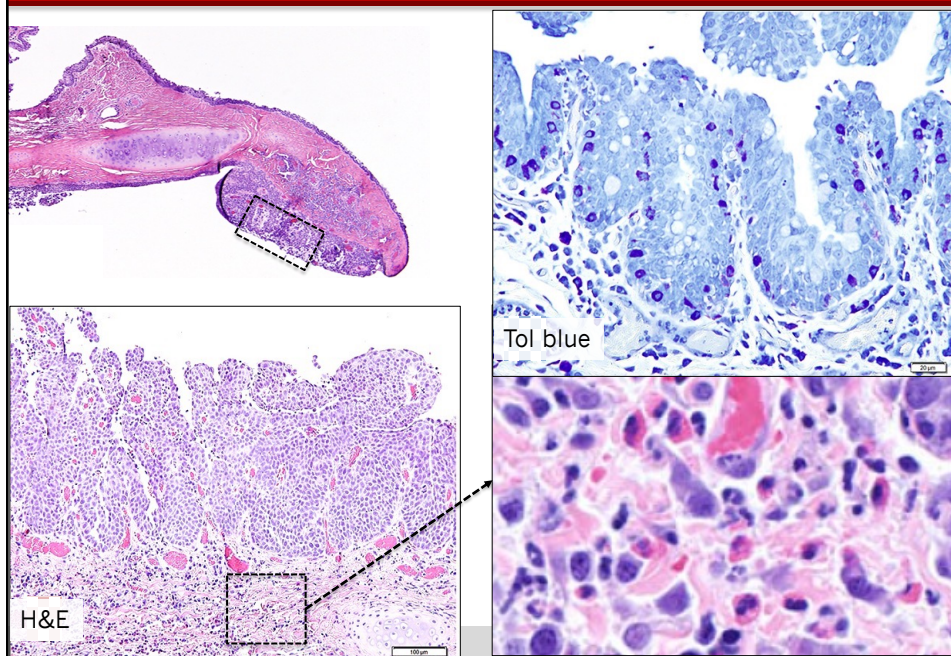
Histologic presentation

- Papillary epithelium proliferation
- Lymphocytes, plasma cells and eosinophils + edema
- Large numbers of mast cells
- Many intraepithelial mast cells

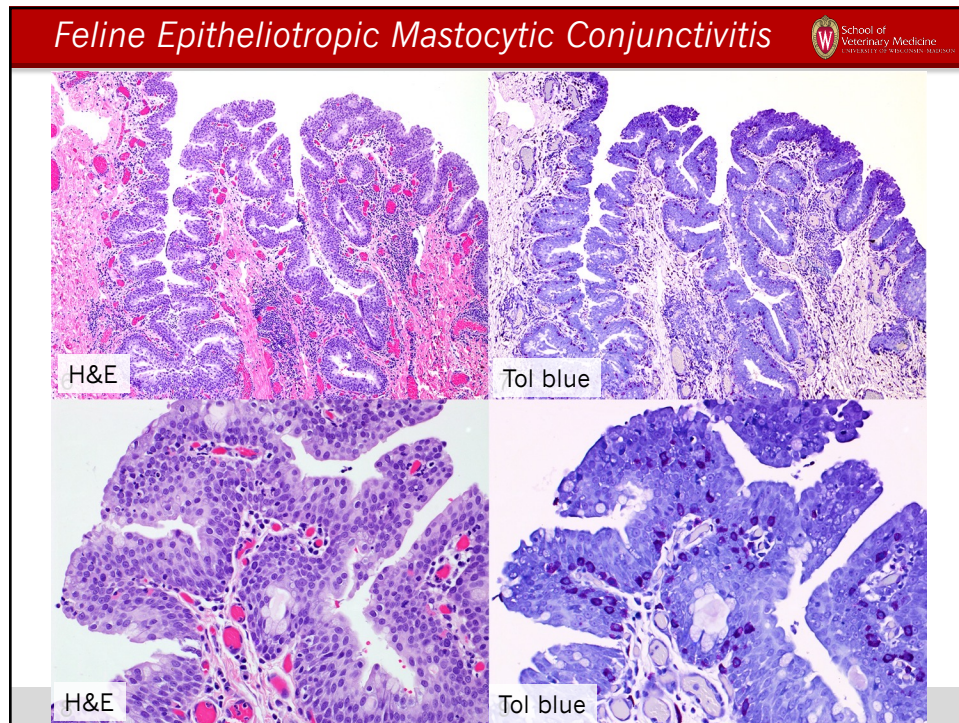


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Feline Epitheliotropic Mastocytic Conjunctivitis



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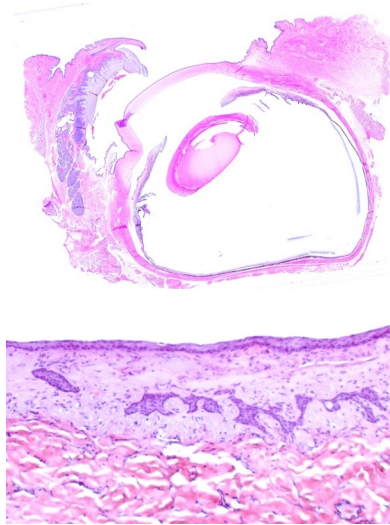
Ligneous Conjunctivitis

- Rare condition
- Doberman Pinschers and Golden Retrievers
- Bilateral ulcerative conjunctivitis
- Adherent dense pseudomembranous exudate
- Similar oral mucosal lesions
- Hard and rigid 'wooden' tissues
- Link to renal glomerular and respiratory disease

The clinical images show a dog with Ligneous Conjunctivitis. The top-right image shows a close-up of the eye with a dense, white, adherent pseudomembranous exudate covering the cornea. The bottom-left image shows the dog's eyes with similar white, adherent exudates. The bottom-right image shows the dog's mouth with white, adherent lesions on the oral mucosa, characteristic of the condition.

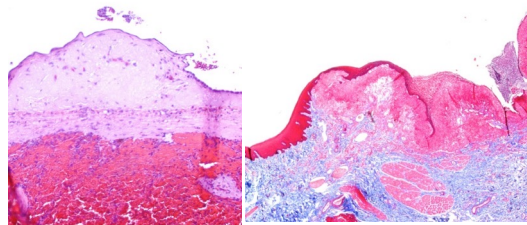
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Ligneous Conjunctivitis



Morphologic characteristics:

- Ulcerative lesions
- Hyaline, cell-poor matrix with epithelial elements buried deeply within this matrix
 - Fails to stain for amyloid
 - Stains bright red with trichrome
- The human disease is thought to be linked to plasminogen deficiency



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Pathology of the Orbit

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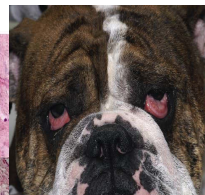
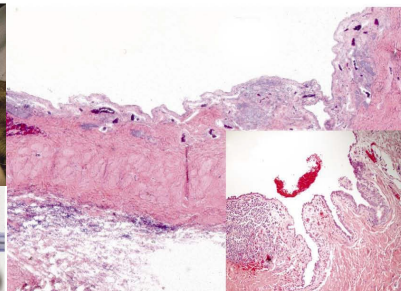
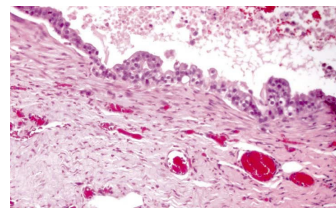
Orbital lesions

- Infectious diseases
 - Abscesses
 - Orbital cellulitis
 - Extension of disease at other sites
- Non-infectious diseases
 - Trauma/foreign body
 - Cysts *Matthews MR et al. VO 2025; Diaz J et al. Can Vet J 2024; Maggets AC et al. VO 2023*
- Unlikely to be biopsied

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Orbital cysts

- Acquired conjunctival cysts
 - Trauma or surgery
- Dermoid cyst
 - Skin-like cysts – congenital
- Salivary or lacrimal ductal cyst
- Zygomatic salivary mucocele



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Orbital Inflammation

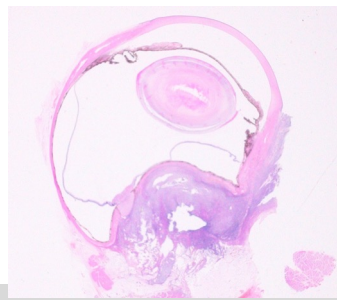
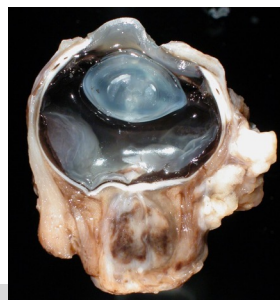
1. Secondary to Dental Disease
2. Secondary to Osteomyelitis
3. Secondary to Salivary Gland Disease
4. Fungal Inflammation
5. Trauma

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Orbital Inflammation

Orbital cellulitis or abscess secondary to tooth root inflammation

- Most common in dogs, rabbits, chinchillas, and horses
- Periodontitis extending to the root apex
- Pulpitis due to exposure of the root canal from trauma
- Trauma and/or iatrogenic during dental procedures
 - Radiography osteolysis at the tooth root apex → caudal maxillary tooth roots



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Orbital Inflammation

Orbital cellulitis or abscess secondary to tooth root inflammation

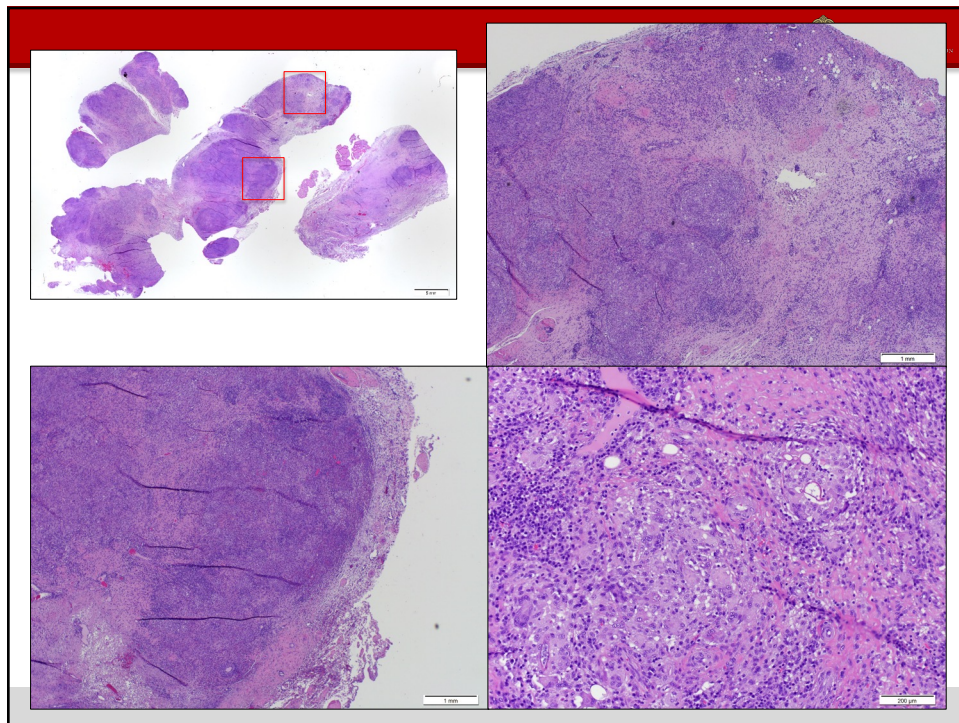


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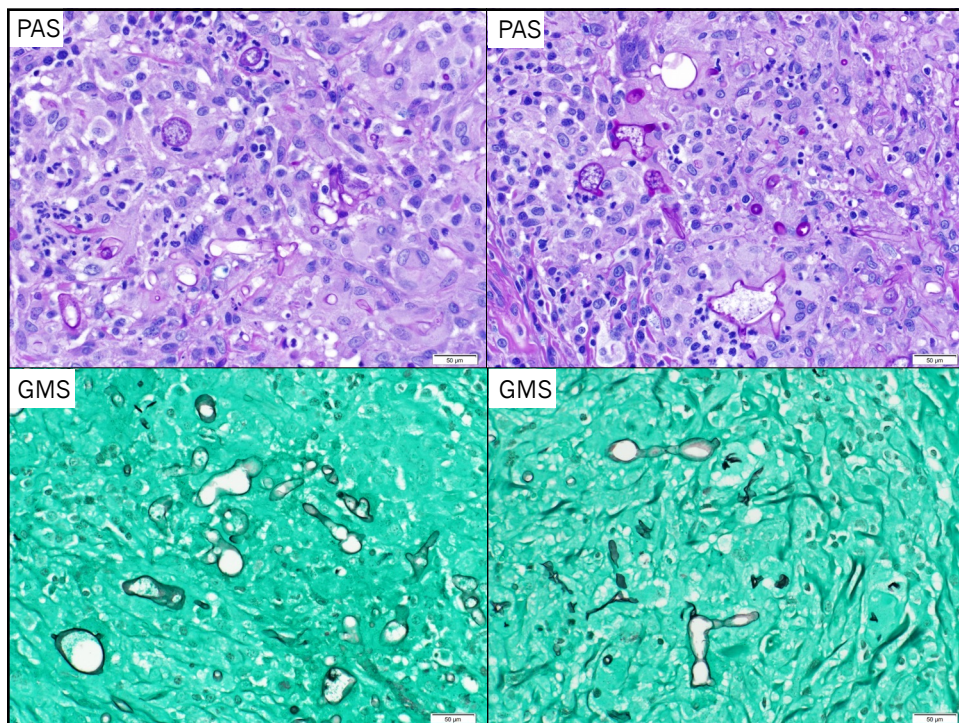
Mycotic orbital cellulitis in cats

- Rare
- Hematogenous or spread of nasal cavity and sinus
 - Disseminated form → immunosuppressed animals
 - Sino-orbital infection → Local form in immunocompetent animals
- Causes
 - Cryptococcus → most common
 - Filamentous fungi → Aspergillus sp
 - Also: Blastomyces, Coccidioides and Candida
- Prognosis is guarded to poor.

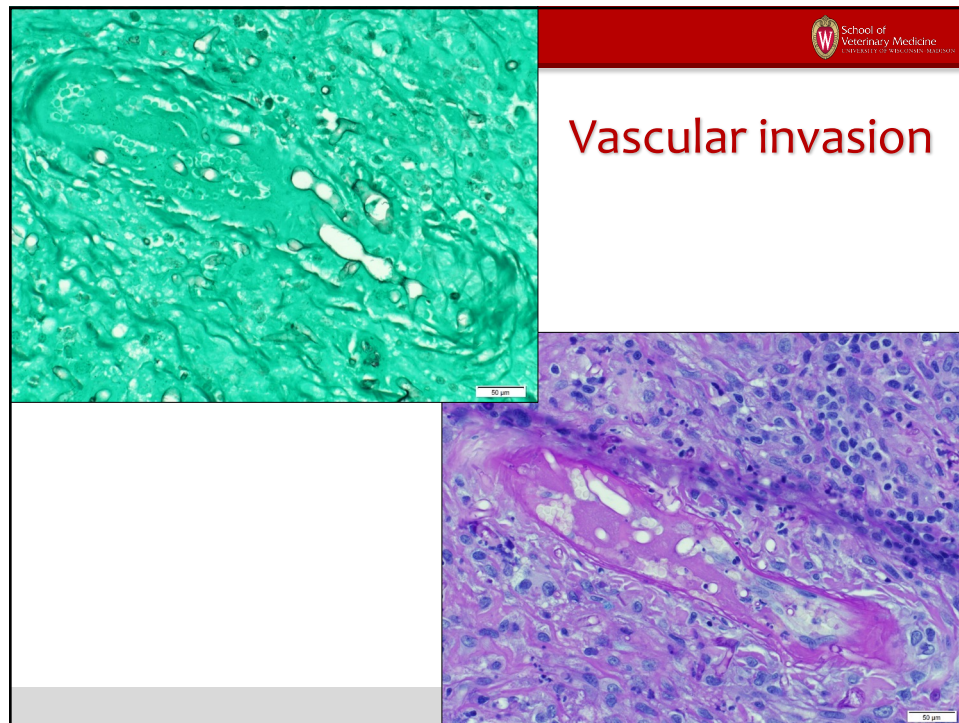
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Orbital extraocular polymyositis

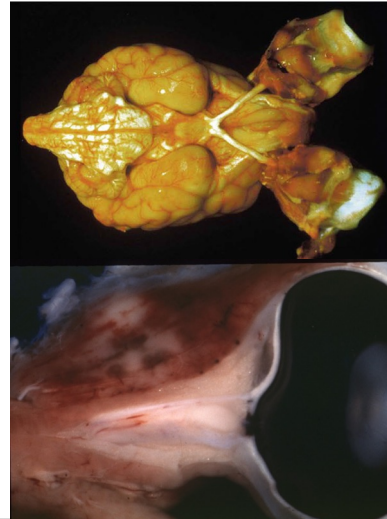
- Affects all extraocular muscles except the retractor bulbi muscle
- Rare disease, typically young dogs
- Bilateral and variably symmetric exophthalmos
- Retraction of the upper eyelid
- Chronic:
 - Enophthalmos and strabismus



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Orbital extraocular polymyositis

- CD3+ (T cell) predominant lymphocytic myositis with myonecrosis
- Attempts at myoregeneration with muscle atrophy and fibrosis
- Immune-mediated attack directed specifically against the extraocular muscles is suspected
- Unlikely to be biopsied



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Questions?



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