Abstracts: The 51st Annual Scientific Meeting of the American College of Veterinary Ophthalmologists, Virtual Conference, Sept 23–27, 2020

GENERAL SCIENTIFIC PAPERS SECTION

G1 | Diagnosis of Infectious Ulcerative Keratitis: The Use of Next-Generation Sequencing in Veterinary Ophthalmology Patients

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Purpose: To compare next-generation sequencing (NGS) to corneal cytology and culture for identification of causative organisms in veterinary patients presenting for infectious ulcerative keratitis (IUK).

Methods: Corneal swabs for aerobic and fungal cultures and swabs for NGS were submitted for canine and equine normal controls (n = 10 and n = 1, respectively) and IUK patients (n = 18 and n = 6, respectively) for which cytology specimens confirmed the presence of infectious organisms. The sensitivity of NGS was compared to bacterial and fungal culture results. Concordance between NGS and culture results was determined.

Results: NGS was positive for bacterial and fungal organisms in 5 and 0 normal and 21 and 1 IUK cases, respectively. Bacterial and fungal cultures were positive for 3 and 0 normal and 20 and 8 IUK cases, respectively. Sensitivity of NGS was 80.95% (95% confidence interval (CI), 58.09% to 94.55%), and specificity was 82% (95% CI, 68.56% to 91.42%). Concordance between identified bacterial and fungal species was found in 81.8% and 100% of positive cases, respectively. NGS identified organisms in 3 bacterial culture-negative samples. NGS identified fungus in only 1 of 5 fungal culture-positive cases.

Conclusions: NGS may be useful in identification of causative bacterial agents in IUK cases with a sensitivity greater than the sensitivity previously reported for bacterial culture. Further testing is needed to determine its efficacy in identification of fungal organisms, and the clinical significance of additional organisms identified by NGS from infected as well as normal corneas. Supported by VCA resident research funds. None.

G2 | Therapeutic Effects of Gamma Irradiated Equine Amniotic Membrane Suspension on Re-epithelialization and Haze in an Ex-vivo Lagomorph Corneal Wound Healing Model

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Purpose: To investigate the therapeutic effects of topical equine amniotic membrane (eAM) suspension following corneal wounding in a controlled experimental setting.

Methods: Equine amniotic membrane was collected, gamma irradiated, homogenized in saline, centrifuged, and supernatant cryopreserved. Corneoscleral rims harvested from fresh rabbit globes were wounded via keratectomy and were maintained in an air-liquid interface ex-vivo corneal culture model. Corneas were treated topically with gamma irradiated eAM suspension (n = 20) and compared to a wounded control group (n = 20). Re-epithelialization of the wound was assessed with daily photographic evaluation of area of fluorescein uptake (mm²). Corneal haze was evaluated, and corneal tissue was collected for histologic assessment 21 days following wounding. Photographic analysis of haze included area (mm²) and pixel intensity (0–255). Protein assessment
was performed, identifying proteins in eAM suspension using LC-MS-MS.

**Results:** Corneal re-epithelialization was complete 6 days following wounding in both controls and topically treated corneas. The mean area and overall intensity of corneal wound haze was significantly reduced in corneas treated with topical eAM suspension ($P < 0.05$) compared to controls. Histologic findings in all corneas demonstrated normal epithelial regeneration and changes potentially contributing to corneal haze at keratectomy sites. Protein analysis identified numerous proteins, some known to have involvement in regulation of corneal remodeling.

**Conclusions:** Gamma irradiated eAM suspension applied topically to corneas following keratectomy resulted in reduction of long-term corneal haze area and intensity. These therapeutic effects may be useful for the treatment of ulcerative corneal diseases which do not require surgical grafting and/or in poor surgical candidates. None.

**G3 | Infracyanine Green-Based Corneal Tissue Welding With Infrared Laser Irradiation Following Full-thickness Clear Corneal Incisions is Impeded by Viscoelastic**

**Purpose:** To evaluate infracyanine-based corneal tissue welding of full-thickness clear corneal incisions in 16 enucleated equine eyes using diffuse diode laser irradiation.

**Methods:** Full-thickness clear corneal incisions (5 mm long) were made 3 mm axial to the limbus in four quadrants (dorsomedial, dorso temporal, ventromedial, and ventro temporal) using sapphire blades (crescent knife, bevelled keratome, 5 mm corneal incision extender). The anterior chamber was maintained via intracameral injections of viscoelastic material. Infracyanine green (100 μl, 1 mg/ml) was applied to each of the incisions, and a single simple-inter rupted 9-0 polyglactin suture was placed in the center of the incision to facilitate tissue apposition. After five minutes, each incision was irradiated with an 810 nm diode laser via a 300 μm fiber using a focal spot-welding technique. Irradiation energy and wattage were varied to determine the parameters necessary to achieve the best welding effect. Five Joules (J), 10J, and 20J were delivered each with either 100 mW or 200 mW. The control incisions did not undergo laser irradiation. Each cornea was examined for visible changes and evaluated histologically.

**Results:** No welding effect was achieved in any of the corneal incisions, in contrast with the preliminary study where robust welding effects were achieved in partial-thickness corneal incisions. Histologically, viscoelastic material lined the walls of the incision and collected upon the corneal surface adjacent to the incisions.

**Conclusions:** The optimal time point of infracyanine green application to the corneal incision requires further investigation. Corneal tissue welding in full-thickness incisions was impeded by viscoelastic material. Supported by ACVO Vision for Animals Foundation (VAF grant 2019-1). None.

**G4 | Evaluation of a Novel bi-modal Topical Drop for the Treatment of Corneal Fibrosis**

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**Purpose:** To test the safety/efficacy of combination topical therapy for corneal fibrosis.

**Methods:** Twelve New Zealand rabbits were randomly assigned into 2 groups (6 rabbits/group). Naïve healthy eyes were treated OD BID×5 days with either treatment (combination TRAM-34 25 μM (Tocris Biosciences, Bristol, UK) and ascorbic acid 10% (TVC)) or control (BSS). Rabbits underwent an axial corneal wound OS using an established model. Groups were treated OS BID×5 days. Degree of corneal opacity, ocular health, safety, and efficacy were determined utilizing the Fantes grading scale and modified McDonald-Shadduck (mMS) scoring system. Immunohistochemical and microscopy techniques evaluated corneal fibrotic markers at study conclusion (day 28).

**Results:** Combination therapy was well tolerated in all eyes, with no significant differences in mMS scores, IOP, or central corneal thickness (CCT) between treatment and control groups. Significant differences in mMS scores between groups were found at day 1 ($P = 0.0001$), 2 ($P = 0.0001$), 3 ($P = 0.0001$), 4 ($P = 0.0285$), 14 ($P = 0.0041$), and 28 ($P = 0.0002$). Significant differences in Fantes scores were detected between groups at day 7 ($P = 0.001$), 14 ($P = 0.0027$), and 28 ($P = 0.0001$). Significant differences in CCT between groups were found at days 7 ($P = 0.036$), 14 ($P = 0.0495$), and 28 ($P = 0.0487$). Laboratory testing of corneal tissues demonstrated decreased fibrosis in treatment versus control groups at day 28.
Conclusions: Novel bi-modal TVC topical therapy was well tolerated and demonstrated improved corneal wound healing and reduction in fibrotic changes in TVC treated rabbits compared to controls. Supported by ACVO Vision for Animals Foundation (VAF grant 2020-2) and the MU Phi Zeta chapter. None.

G5 | Intrastromal Injection of Hyaluronidase Alters the Structural and Biomechanical Properties of the Corneal Stroma

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Purpose: Spatiotemporal arrangement of glycosaminoglycans regulates the organization of stromal collagen fibrils and maintains corneal transparency. The purpose of this study was to determine the consequences of intrastromally injected hyaluronidase (HAse) on stromal stiffness and ultrastructure.

Methods: The HAse or equal volumes of balanced salt solution were injected intrastromally to the right and left eyes of 12 rabbits, respectively. Ophthalmic examination and multimodal imaging techniques including optical coherence tomography and in vivo confocal microscopy were performed at multiple time points to evaluate the impact of HAse treatment. Atomic force microscopy and transmission electron microscopy were used to measure corneal stiffness and collagen's interfibrillar spacing, respectively.

Results: Central corneal thickness progressively decreased after HAse injection reaching its lowest value at day 7 and then returned to normal by day 42. HAse did not impact the corneal endothelium but transiently altered keratocyte morphology at days 1 and 7. HAse-injected corneas became stiffer by day 1 post-injection, were stiffer at day 7 and returned to pre-injection values by day 90. Changes in stromal stiffness correlated with decreased interfibrillar spacing.

Conclusions: Degradation of GAGs by HAse decreases the corneal thickness and increases stromal stiffness through increased packing of the collagen fibrils in a time-dependent manner. Intrastromal HAse injection appears relatively safe in the normal cornea but impact on corneal biomechanics and structure under pathologic conditions require further study. Supported by the National Institutes of Health R01 EY019970 and P30 EY12576. None.

G6 | The Corneal Surface Bacterial Microbiome: A Distinctive Niche Within the Ocular Surface

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Purpose: The ocular surface microbiome has been described as paucibacterial. Until now, studies investigating the bacterial community associated with the ocular surface through high-throughput sequencing have focused on the conjunctiva. Conjunctival samples are thought to reflect and be representative of the microbiome residing on the ocular surface, including the cornea. Here, we hypothesized that the bacterial community associated with the corneal surface was different from those of the inferonasal and superotemporal conjunctival fornices, and from the tear film.

Methods: Both eyes from 15 healthy piglets were sampled using swabs (inferonasal fornix, superotemporal fornix, and corneal surface, n = 30 each) and Schirmer tear test strips (STT, n = 30). Negative sampling controls (swabs and STT, n = 2 each) and extraction controls (n = 4) were included. Total DNA was extracted, and high-throughput sequencing targeting the 16S rRNA gene was performed. Bioinformatic analyses included multiple contamination-control steps.

Results: Corneal surface samples had significantly lower number of taxa detected (P < 0.01) and were compositionally different from all other sample types (Bray-Curtis dissimilarity, P < 0.04). It also harbored higher levels of Proteobacteria (P < 0.05), specifically Brevundimonas spp. (4.1-fold) and Paracoccus spp. (3.4-fold) than other sample types. Negative control STT strip samples yielded the highest amount of 16S rRNA gene copies across all sample types (P < 0.05).

Conclusions: Our data suggest that the corneal surface provides a distinct environmental niche within the ocular surface, leading to a bacterial community compositionally different from all other sample types. Supported by the Department of Veterinary Clinical Sciences, University of Minnesota. None.

G7 | Bacterial Isolates of Indolent Ulcers in 44 Dogs and the Influence of Topical NSAIDS on Healing

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Purpose: The ocular surface microbiome has been described as paucibacterial. Until now, studies investigating the bacterial community associated with the ocular surface through high-throughput sequencing have focused on the conjunctiva. Conjunctival samples are thought to reflect and be representative of the microbiome residing on the ocular surface, including the cornea. Here, we hypothesized that the bacterial community associated with the corneal surface was different from those of the inferonasal and superotemporal conjunctival fornices, and from the tear film.

Methods: Both eyes from 15 healthy piglets were sampled using swabs (inferonasal fornix, superotemporal fornix, and corneal surface, n = 30 each) and Schirmer tear test strips (STT, n = 30). Negative sampling controls (swabs and STT, n = 2 each) and extraction controls (n = 4) were included. Total DNA was extracted, and high-throughput sequencing targeting the 16S rRNA gene was performed. Bioinformatic analyses included multiple contamination-control steps.

Results: Corneal surface samples had significantly lower number of taxa detected (P < 0.01) and were compositionally different from all other sample types (Bray-Curtis dissimilarity, P < 0.04). It also harbored higher levels of Proteobacteria (P < 0.05), specifically Brevundimonas spp. (4.1-fold) and Paracoccus spp. (3.4-fold) than other sample types. Negative control STT strip samples yielded the highest amount of 16S rRNA gene copies across all sample types (P < 0.05).

Conclusions: Our data suggest that the corneal surface provides a distinct environmental niche within the ocular surface, leading to a bacterial community compositionally different from all other sample types. Supported by the Department of Veterinary Clinical Sciences, University of Minnesota. None.
Purpose: To determine whether bacteria are cultured from indolent ulcers of dogs and evaluate their influence on clinical outcomes.

Methods: Swabs for anaerobic and aerobic culture were collected from indolent ulcers of 44 client-owned dogs presenting to the University of Saskatchewan Veterinary Medical Centre. Outcomes were compared between ulcers with bacterial isolates and those without. Medical therapy was reviewed.

Results: Bacteria were isolated in 8/44 ulcers: three cultured two isolates, and five cultured single isolates. *Staphylococcus* was the most common genus isolated and was present in six ulcers; species included unspecified [2], *pseudointermedius* [2], *schleiferi* [1], and *hominis* [1]. *Streptococcus* was the second most common isolate present in two ulcers; species included *canis* and *agalactiae*. Tobramycin was the most common antibiotic used in ulcers with bacterial isolates prior to referral (n = 3). Seven culture-positive ulcers healed without complication: six healing after one procedure and one healing after two procedures. One culture-positive ulcer was recorded as almost healed at last recheck. Thirty-six ulcers were culture negative. There was no difference in outcome between indolent ulcers with bacterial isolates and those with negative cultures (P = 0.6238). Topical non-steroidal anti-inflammatory drugs (NSAIDs) were used in 42/44 ulcers. There was significantly increased healing after one procedure in dogs treated with topical diclofenac 4 times daily (n = 10/10) versus 2 times daily (n = 14/24) (P = 0.0299).

Conclusions: Bacteria were isolated from 18% of indolent ulcers, and *Staphylococcus* was the most common isolate. Bacterial isolation did not influence outcome. Topical NSAID treatment of indolent ulcers did not prevent healing. None.

G8 | Feline Conjunctival Microbiota in a Shelter: Effects of Time, Upper Respiratory Disease, and Famciclovir Administration

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**Purpose:** To evaluate changes in the conjunctival microbiota of shelter-housed cats with time, upper respiratory disease (URD), and famciclovir administration.

**Methods:** Healthy or URD-affected cats were stratified into treatment groups on shelter entry and received no treatment, placebo, or ~30 or ~90 mg/kg famciclovir PO q12 h for 7d. Swabs were collected from ventral conjunctival fornices prior to (Day 1) and immediately after (Day 8) the treatment period. Microbiota analysis was conducted on 124 randomly selected swabs from healthy (56 swabs) or URD-affected (68 swabs) cats. Following DNA extraction and amplification of the V4 region of the 16sRNA gene, sequences were assembled into operational taxonomic units (OTUs). Over-represented OTUs (as determined by linear discriminant analysis effect size), alpha and beta diversity, and median relative abundance of feline ocular surface pathogens were assessed.

**Results:** Bacteria from 33 phyla and 70 genera were identified. Considering all cats, median relative abundance of *Mycoplasma* increased from Day 1 to Day 8, while Proteobacteria decreased. Beta diversity differed between Days 1 and 8 for all famciclovir-treated cats (regardless of health status or dose) and healthy or URD-affected cats (regardless of famciclovir dose). Differences in alpha diversity between Days 1 and 8 were not detected among any subpopulations.

**Conclusions:** Within 1 week of shelter entry, significant changes occur in beta diversity of the feline conjunctival microbiota, with a shift towards over-representation of ocular surface pathogens. Although famciclovir may impact beta diversity, absence of change in alpha diversity suggests minimal shift in the conjunctival microbiota of individual cats. Supported by Morris Animal Foundation grant D16FE-018 and the UC Davis Center for Companion Animal Health grant 2015-23F and RM Cello Endowment. None.

G9 | Effect of a Commercial Amnionic Membrane Extract on Corneal Healing After Experimental Ulceration in Adult Horses

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**Purpose:** To evaluate the effect of amniotic membrane extract (AME) on re-epithelialization of equine corneal ulcers compared to ulcers treated with conventional therapy alone.
To evaluate equine corneal healing after uncomplicated ulceration.

**Methods:** In a masked randomized controlled experimental trial, superficial (8 mm) corneal ulcers were created bilaterally in ten horses. One eye was treatment, and the opposite was control. All eyes received conventional therapy. Treatment eyes received AME, and control eyes received AME vehicle. Ulcers were stained with fluorescein and photographed every 12 hours until resolution. Ulcer surface area was determined by analyzing photographs with ImageJ then used in a regression model to calculate re-epithelialization rate. Re-epithelialization rates and hours until healing between groups were compared using multilevel repeated measures ANOVA.
Results: Regardless of therapy, healing occurred in two phases. Healing rate in an initial rapid phase was 0.88 mm²/hr (95% CI: 0.81 to 0.94 mm²/hr). Healing rate in a second slow phase was 0.07 mm²/hr (95% CI: 0.04 to 0.09 mm²/hr). Most eyes healed within 156 hours. In mixed linear models separated by healing phase, the treatment group was not significantly associated with ulcer size over time (P = 0.486 in rapid phase and P = 0.774 in slow phase). Discomfort was minimal to absent.

Conclusions: There was no difference in healing rate with addition of AME to conventional therapy for equine superficial corneal ulcers. Biphasic healing was observed, with an initial rapid phase followed by a slow phase. Further study may find beneficial effects of AME for complicated equine corneal ulcers. Supported by the Purdue University Department of Veterinary Clinical Sciences Graduate Student Competitive Research Funds. None.

G10 | Effect of Tissue Transglutaminase II Inhibitors on Corneal Epithelial Wound Healing

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Purpose: Inhibition of tissue transglutaminase 2 (TGM2) is a potential therapy against the development of corneal scarring. However, TGM2 is critical for epithelial healing in other tissues. The objective of this study was to determine the effect of TGM2 inhibition on corneal epithelial wound healing.

Methods: qPCR was used to quantify TGM2 in corneal cells. Three TGM2 inhibitors were applied to corneal epithelial cells, and cell migration assays were performed to assess in vitro migration time in the face of inhibition. The three inhibitors were then applied four times per day on rabbit corneas with experimentally created epithelial wounds, until healed. One eye received TGM2 inhibitor, and the contralateral eye received vehicle control. Rabbits received daily ophthalmic examinations, inflammation scoring, and photography following fluorescein application. Data were analyzed to compare cells and rabbit eyes that received TGM2 inhibitor versus vehicle control.

Results: The TGM2 mRNA expression was greatest in corneal epithelial cells, followed by myofibroblasts and then fibroblasts. Cell migration assays showed no significant difference in migration between cells treated with TGM2 inhibitor versus control. There was no difference in healing time or inflammation between eyes treated with TGM2 inhibitor versus control.

Conclusions: TGM2 is highly expressed in corneal epithelial cells. TGM2 inhibition showed no effect on epithelial cell migration in vitro, or on epithelial wound healing in vivo, supporting its subsequent testing against scar tissue formation during corneal wound healing. These experiments were funded by grants from the Claire Burns Audacious Grants Program, ACVO-Vision for Animals Foundation VAF2020-3-0, National Institute of Health R01 EY019970 and P30 EY12576, Center for Companion Animal Health, School of Veterinary Medicine, University of California, Davis. None.

G11 | Evaluation and Comparison of Inhibitory Effects of Topical Tacrolimus, Cyclosporine, and Dexamethasone on Corneal Neovascularization AND Wound Healing in an Experimental Rat Study

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Purpose: To compare the inhibitory effects of topical tacrolimus, cyclosporine, and dexamethasone on corneal neovascularization (CN) and epithelial wound healing.

Methods: Twenty-eight Wistar-Albino rats were divided into 4 treatment groups (n = 7). All animals received a cautery wound on the central cornea and topical treatment TID as follows for 7 days: G1—balanced salt solution (positive control); G2—tacrolimus 0.03%; G3—cyclosporine 1%; and G4—dexamethasone 0.1%. Follow-up examinations were performed on days 1, 3, 5, and 7. Corneal epithelial healing rate was evaluated using image analysis (ImageJ) by measuring the fluorescein uptake area. Corneal neovascularization was assessed clinically using slit-lamp biomicroscopy at all data points, and by image analysis on day 7. Statistical significance was set at P < 0.05.

Results: Tacrolimus and cyclosporine significantly delayed epithelial healing in comparison with positive control (P = 0.0059 and P = 0.0003) and dexamethasone (P = 0.0003 and P = 0.00001). Dexamethasone significantly decreased CN area in comparison with all groups. No difference was found between tacrolimus and cyclosporine for either epithelial healing rate (P = 0.671) or CN area (P = 0.987).
Dexamethasone started to show significant CN inhibition in comparison with positive control ($P = 0.012$) on day 3. No significant difference in CN inhibition was noted between tacrolimus and cyclosporine at any time ($P > 0.05$). By day 7, tacrolimus and cyclosporine groups had significantly more CN than the positive control ($P = 0.0116$ and $P = 0.08$).

**Conclusions:** Early use of tacrolimus and cyclosporine significantly delayed corneal epithelial wound healing but had no effective inhibition of CN. None.

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**G12 | Effect of Tissue Transglutaminase II Inhibitors on Corneal Epithelial Wound Healing**

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**Purpose:** To histologically compare the effects of topical tacrolimus, cyclosporine, and dexamethasone on corneal fibrosis and neovascularization.

**Methods:** Thirty-five Wistar-Albino rats were divided into 5 treatment groups ($n = 7$). Animals received a cautery wound on the central cornea and topical treatment TID as follows for 7 days: G1—balanced salt solution; G2—tacrolimus 0.03%; G3—cyclosporine 1%; G4—dexamethasone 0.1%; and G5—balanced salt solution without corneal wound (negative control). All treated eyes were histologically analyzed for comparative description of morphological changes.

**Results:** Descriptive analysis demonstrated variable degrees of severity within and between groups. Neovascularization was extensive in G1, G2, and G3 and was absent in G4 and G5. Epithelial thickening and partial keratinization, subepithelial clefts, and the presence of nests of epithelium within stroma were observed in G3, G2, and G1 in order of severity. Mild epithelial attenuation and subtle keratinization were observed in G4. Keratocyte necrosis and apoptosis were more frequently observed in G1, G2, and G3, whereas G4 presented brown discoloration of stroma with loss of keratinocytes. Granulation tissue was present in G2 and G3. Variable frequency and severity of ruptured Descemet’s membrane and thick retrocorneal membranes were observed in G3, G2, and G1 in order of severity.

**Conclusions:** Use of tacrolimus and cyclosporine in the early treatment of ulcerative keratitis did not inhibit corneal fibrosis or neovascularization. Further investigation of the ability of these drugs to reverse existing vascularization and promote corneal remodeling is warranted to verify benefits of their late use in treatment. None.

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**G13 | Evaluation of Tincture of Iodine for Treatment of Canine Indolent Corneal Erosions**

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**Purpose:** Alcohol delamination, or chemical cautery induced by an alcohol-based tincture of iodine, is a reported therapy employed in human medicine for treatment of recurrent corneal erosions that fail medical management. However, in the veterinary literature, few reports exist of its use. The purpose of this study was to evaluate the effectiveness of tincture of iodine for treatment of canine indolent corneal erosions.

**Methods:** Between 2013 and 2020, dogs that underwent tincture of iodine (Humco, Austin, TX) chemical cautery following diagnosis of an indolent corneal erosion by a board-certified ophthalmologist with at least one subsequent appointment were included in the study. Dogs concurrently diagnosed with adenexal disease, corneal dystrophy or degeneration, infectious ulcerative keratitis, or keratoconjunctivitis sicca were excluded from the study. The procedure involved application of a cotton-tipped applicator saturated in tincture of iodine solution to the corneal erosion, with or without corneal epithelial debridement performed immediately prior.

**Results:** Eighty-three dogs and one hundred eyes met the inclusion criteria. Fifty-three eyes (53%) undergoing tincture of iodine healed at the recommended recheck, between 7 and 35 days. Boxers (19 eyes, 11 healed), Boston terriers (15 eyes, 10 healed), and English bulldogs (11 eyes, 4 healed) were overrepresented. Eight eyes that healed with tincture of iodine had not healed by previously performed diamond burr debridement ($n = 7$) or anterior stromal puncture ($n = 1$).

**Conclusions:** While less effective than other reported therapies, tincture of iodine may be useful in patients that require sedation but are poor anesthetic candidates or for owners with financial limitations. None.

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**G14 | Effect of Topical Cyclopentolate Alone or Combine to Phenylephrine in Healthy Horses**

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**Purpose:** The purpose of our study was to evaluate the effect of repeated doses of topical 1% cyclopentolate hydrochloride
alone and in combination with topical 2.5% phenylephrine on tear production, intraocular pressure, digestive function, heart rate, and mydriasis.

**Methods:** In a prospective randomized controlled and crossover design study, the left eye of six control mares was treated with 0.2 ml of 1% cyclopentolate (Alcon Canada, Mississauga, ON, Canada) alone and then combined with 0.2 ml of 2.5% phenylephrine (Alcon Canada, Mississauga, ON, Canada). The treatment was administered TID for one day, BID for one day, then SID for two days. Daily and two days after the last topical administration, tear production, intraocular pressure, pupil diameter, heart rate, digestive auscultation, and manure production were evaluated.

**Results:** The 1% cyclopentolate significantly increased the horizontal and vertical pupil diameter of the treated eye from day 2 to day 6 ($P < 0.0001$) compared to baseline. However, topical 2.5% phenylephrine did not have any effect on mydriasis. The other ocular and digestive parameters were not affected by cyclopentolate alone or combine.

**Conclusion:** The 1% cyclopentolate is a potent mydriatic and is not associated with side effects during repeated use in control horses. Therefore, its clinical use for desired mydriasis should be considered. Benefits of combining it with phenylephrine in horses with ocular pathology remain to be determined. Supported by ‘Fonds du centenaire’ (SFMVA020). None.

**G15 | Evaluation of Subconjunctival Cyclosporine Implantation to Treat Chronic Superficial Keratitis in Dogs**

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**Purpose:** To evaluate subconjunctival cyclosporine implantation (SCI) to treat chronic superficial keratitis (CSK) in dogs.

**Methods:** Patients with CSK that underwent SCI under sedation were identified. Treatment efficacy was determined by lack of corneal granulation, improved or normal corneal transparency and normal functional vision. Need for adjunctive subconjunctival triamcinolone therapy and client satisfaction based on verbal feedback were evaluated.

**Results:** Six German shepherds and one greyhound (14 eyes) with CSK underwent SCI with an average age of 3.8 years (range 2–6 years) and average follow-up of 10 mo (range 5–28 mo). Topical therapy was not utilized in any case during the follow-up period. Initially, severe disease was present in 5/14 eyes (36%), moderate disease was present in 7/14 eyes (50%), and mild disease was present in 2/14 eyes (14%). SCI was repeated once in two dogs at 10 and 12 months and twice in one dog both 10 months apart when signs of active CSK recurred. CSK remains controlled in the remaining dogs in which SCI was performed (<9 mo since SCI). Adjunctive subconjunctival triamcinolone therapy was necessary in 5/14 eyes (36%) 6–12 months after SCI. All dogs maintain normal functional vision with no corneal granulation and improved corneal transparency after SCI. Client satisfaction was very high based on verbal feedback and clients electing to pursue implant replacement.

**Conclusion:** SCI is a viable treatment option for CSK and eliminates the need for daily topical therapy. Periodic steroid therapy may be necessary for complete disease control. Client satisfaction is very high with SCI. None.

**G16 | Disseminated Histoplasmosis With Ocular Adnexal Involvement in Seven Cats**

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**Purpose:** To describe the clinical features, diagnosis, and treatment of disseminated histoplasmosis with conjunctival and/or nictitating membrane involvement in cats.

**Methods:** Medical records from seven cats with naturally acquired disseminated histoplasmosis and conjunctival and/or nictitating membrane lesions were reviewed for signalment, clinical findings, diagnostic results, treatment, and outcome.

**Results:** Breeds included domestic shorthair (n = 5), Maine Coon (n = 1), and Siamese mix (n = 1) with four spayed females and three castrated males. Conjunctival abnormalities were identified in four cats, and nictitating membrane lesions were identified in four cats. Cytologic evaluation of lesions identified *Histoplasma capsulatum* organisms in two of four cases sampled, and histopathologic evaluation identified *H. capsulatum* in both cases in which a sample was submitted. Histoplasmosis antigen testing was positive in three of four submitted samples. Initial treatment for all cats included fluconazole (median dose: 26 mg/kg/day). Median duration of follow-up was 11 months (range: 1–108 months; n = 4). Resolution of ocular adnexal lesions was achieved in three cats. Two cats had relapse of disease, one of which was subsequently euthanized. One cat with concurrent feline immunodeficiency virus (FIV) infection died one month after diagnosis of histoplasmosis.

**Conclusions:** Histoplasmosis should be a differential diagnosis for ocular adnexal inflammatory lesions in cats. None.
**G17 | Treatment of Equine Ocular and Periocular Squamous Cell carcinoma with Infracyanine Green Photodynamic Therapy**

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**Purpose:** To evaluate outcomes of horses treated with surgical excision and photodynamic therapy (PDT) with infracyanine green 1% (InfraCG [EmunDo®, A.R.C. Laser GmbH, Nürnberg, Germany]) or compounded indocyanine green 2% (ICG) for ocular and eyelid squamous cell carcinoma (SCC), respectively.

**Methods:** Retrospective analysis of 23 horses with confirmed (histopathology) eyelid and 24 cases with ocular (corneconjunctival) SCC. All of the surgeries were performed under standing sedation local anesthesia with retrobulbar, auriculo- palpebral, supraorbital, and +/- eyelid line blocks.

**Results:** Eyelid SCC: 10/23 had margins free of neoplastic cells, while 13/23 had surgical margins demonstrating neoplastic cells. Mean age was 15.3 ± 4.6 years (range 6–24). One horse with eyelid SCC (neoplastic cells at the margins and a history of third eyelid SCC 4 years prior) had recurrence 215 days after PDT and underwent exenteration. American Paint Horses were overrepresented (16/23) in the eyelid SCC group. Follow-up duration ranged from 2 to 487 days (mean of 124 ± 159.3 days). Three cases were affected bilaterally. Recurrence rate: 4.3% (1/23).

Limbal SCC: 18/24 had tumor-free margins, while 6/24 had neoplastic cells at the surgical margins. Mean age on presentation was 15.3 ± 4.6 years (range 6–24). Ocular SCC recurred at 30 days postoperatively in one horse with neoplastic cells at the margins, resulting in exenteration. American Paint Horses were overrepresented (16/23) in the eyelid SCC group. Follow-up duration ranged from 2 to 487 days (mean of 124 ± 159.3 days). Three cases were affected bilaterally. Recurrence rate: 4.3% (1/23).

**Conclusions:** Photodynamic therapy with InfraCG and ICG as the photosensitive agent is an effective treatment option for ocular and eyelid squamous cell carcinoma, respectively.

**Support:** Birmingham Racing Commission Research Agreement 12/11/2018 under AU Fund 250441 and Auburn University, Department of Clinical Sciences. None.

**G18 | Comparison of the Image Quality From Ocular Coherence Tomography Examination of the Equine Cornea and Retina Using Sedation and General Anesthesia Protocols with Or Without the Use of Local Retrobullbar Anesthesia**

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**Purpose:** To compare equine corneal and retinal spectral domain optical coherence tomography (SD-OCT) image quality and time to image acquisition under three different scenarios.

**Methods:** One randomly selected eye from six horses free of ocular disease was evaluated via SD-OCT: 1). standing sedation without retrobulbar block (RB); 2). standing sedation with RB; and 3). general anesthesia with RB. Five (axial, 12, 3, 6, and 9 o’clock) regions of interest (ROI) were evaluated in the cornea and fundus (optic nerve head (ONH)). Three diagnostic scans of predetermined quality were obtained per anatomical region. Image acquisition times and total scans per site were recorded. Corneal and retinal SD-OCT image quality was graded on a 0–4 scale (0: non-diagnostic to 4: excellent).

**Results:** Results are listed in the following order: standing sedation without RB, standing sedation with RB, and GA. Mean total cornea scan attempts: 24, 23, and 17. Mean total retinal scan attempts: 23, 19, and 19. Mean total cornea scan times: 880, 790, and 550 seconds. Mean total retina scan times: 1150, 550, and 780 seconds. Mean cornea grades: 2.0, 2.3, and 2.5. Mean retina grades: 2.7, 2.9, and 2.5.

**Conclusions:** Neither total scan time nor number of corneal scan attempts differed significantly between sedation groups. The retrobulbar block facilitated globe akinesia and improved the percentage of “scans in frame” and ROI accuracy for retinal imaging. Retinal OCT grades were significantly lower in the GA group compared with the RB group.

**Support:** Birmingham Racing Commission Research Agreement 12/11/2018 under AU Fund 250441 and Auburn University, Department of Clinical Sciences. None.

**G19 | Leptospira SPP. Testing Results and Ocular Examination may Offer Prognostic Indicators in Horses Diagnosed with Equine Recurrent Uveitis: A Retrospective Study of 63 Horses**

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**Purpose:** To evaluate the role of leptospiral testing in horses with equine recurrent uveitis (ERU) by correlating results to signalment, clinical findings, and visual outcome.

**Methods:** Records of horses diagnosed with ERU at NC State University between 2014 and 2019 were reviewed. Signalment, initial visual status, ocular exam findings, treatments, and visual outcome were collected. Serum and aqueous humor (AH) leptospiral titers were assessed for 6 different leptospirosis serovars and PCR testing. C-values were calculated. Data were analyzed using JMP statistical software (SAS Inc, Cary, NC).
Results: Records of 63 horses and 78 eyes with ERU were evaluated. Quarter Horses (QH) were the most affected breed with ERU (17/27.0%), followed by Thoroughbreds (8/12.7%), and Appaloosas (7/11.1%). QHs were more likely to be associated with a positive C-value ($P = 0.01$) compared to other breeds. Horses with a positive AH PCR were significantly younger in age (mean 9.25 +/− 1.14) than PCR negative horses (mean 13.3 +/− 0.95) ($P = 0.01$). A positive AH titer of any serotype was significantly correlated with blindness at presentation ($P = 0.04$). A positive serum titer was significantly correlated with presence of ocular posterior segment disease ($P = 0.01$). Positivity to *Bratislava* serovar correlated with posterior segment disease ($P = 0.04$) and blindness at presentation ($P = 0.002$).

Conclusions: Positive leptospiral testing results were associated with QHs, younger horses, and ocular posterior segment clinical disease. Horses with AH titers to any leptospiral serotype, especially *Bratislava* serovar, were correlated with poor prognosis for vision. None.

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**Purpose:** To describe a combined treatment approach to heterochromic iridocyclitis and secondary keratitis (HIK) in adult horses.

**Methods:** Fourteen eyes from 13 horses of various breeds (8 warmbloods, 2 Quarter horses, 1 PRE, 1 Standardbred, and 1 Thoroughbred), age (range 6–26 years; 14.769 ± 5.92 years), and gender (6 mares, 6 geldings, 1 stallion) underwent low-dose (4 mg) intravitreal gentamicin injection (IVGI) and modified Gundersen flaps under standing sedation and local anesthesia. Loupes (2.3x or 6.0x) were used for magnification. For the Gundersen flaps, the corneoconjunctival dissection was combined to improve tissue manipulation and conjunctival integrity. A tapering elliptical corneoconjunctival incision (approximately five clock hours wide) reached a maximum width of 5–8 mm at the 12 o’clock (dorsal) or 6 o’clock (ventral) positions, respectively. Lamellar separation of the superficial stroma using a nr. 64 microsurgical blade was followed by transection of the limbus and blunt dissection of the adjacent proximal conjunctiva using Westcott’s tenotomy scissors. These grafts were sutured in place using a Ford interlocking continuous suture pattern.

**Results:** Postoperative treatment consisted of topical and systemic NSAIDs and topical antibiotics. Complications included chronic corneal ulceration (2/13, 15.4%), recurrent corneal edema (5/13, 38.5%), increased photophobia (2/13, 15.4%), chemosis (4/13, 30.8%), conjunctival hemorrhage (4/13, 30.8%), epithelial bullae formation (1/13, 7.7%), and uncontrolled progression of disease leading to enucleation (1/13, 7.7%).

**Conclusions:** This combined treatment protocol addresses both the underlying uveitis and endothelial decompensation in horses with HIK. Enucleation was required less frequently than with medical management alone. Further long-term follow-up is necessary. None.

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### G21 | Clinical Outcomes of Empirical Selection of Chloramphenicol and Ofloxacin in the Treatment of Keratomalacia

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**Purpose:** To provide in vivo clinical data on outcomes with the empirical selection of chloramphenicol (Chlorsig 5 mg/mL Allergan Australia 4/810 Pacific Hwy, Gordon NSW 2072) and ofloxacin (OcuFlox 3 mg/mL Allergan Australia 4/810 Pacific Hwy, Gordon NSW 2072) in the treatment of keratomalacia. Additionally, the data examine predisposing factors found in this data series.

**Methods:** Medical records were examined retrospectively between January 2016 and March 2019 for cases with a diagnosis of “keratomalacia” or “melting cornea.” Data on animal breeds, pre-existing topical medications, and systemic disease were extracted from the records. Records of animals that received chloramphenicol and ofloxacin were examined in detail.

**Results:** There were 66 dog eyes and 16 cat eyes that were treated with chloramphenicol and ofloxacin. Infections were controlled in 91% (75/82) of cases and malacia controlled and resolved in 63% (52/82) of cases. There were 20/75 (27%) of cases requiring further surgery despite control of infection and malacia. Predisposing factors to the development of keratomalacia included use of topical steroidal and nonsteroidal...
anti-inflammatories, suffering from keratoconjunctivitis sicca (KCS) and brachycephalic breeds. In cats, there appears to be an increased risk for the Burmese cats.

Conclusions: A treatment protocol using chloramphenicol and ofloxacin represents a good empirical selection of antimicrobials for treating keratolamalacia.

G22 | Antimicrobial Susceptibility and Resistance Patterns of Microbial Flora Residing on the Ocular Surface of Horses with Ulcerative Keratitis in the Hunter Valley, Australia

**Purpose:** To describe antimicrobial susceptibility and resistance patterns of microbial flora residing on the ocular surface of horses with ulcerative keratitis in the Hunter Valley, Australia.

**Methods:** Medical records of horses diagnosed with ulcerative keratitis from 2014 to 2020 were reviewed. Information collected included age, sex, breed, prior treatment, corneal cytology, culture, and antimicrobial susceptibility.

**Results:** Medical records of 122 horses were evaluated (123 eyes). Seventy-three samples yielded bacterial growth (60%), and four samples yielded fungal growth (3%). Seventy-two horses (59%) received topical antibiotic therapy prior to microbial swab culture, and of these horses, forty-one (56.9%) yielded bacterial growth. Gram-positive (83.5%) organisms were more common than Gram negative (16.5%). The most commonly isolated organisms were Streptococcus spp. (49/85, [57.6%]), Bacillus spp. (10/85, [11.8%]), and Staphylococcus spp. (9/85, [10.6%]). Antimicrobial resistance was found to neomycin (39/65, [60%]), gentamicin (31/54, [57%]), tobramycin (31/58, [53%]), tetracycline (18/59, [30.5%]), chloramphenicol (14/65, [21.5%]), and ofloxacin (4/57, [7%]).

**Conclusions:** Gram-positive bacteria were the dominant microorganisms on the corneal surface of horses with ulcerative keratitis. The majority of horses with ulcerative keratitis were resistant to one or more topical antimicrobials, most commonly aminoglycosides, tetracyclines, and chloramphenicol. Knowledge of the microbial flora and their antimicrobial susceptibility for each geographical region is important for guiding empirical therapy and increasing the chance of a positive case outcome in horses with ulcerative keratitis. None.

G23 | Effect of Topical NSAIDS on Healing Time and Complications in Dogs with Spontaneous Chronic Corneal Epithelial Defects

**Purpose:** To compare healing times and complication rates in dogs with spontaneous chronic corneal epithelial defects (SCCEDs) treated with and without topical non-steroidal anti-inflammatory drugs (NSAID).

**Methods:** A total of 66 dogs (71 eyes) diagnosed with SCCEDs between 2008 and 2019 were included. Eyes were divided: those receiving topical NSAID (n = 33) versus those not receiving topical NSAID (n = 38). Initial presentation to UGA ophthalmology service was time zero. Follow-up until healed (comfortable, fluorescein-negative) was required. Dogs receiving other topical or systemic immune-modulating medication, or with other underlying ocular or endocrine disease were excluded.

**Results:** Healing times were significantly shorter in eyes that did not receive topical NSAID (P = 0.02); however, the use of more medications for treatment was also associated with longer healing times (P = 0.001). The vast majority of eyes in the NSAID group was treated with multiple medications, compared to the non-NSAID group that was largely treated with only one, so it was not possible to separate effects of NSAID from number of medications. Complications occurred in 4 eyes of 4 different dogs (1 follicular conjunctivitis, 1 keratitis, 2 infection), all of which were in the NSAID group. Due to the small number of complications, statistical analysis could not be performed.

**Conclusion:** In this sample of canine SCCED eyes, those that received topical NSAID had a significant delay in healing time compared to those that did not receive topical NSAID. However, because it was not possible to adjust for effect of number of topical medications on healing time, this could also be responsible for the difference between groups. None.

G24 | In Vivo Evaluation of the Cornea and Anterior Segment of the Normal Adult Horse Using Ultrasound Biomicroscopy

**Purpose:** To evaluate the cornea and anterior segment of the normal adult horse using ultrasound biomicroscopy.

**Methods:** A total of 66 dogs (71 eyes) diagnosed with SCCEDs between 2008 and 2019 were included. Eyes were divided: those receiving topical NSAID (n = 33) versus those not receiving topical NSAID (n = 38). Initial presentation to UGA ophthalmology service was time zero. Follow-up until healed (comfortable, fluorescein-negative) was required. Dogs receiving other topical or systemic immune-modulating medication, or with other underlying ocular or endocrine disease were excluded.

**Results:** Healing times were significantly shorter in eyes that did not receive topical NSAID (P = 0.02); however, the use of more medications for treatment was also associated with longer healing times (P = 0.001). The vast majority of eyes in the NSAID group was treated with multiple medications, compared to the non-NSAID group that was largely treated with only one, so it was not possible to separate effects of NSAID from number of medications. Complications occurred in 4 eyes of 4 different dogs (1 follicular conjunctivitis, 1 keratitis, 2 infection), all of which were in the NSAID group. Due to the small number of complications, statistical analysis could not be performed.

**Conclusion:** In this sample of canine SCCED eyes, those that received topical NSAID had a significant delay in healing time compared to those that did not receive topical NSAID. However, because it was not possible to adjust for effect of number of topical medications on healing time, this could also be responsible for the difference between groups. None.
Purpose: To determine corneal thickness (CT), axial anterior chamber depth (ACD), and landmarks of the iridocorneal angle (ICA) using in vivo ultrasound biomicroscopy (UBM) in normal adult horses.

Methods: Data from 60 eyes of 15 mares and 15 geldings aged 8–24 years were collected at two time points. Ultrasonic pachymetry was utilized to obtain triplicate CT measurements of the central, superior, temporal, inferior, and nasal cornea. Triplicate images of the same corneal locations were acquired using a 50 MHz probe with central corneal images used to measure ACD and peripheral corneal images used to assess the ICA.

Results: Mean ± SD ACD was 5.74 ± 0.41 mm with no statistical differences between geldings and mares identified for any location. ICA measurements except inferior. No statistical difference in CT between eyes. A statistical difference between time points for UBM CT values was detected for a single measurement (central, left eye, \( P = 0.029 \)). CT measured via UBM was significantly thicker \( (P = 0.006–0.048) \) than via pachymetry at all locations except inferior. No statistical difference in CT between geldings and mares was identified for any location. Mean ± SD ACD was 5.74 ± 0.41 mm with no statistical differences between eyes or time points. ICA measurements were highly variable.

Conclusions: CT and ACD of normal adult horses were reproducibly measured via UBM. CT determined via UBM was significantly thicker relative to pachymetry for all but the inferior corneal location. Supported by VAF2019-2 and RM Cello Endowment. None.


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Cummings School of Veterinary Medicine

Purpose: To evaluate bacterial culture and sensitivity findings in dogs with retrobulbar abscesses, particularly those without prior antibiotic exposure.

Methods: Medical records were searched to identify dogs with confirmed retrobulbar abscess and available bacterial culture and sensitivity results.

Results: One hundred thirty-three dogs were identified, 64 of which had received no antibiotics or only a single dose prior to culture. Aerobic culture only was performed in 37 dogs; both aerobic and anaerobic cultures were performed in 96 dogs. Aerobic culture yielded growth in 81/133 dogs (131 isolates from 32 species) while anaerobic culture yielded growth in 32/96 dogs (45 isolates from 5 species). Fifty-five percent of cultures yielded multiple isolates. Most common aerobic were Pasteurella multocida (26), Streptococcus spp. (20), nonspeciated Gram-negative rods (11), and Actinomyces spp. (10). Most common anaerobes were Bacteroides spp. (22), Fusobacterium spp. (10), and Peptostreptococcus spp. (9). Of antibiotics tested against > 10% of isolates, resistance was most common against azithromycin (35% of isolates tested), penicillin (31%), erythromycin (31%), and amoxicillin (30%).
Resistance was least common for amikacin (4%), chloramphenicol (4%), imipenem (5%), ceftazidime (5%), and enrofloxacin (8%). Resistance patterns did not differ appreciably with respect to prior antibiotic exposure with the exception of ciprofloxacin and enrofloxacin, where resistance was approximately twice as likely with prior antibiotic exposure.

**Conclusions:** Anaerobic and multipathogen infections are common in dogs with retrobulbar abscess. Amoxicillin-clavulanic acid monotherapy or clindamycin in combination with enrofloxacin is rational first-line therapies and would be expected to successfully treat 74–85% of patients. None.

**G27 | Utility of Optical Coherence Tomography in Determining the Efficacy of Diamond Burr Debridement of Indolent Ulcers and Morphological Features Associated with Healing**

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**Purpose:** To determine the utility of optical coherence tomography (OCT) in determining the efficacy of diamond burr debridement for indolent ulcers, and if any morphological features correlate with healing.

**Methods:** Tomograms from five dogs that had undergone diamond burr debridement for an indolent ulcer and healed were compared to tomograms from five dogs that had undergone diamond burr debridement and not healed. Images were evaluated, and morphology described. Measurements of epithelial thickness, corneal edema depth, Descemet’s membrane thickness, corneal stromal thickness, and total corneal thickness were completed. Images of the stromal surface without epithelium present were randomized and reviewed by a blinded Diplomate of the American College of Veterinary Ophthalmology (DACVO) instructed to determine whether the image was pre- or post-debridement.

**Results:** Pre-debridement epithelial thickness adjacent to the ulcer was significantly greater in dogs with ulcers that healed (mean: 89.2 μm) compared to those that did not heal (mean: 54.6 μm) (\(P = 0.0207\)). Corneal edema depth, Descemet’s membrane thickness, corneal stromal thickness, and total corneal thickness were not significantly different between groups. A blinded DACVO was not able to determine which tomograms of the stromal surface were competed pre- or post-debridement.

**Conclusion:** Increased epithelial thickness adjacent to the ulcerated region was associated with healing after first debridement. OCT was not useful in determining changes in the anterior stroma associated with debridement. Supported by WCVM Intern Research Fund. None.

**G28 | Ocular Findings, Selected Diagnostic Tests, and Calculation of Intraocular Lens Power in 33 Captive Chimpanzees (Pan Troglodytes)**

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**Purpose:** To perform a descriptive investigation of the chimpanzee (*Pan troglodytes*) eye, conduct selected ophthalmic diagnostic tests, and determine the intraocular lens (IOL) power for this species.

**Methods:** A total of 33 anaesthetized captive chimpanzees underwent ophthalmic examination as part of routine health examinations. Selected diagnostic tests performed: intraocular pressure (IOP) by rebound tonometry (TonoVet®), central corneal thickness (CCT) by ultrasonic pachymetry, keratometry using a handheld keratometer, and A- and B-mode ultrasonography. IOL power was calculated using Retzlaff and Binkhorst theoretical formulas.

**Results:** Most common ophthalmic findings (eyes): iridal melanosis (11), dyscoria (3), and mature cataracts (2). IOP: 22.59 ± 5.34 mmHg (“d” setting), 14.34 ± 4.03 mmHg (“P” setting) with males having lower IOP than females. CCT: 0.45 ± 0.04 mm. Ocular biometry: axial globe length: 21.41 ± 0.76 mm, anterior chamber depth (ACD): 3.63 ± 0.47 mm, crystalline lens thickness (LT): 3.81 ± 0.68 mm, posterior segment depth: 13.98 ± 1.00 mm. Calculated IOL powers for various estimated postoperative ACD (PACD) (Retzlaff and Binkhorst formulas, respectively): PACD: 21.86 ± 5.73 D and 22.81 ± 5.79 D; PACD + 2 mm: 27.67 ± 7.36 D and 28.83 ± 7.43 D; PACD -2 mm: 17.71 ± 4.59 D and 18.51 ± 4.65 D.

**Conclusions:** Normal parameters described in this study will aid in the identification of ocular pathology in chimpanzees. Determination of the IOL power will facilitate correct IOL selection for the phacoemulsification candidate, although further studies evaluating pseudophakic refraction and determination of actual PACD are required. None.
G29 | Ophthalmic and Diagnostic Description in Sugar Gliders (Petaurus breviceps), and Prevalence of Ocular Presentations to a Veterinary Teaching Institution

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Purpose: To provide reference values for ocular examination and diagnostics in ophthalmologically normal sugar gliders (Petaurus breviceps). To determine the prevalence of ocular diseases in sugar gliders presenting to a single institution.

Methods: A descriptive study of sugar gliders presented from August 2019 to January 2020. A complete ophthalmic examination, conjunctival microbiology and cytology, was performed on ten, owned, anesthetized sugar gliders. A retrospective study reviewed medical records of sugar gliders presented to Colorado State University from 2008 to 2018 for ocular disease. A total of 106 sugar gliders were enrolled in this retrospective study. Mean ± standard deviation and statistical analysis (performed using Mann-Whitney U test and Fisher’s exact test) were reported. A P-value ≤ 0.05 was considered significant.

Results: Schirmer tear test II (2.2 ± 6.7 mm/minute), phenol red thread test (0 ± 0 mm/15 seconds), and intraocular pressure (IOP) (12 ± 2.6 mmHg) using rebound tonometry were measured in ten sugar gliders. Fluorescein and rose bengal staining showed corneal abrasions secondary to tear testing. The three most common bacteria cultured were Staphylococcus spp. (3/20:15%), Coryneform spp. (3/20:15%), and Gram-positive cocci (3/20:15%). Retrospective analysis revealed ocular diseases as the third most common reason for presentation (13/106:12.3%). The majority of ocular presentations were secondary to dental disease, but abscessation, ulceration, neuro-ophthalmic disease, and ophthalmia neonatorum were also noted.

Conclusions: The descriptive study gives useful reference values for IOP, conjunctival microbiology, and cytology for sugar gliders. The retrospective study revealed that ocular disease was the third most common reason for presentation. None.

G30 | Punctate Fluorescein and Meibomian Gland Scoring in Dogs With Non-ocular Surface Disease

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Purpose: Ocular surface punctate fluorescein staining (PFS) and noncontact meibography are used to diagnose and manage dry eye disease in humans. We evaluated these tests in dogs with non-ocular surface disease (NOSD).

Methods: Dogs with a normal quantity of tears [Schirmer tear test (STT) ≥ 15 mm/min] were retrospectively reviewed. Dogs that had glaucoma or undergone ophthalmic surgery were excluded. STT and strip meniscometry tube test (SMT), PFS-cornea (PFS-C), and upper palpebral conjunctiva (PFS-UPC) were performed. Noncontact infrared meibography (NIM) and meibum expression scores (ME) were calculated. PFS-C was assessed by the total area (< 50%;1 and ≥ 50%;2) and density (mild; 1, moderate; 2, severe; 3). PFS-UPC was evaluated by density. NIM and ME were graded as 0; none; 1: < 1/3; 2: 1/3–2/3; 3: > 2/3 and 0: clear liquid; 1: mucus; 2: thick; 3: toothpaste-like; 4: unable to express, respectively.

Results: Thirty-seven dogs, with a mean age ± SD of 8.1 ± 3.4 years, were included. Mean ± SD STT, SMT, PFS-C, PFC-UPC, NIM, and ME were 20.4 ± 3.4 mm/min, 8.8 ± 2.8 mm/5 sec, 4.0 ± 0.7, 1.9 ± 0.5, 1.3 ± 0.6, and 2.2 ± 1.0, respectively.

Conclusion: The ocular surface of dogs might be damaged in NOSD. None.

G31 | Clinical and Pathologic Evaluation of Chorioretinitis in Wild Owl Species

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Purpose: To correlate histopathology and spectral domain optical coherence tomography (OCT) imaging of wild owls with chorioretinitis and identify a possible correlation with an infectious etiology.

Methods: A complete ophthalmic examination, retinal OCT imaging, complete blood count, biochemistry, West Nile virus (WNV) plaque reduction neutralization test, and Toxoplasma gondii modified direct agglutination test were performed on
fifteen great horned (Strix varia) and barred (Bubo virginianus) owls (30 eyes) with chorioretinitis and five normal owls (10 eyes). A necropsy performed on all owls included ocular histopathology, WNV RT-PCR, and Avian Influenza RT-PCR. **Results:** Fundus lesions included retinal detachment (7/15 birds), depigmented lesions (12/15), pigment clumping (8/15), and retinal tear (4/15). All birds were negative on PCR for WNV and Avian Influenza. Of the affected owls, 3/15 were seropositive for WNV and 7/15 for T. gondii. OCT images of 25/30 affected eyes revealed outer retinal hyper-reflective lesions (19/25 eyes), retinal detachment (16/25), and retinal tears (3/25). Histopathological examination revealed outer nuclear layer atrophy (19/30 eyes), retinal detachment (18/30 eyes), retinal tears (7/30 eyes), suprachoroidal hemorrhage (12/30 eyes), scleral rupture (2/30 eyes), and scleral ossicle fracture (3/30 eyes). Inflammatory cells were not noted in the choroid or retina of any eyes. **Conclusions:** Although 53% of birds were serologically positive for WNV and/or T. gondii, histopathologic findings support posterior segment lesions in wild owls were likely due to blunt force trauma. It is recommended that owls with suspected trauma receive a full ophthalmic examination. OCT correlated well with histopathologic findings to confirm blunt ocular trauma. Supported by Auburn University DCS intramural grant. None.

**G32 | Poor Accuracy, Precision, and Consistency of Compounded Famiclovir Formulated for Management of Feline Herpesvirus-1 in Cats**

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**Purpose:** To evaluate compounded famciclovir suspensions for accuracy, precision, and consistency in drug content, comparing results with FDA-approved famciclovir tablets.

**Methods:** Two compounded famciclovir concentrations were evaluated (250 mg/ml and 400 mg/ml) for a total of 30 preparations obtained from 9 compounding pharmacies (multiple companies/locations). FDA-approved famciclovir tablets (Apotex Corp, Toronto, Canada) served as control. Drug quantification via high-performance liquid chromatography was performed at 0, 14, and 28 days, with levels of 90–110% of labeled dose considered acceptable. Student’s t tests and one-way ANOVA tests were used to compare the main outcomes, with significance set to $P < 0.05$.

**Results:** FDA-approved tablets were accurate and precise with acceptable drug content, a finding confirmed in 3 different manufacturers. In contrast, no compounding pharmacy’s preparation had acceptable drug content at all time points tested, and when assessing time points separately, only 15/63 (24%) samples of 250 mg/ml and 0/27 (0%) samples of 400 mg/ml suspensions met the acceptance standards (poor accuracy). A significantly greater ($P < 0.001$) mean deviation from labeled content was noted for 400 mg/ml suspensions (-53%) compared to 250 mg/ml suspensions (-18%). Coefficients of variation in drug content among pharmacy samples tested, and when assessing time points separately, only 15/63 (24%) samples of 250 mg/ml and 0/27 (0%) samples of 400 mg/ml suspensions met the acceptance standards (poor accuracy). A significantly greater ($P < 0.001$) mean deviation from labeled content was noted for 400 mg/ml suspensions (-53%) compared to 250 mg/ml suspensions (-18%). Coefficients of variation in drug content among pharmacy batches ranged from 0.5 to 29%, with 5/10 formulations having significantly lower CV% ($P < 0.044$) compared to control (poor precision). Drug content changed over time (0–28 days) in all compounded formulations (poor consistency), with both downward and upward trends observed.

**Conclusions:** Most compounded famciclovir formulations were inaccurate, imprecise, and inconsistent, thereby resulting in subtherapeutic and ineffective treatment if used in clinical patients. FDA-approved famciclovir tablets are preferred over compounded famciclovir formulations for the management of feline herpesvirus-1. Supported by grants from Winn Feline Foundation (W19–030) and the ACVO Vision for Animals Foundation (VAF2019–4). None.

**G33 | Histopathologic Findings in Two Common Octopuses (OCTOPUS VULGARIS) and One Giant Pacific Octopus (Enteroctopus Dofleini) Diagnosed with Inflammatory Phakitis and Retinitis**

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**Purpose:** To study eyes of two common octopuses (Octopus vulgaris) and one giant Pacific octopus (Enteroctopus dofleini) with a history of ophthalmic disease.

**Methods:** Two blind common octopuses were euthanized. One giant Pacific octopus died a month after developing lens opacity. Six eyes were harvested, and together with one normal control eye from each species were stained with
hematoxylin and eosin, and GMS, gram, and Fite’s acid fast stains.

**Results:** Octopuses have transparent eyelids and a pseudo-cornea with a dorsal opening that connects the anterior chamber with ambient water. The ciliary papilla (CP) suspends the lens and produces its fibers. The lens lacks a capsule and is divided into anterior and posterior parts, separated by a septum. A muscular ring joins scleral cartilage to the CP, allowing for accommodation by lens movement rather than change in diameter. The retina is inverted, with photoreceptor cells facing the vitreous. Small optic nerve subunits extend through the cartilaginous sclera to the optic lobe. Histopathology revealed hemocyte-rich inflammation and protein changes (analogous to mammalian Morgagnian globules) in the lens and CPs of the six study eyes (phakitis). Hemocyte-rich inflammation and degeneration was also seen in the retinas (retinitis). Clusters of coccidian parasites (*Aggregata sp.*) were seen in extraocular tissues and blood vessels of one common octopus eye.

**Conclusions:** We report on inflammatory phakitis and retinitis in two species of octopuses. The underlying cause for this severe intraocular response may be intraocular infection, poor water quality, or an ocular manifestation of a systemic disease. None.

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**G34 | Effects of Long-Term Oral Administration of Melatonin on Tear Production and Tear Film Melatonin Concentration in Dogs**

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**Purpose:** To evaluate effects of long-term oral administration of melatonin on tear production, intraocular pressure, and concentration of melatonin in tear film in dogs.

**Methods:** Twenty healthy adult intact male dogs were subjected in this study. Tear production was measured via Schirmer tear test (STT) strips, and intraocular pressure (IOP) was measured via a TonoVet\(^\text{®}\) device. Melatonin was orally administered to dogs, 3 mg/10 kg every day for duration of a month. Placebo was used for the control group. STT and IOP levels were measured at the baseline (T0) and 30 minutes after oral administration of melatonin once a week (T1–T4). Melatonin concentrations were measured using ELISA both in tear and in blood serum at each time point.

**Results:** In the melatonin group at T0, T1, T2, T3, and T4, mean±SD of STT and IOP were 20.75 ± 4.76 mm/min, 23.50 ± 1.97 mm/min, 20.75 ± 2.54 mm/min, 22.25 ± 2.59 mm/min, and 23.50 ± 2.27 mm/min; and 16.00 ± 2.09 mmHg, 16.00 ± 3.22 mmHg, 16.50 ± 3.46 mmHg, 15.50 ± 1.39 mmHg, and 17.25 ± 2.87 mmHg, respectively. There were significant effects of duration of treatment on STT (*P* = 0.001), IOP (*P* = 0.0004), and tear melatonin concentration (*P* < 0.0001). Also, a significant effect of the drug on tear melatonin concentration (*P* = 0.03) was observed. No statistical differences were observed on serum melatonin concentration in any time points. Systemic or ocular adverse effects were not observed in this study.

**Conclusions:** Results of this study revealed that daily oral administration of melatonin for the duration of a month significantly increased tear production, IOP, and concentration of melatonin in tear film in dogs. None.

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**G35 | Using Optical Coherence Tomography to Determine Anterior Segment Morphology and Morphometry in Selected Australian Reptile Species**

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**Purpose:** To generate images of the morphology and morphometry of the anterior segment in Australian reptile species.

**Methods:** A total of 29 Saurian eyes, 13 Ophidian eyes, and 9 Chelonian eyes were examined by a single investigator [BDR], with 13 species in total represented. Weight was recorded for all animals, and age when known and nose-cloaca distance when feasible to measure were recorded. The anterior segment was grossly photographed, and examined by optical coherence tomography without sedation or general anesthesia. Gross descriptions of the anterior segment were generated, and the central corneal thickness (CCT), peripheral corneal thickness (PCT), and anterior chamber depth (ACD) were measured.

**Results:** Pupil shape was a vertical slit in all crepuscular and nocturnal animals. Diurnal animals had rounded pupils. Each group had a unique anterior segment: Saurians had a thin cornea and flat ACD, Ophidians had a thick cornea and a narrow ACD, and Chelonians displayed an intermediate corneal thickness and ACD. The spectacle was difficult to identify in all groups except Ophidians. Average measurements for select species include: *Pogona vitticeps* (*n* = 8) CCT = 45.1um, PCT = 69.0um, ACD = 982.0um, *Morelia spilota* (*n* = 4) CCT = 352.5um, PCT = 279.3um, ACD = 802.8um, *Chelodina longicollis* (*n* = 7) CCT = 127.5um, PCT = 143.3um, ACD = 707.8um.

**Conclusions:** Ocular coherence tomography is a useful aid to examine the reptilian anterior segment. Despite similar gross...
antior segment architecture, there are inherent morphologic and morphometric differences between these groups. None.

G36 | The Effects of Topical Diclofenac, Ketorolac, and Flurbiprofen on Corneal Sensitivity in Normal Cats

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**Purpose:** To investigate the immediate and prolonged dosing effects of three topical nonsteroidal anti-inflammatory drugs on corneal sensitivity in cats.

**Methods:** Twelve normal, nonbrachycephalic domestic shorthair cats were enrolled in this prospective, randomized, masked, crossover study. To determine immediate dosing effects, one drop of the treatment (0.1% diclofenac sodium, 0.5% ketorolac tromethamine, or 0.03% flurbiprofen sodium) or control (0.9% saline) solution was applied to both eyes every five minutes for five applications, and corneal sensitivity was measured using a Cochet-Bonnet esthesiometer every 15 minutes for one hour. To determine prolonged dosing effects, one drop of the treatment or control solution was applied to both eyes every 12 hours for five days, and corneal sensitivity was measured for each eye at the end of the last treatment. A 2-day washout period occurred between each group for both treatment phases. ANOVA with a Tukey's multiple comparisons post hoc was used to compare corneal sensitivity over time in each eye within each treatment group, and to compare corneal sensitivity between baseline and each day of the washout period.

**Results:** There was no significant difference in corneal sensitivity when compared to baseline measurements following immediate or prolonged twice-daily dosing for any treatment group.

**Conclusions:** Topical nonsteroidal anti-inflammatory drugs had no effect on corneal sensitivity immediately following application or after repeated dosing in normal, nonbrachycephalic cats. Funded by the Department of Clinical Sciences, College of Veterinary Medicine, Kansas State University. None.

G37 | Concentration of Topically Applied 0.5% Oxytetracycline Ointment in Tears Over Time in Normal Dogs

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**Purpose:** To determine the tear film levels of oxytetracycline in normal canine eyes after application of the ophthalmic ointment, Terramycin™ (0.5% oxytetracycline, polymyxin B sulfate), to guide appropriate treatment frequency.

**Methods:** Ten research beagles with confirmed normal eyes were administered 0.02 mL of Terramycin™ ophthalmic ointment onto the dorsal bulbar conjunctival surface of the right eye. Tear samples were collected via dye-less Schirmer tear strips at 2, 4, 6, 8, and 12 hours post-administration. The sample for each time point was collected on a separate day, and concentrations of oxytetracycline were determined using high-performance liquid chromatography (HPLC).

**Results:** There was a semi-logarithmic decline in the median tear concentration of oxytetracycline. The median (2.5th and 97.5th percentiles) tear concentrations of oxytetracycline at 2, 4, 6, 8, and 12 hours were 43.5 μg/mL (11.1–302.2 μg/mL), 28.7 μg/mL (8.04–113.7 μg/mL), 16.1 μg/mL (4.96–37.7 μg/mL), 9.2 μg/mL (4.52–28.1 μg/mL), and 6.11μg/mL (4.36–26.7 μg/mL), respectively. Mean (±SD) drug recovery via HPLC was 88% (±7.5%).

**Conclusions:** Ophthalmic Terramycin™ achieves a substantially higher tear level than the MIC for common bacterial corneal pathogens up to 12 hours post-administration in normal eyes. Anti-collagenolytic tear levels were not achieved at the time points evaluated or with the manufacturer-prescribed dosing frequency. HPLC can be used to analyze tear concentrations of ophthalmic ointment formulations. Supported by the ACVO Vision for Animals Foundation Resident Grant Program (VAF 2019-5). None.

G38 | Retinal Topography and Visual Streak Localization Through SD-OCT Imaging in the Minipig

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**Purpose:** To compare manual and semi-automated layer thickness measurements, to establish retinal layer thickness maps, and to attempt identification of the visual streak on spectral-domain optical coherence tomography (SD-OCT) scans of the minipig retina.

**Methods:** Grid-volume SD-OCT scans (Spectralis HRA+OCT, Heidelberg Engineering; 50° objective lens) were acquired from healthy anesthetized Goettingen minipigs (n_male=6, n_female=6; age 5–8 months). Manual single-point measurements (Spectralis software) from the
presumed visual streak area were statistically compared to manually assisted semi-automated segmentation measurements (OCTSEG software) by linear models and tolerance intervals. Topographic layer thickness maps were generated \( n = 8 \) for the total retinal thickness (TRT), photoreceptor (PRL), outer nuclear (ONL), outer plexiform-inner nuclear (OPL-INL), inner plexiform-ganglion cell (IPL-GCL), and nerve fiber (NFL) layers (Paraview software).

Results: The linear models demonstrated differences between measurement means for NFL \( P < 0.001 \), PRL \( P < 0.001 \), and TRT \( P = 0.019 \), but no differences for IPL-GCL, OPL-INL, and ONL. Manual measurements yielded larger tolerance intervals but largely overlapped with the semi-automated measurements. The presumed visual streak area could be identified on topographic layer maps on account of regional thickening of the IPL-GCL and OPL-INL layers. Distinct regional thickness changes were not observed for PRL or ONL.

Conclusions: The visual streak was identifiable on topographic maps generated from SD-OCT volumes, but not via direct visual identification on OCT B-scans. Both manual and semi-automated measurement methods are useful for retinal layer thickness evaluation with largely comparable results. None.


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Purpose: To evaluate general retinal and foveal anatomy in the common buzzard (Buteo buteo), common kestrel (Falco tinnunculus), and red kite (Milvus milvus) using spectral-domain (SD-OCT) and swept-source optical coherence tomography (SS-OCT) and histology.

Methods: Healthy eyes of awake birds presenting as patients to the ophthalmology section were imaged by SD-OCT (Bioptigen Envisu R2210, Leica, Germany) \( n_{Buteo} = 7 \), \( n_{Falco} = 3 \), \( n_{Milvus} = 4 \) and SS-OCT (DRI OCT Triton Topcon, Japan) \( n_{Buteo} = 2 \), \( n_{Falco} = 2 \), \( n_{Milvus} = 2 \). Retinal anatomy at the nasal and temporal fovea and between foveae was evaluated. Davidson’s fixed specimens from eyes \( n_{Buteo} = 3 \), \( n_{Falco} = 1 \), \( n_{Milvus} = 4 \) of birds euthanized for reasons unrelated to this study were evaluated via light microscopy.

Results: Bands that correlate with the amacrine cell layer (ACL), Müller cell somata layer (MCSL), and bipolar cell layer (BCL) on histology were identified within the inner nuclear layer of the retina on both SD-OCT and SS-OCT in all three species. These bands have not previously been identified on OCT. Visualization of retinal anatomy was comparable for both OCT modalities; but complete visualization of deeper structures, like choroid, sclera and scleral cartilage was only possible with SS-OCT. Photoreceptor outer segments and interdigitation zone were poorly distinguishable in the nasal, but not in the temporal foveae, which was attributed to differences between foveae in pigment melanosome distribution in RPE microvilli.

Conclusions: OCT examination of awake non-sedated birds of prey is feasible. OCT can distinguish between the ACL, MCSL, and BCL within the inner nuclear layer of the avian retina. Differences in anatomy exist between foveae and species. None.

G40 | Aqueous Humor Concentration and Prostaglandin E\(_2\) Suppression Efficacy of Topically Applied Ophthalmic Ketorolac 0.5% and Diclofenac 0.1% Solutions in Dogs With Cataract

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Purpose: To investigate the relative intraocular penetration and anti-inflammatory effect of topical ophthalmic diclofenac 0.1% (Alcon, Fort Worth TX) and ketorolac 0.5% (Apotex, Toronto Ontario) in dogs.

Methods: Twenty-two client-owned dogs (22 eyes), with or without diabetes, presenting to the VTH ophthalmology service for routine cataract surgery for mature or hypermature cataract were included in the study. Subjects were randomized and treated with either topical ketorolac 0.5% or diclofenac 0.1% at specified times in the 24-hour pre-operative time period. Aqueous humor samples were obtained intraoperatively and stored for evaluation of drug concentrations and prostaglandin E\(_2\) (PGE\(_2\)) concentrations via ultraperformance liquid chromatography-mass spectrometry and enzyme-linked immunoassay analysis, respectively. Outcomes were compared using the Wilcoxon rank-sum test.

Results: Median aqueous humor drug concentrations were significantly higher in dogs treated with ketorolac 0.5%
(1311.6 ng/mL) compared to those treated with diclofenac 0.1% (284.9 ng/mL) \((P = 0.0017)\). There was no significant difference in aqueous humor PGE2 concentrations between the two treatment groups \((P = 0.4196)\). No significant association was observed between aqueous humor drug concentration and PGE2 concentration. There was no significant association between diabetic status and aqueous humor drug concentration or PGE2 concentration in either group.

**Conclusions:** Based on previously established PGE2 concentrations in dogs with mature and hypermature cataract, this study suggests that topical ketorolac 0.5% and diclofenac 0.1% are efficacious in decreasing aqueous humor PGE2 concentrations and are equally suitable for use based on their comparable anti-inflammatory profiles. Supported by Veterinary Memorial Fund 444461. None.

**G41 | Case series of Intraocular Neoplasia Diagnosed in California Sea Lions (Zalophus Californianus)**

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**Purpose:** To describe a series of globes from seven California sea lions (CSL) submitted to COPLOW and diagnosed with intraocular neoplasia.

**Methods:** Records of CSL diagnosed with intraocular neoplasia were reviewed at COPLOW. There were 67 accessions of CSL in the COPLOW database. Cases were included when a diagnosis of a neoplasm was made in a globe.

**Results:** Seven CSL met the inclusion criteria with a total of 14 globes. The animals were from four different facilities. Six of the cases were considered to be metastatic disease, and one was considered to be primary to the globe. Two animals had tumor considered to be metastatic in both eyes. The globes were classified by microscopic findings. The six globes interpreted as having metastatic tumors had five tumors of epithelial origin and one lymphoma. The globe interpreted as having a tumor primary to the eye had a diagnosis of peripheral nerve sheath tumor (PNST). Five of seven CSL had a necropsy. All of these had tumors located outside the eyes supporting a diagnosis of metastasis to the eye. Three cases had metastatic adenocarcinoma, one case had metastatic mammary carcinoma, and the last case had metastatic thyroid carcinoma.

**Conclusions:** The most common ocular neoplasm diagnosed in CSL was a metastatic epithelial tumor consistent with adenocarcinoma with bilateral involvement seen in a few individuals. Intraocular neoplasms are not common in CSL but may signify systemic involvement. None.

**G42 | Evaluation of Serum α2-Macroglobulin Concentration in Canine and Equine Serum Intended for Topical Ophthalmic Use**

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**Purpose:** To determine whether serum α2-macroglobulin concentration (A2M) varies with age and gender in healthy dogs and horses.

**Methods:** Concentration of A2M \([\text{A2M}]\) was measured in serum from healthy dogs \((n = 30)\) and horses \((n = 31)\) in specific age groups (canine: ≤ 2 years, 2–7 years, ≥ 7 years; equine: 1–6 years, 6–20 years, ≥ 20 years) using species-specific A2M ELISA. Inclusion required normal physical examination and screening blood work (complete blood count, serum chemistry) without alterations indicative of inflammation, liver dysfunction, or systemic illness.

**Results:** Concentration of A2M was not significantly affected by gender, age, or sample storage duration in either species. Body weight was not associated with canine \([\text{A2M}]\) and was not obtained from equine subjects. Canine and equine \([\text{A2M}]\) median (IQR; range) was 98.70 ng/mL (92.79 ng/mL; 34.33–696.18 ng/mL) and 557,000 ng/mL (437,900 ng/mL; 62,600–3,042,900 ng/mL), respectively. Equine \([\text{A2M}]\) was significantly higher than canine \([\text{A2M}]\).

**Conclusions:** Signalment and storage at -80°C do not appear to affect \([\text{A2M}]\) in dogs or horses. Weight does not affect \([\text{A2M}]\). Concentration of A2M was exponentially higher in horses than in dogs. Whether \([\text{A2M}]\) correlates with serum antiprotease activity remains to be seen. Supported by the University of Georgia Small Animal Medicine Grant. None.

**G43 | Effect of Multiple Head Positions on Intraocular Pressure in Healthy, Anesthetized Horses During Hoisting**

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**Purpose:** To determine the effect of multiple head positions on intraocular pressure in healthy, anesthetized horses during hoisting.

**Methods:** Intraocular pressure was measured in healthy, anesthetized horses in different head positions during hoisting.

**Results:** Intraocular pressure significantly increased in all head positions compared to the neutral position.

**Conclusions:** Multiple head positions significantly affect intraocular pressure in healthy, anesthetized horses during hoisting. The neutral position may be the most suitable for maintaining intraocular pressure during hoisting. Supported by the Louisiana State University College of Veterinary Medicine Research Fund. None.
**Purpose:** Intraocular pressure (IOP) variation during general anesthesia presents a risk to equine patients with fragile corneal lesions or glaucoma. This study investigated the effect of head positions and various cofactors on IOP in healthy, anesthetized horses during hoisting.

**Methods:** Seventeen healthy adult horses without significant ocular abnormalities were studied. Subjects were administered intravenous xylazine (MWI Boise, ID, USA)/butorphanol (Fort Dodge, Overland Park, KS, USA) premedication and ketamine (Zoetis, Parsippany, NJ, USA)/midazolam (Akorn, Lake Forest, IL, USA) induction with additional xylazine/ketamine administered as needed for anesthetic maintenance. While hoisted, IOP was measured in triplicate for each eye via rebound tonometry (TonoVet®) at neutral neck position (ie, eyes level with the withers) and at multiple 5 cm increments above and below neutral (-20 cm through + 20 cm) using foam pads for head support.

**Results:** IOP significantly decreased with head position elevated ≥+15 cm from neutral and significantly increased with head position lowered ≤-5 cm from neutral. Neck length significantly influenced IOP with linear regression indicating a median (range) increase of 0.244 (0.034 – 0.425) mmHg in IOP for every 1 cm increase in neck length. Age, sex, breed, body weight, body condition score, and eye measured (OD vs. OS) did not significantly influence IOP. IOP only varied significantly between eyes at +10 cm (OS > OD, 1.7 ± 0.6 mmHg, P = 0.0044).

**Conclusions:** IOP in healthy, anesthetized horses varies with head position during hoisting; increased neck length may be associated with more pronounced changes in IOP during hoisting. None.

**G44 | Influence of Schirmer Strip Wetness on Volume Absorbed, Volume Recovered, and Total Protein Content in Canine Tears**

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**Purpose:** To determine the protein content and volume of tears sampled by Schirmer strips wetness ranging from 20 to 35 mm.

**Methods:** Ten healthy Beagles underwent 20 tear collections per day (10 sessions in each eye, spaced by ≥1 h) for 4 separate days, providing 200 tear samples for each length of wetness evaluated: 20, 25, 30, and 35 mm. A dye-free Schirmer strip was placed in each eye until the selected mm-mark was reached, calculating the volume absorbed (VA) as the difference between the post- and pre-collection weight (assuming 1 mg~1 μL for tear fluid), and the volume retrieved (VR) as the amount pipetted from the tube following centrifugation. Total protein content (TPC) was measured with infrared spectroscopy. Statistical comparison among groups was performed using the Kruskal-Wallis test.

**Results:** Median values for VA (μL), VR (μL) and TPC (mg/mL) were as follows: 20 mm (18, 10, 5.9), 25 mm (22, 12.5, 6.0), 30 mm (25.5, 16, 5.9), and 35 mm (31, 22.5, 7.1). Both VA and VR were significantly greater (P < 0.001) for Schirmer strips wetness of 35 > 30 > 25 > 20 mm. TPC was significantly greater (P < 0.001) for 35 > 20–30 mm, but not among other groups (P = 1.000).

**Conclusions:** The study established normative data to consider when canine studies use Schirmer strips to collect tears for bioanalytical purposes (eg, proteomics, pharmacokinetics). Although 35 mm yielded higher VA and VR, the higher TPC suggests excessive ocular irritation and disruption of ocular surface homeostasis. Absorption to 20–30 mm is the suggested length of strip wetness for bioanalytical tear collection in dogs. None.

**G45 | Safety and Efficacy of Latanoprostene Bunod 0.024% Ophthalmic Solution (VYZULTA™) in Normal and Glaucomatous Dogs with ADAMTS10-open Angle Glaucoma (ADAMTS10-OAG)—Preliminary Findings**

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**Purpose:** To evaluate safety and efficacy of latanoprostene bunod 0.024% (Vyzulta™; Bausch & Lomb) compared to latanoprost 0.005% ophthalmic solution in normal and ADAMTS10-OAG-affected dogs.

**Methods:** Following baseline measurements, 4 normal and 4 ADAMTS10-mutant, purpose-bred dogs were treated bilaterally with latanoprost TID (22 days) followed by latanoprostene bunod BID and TID (20 days), with a 29-day recovery period in-between. Efficacy measurements included diurnal intraocular pressure (IOP) and pupil diameter, aqueous humor flow (fluorophotometry), and outflow facility (pneumotonomography). Safety, including conjunctival hyperemia, was assessed by routine ophthalmic examination. Treatment effects were analyzed by pairwise comparison using Student t test (α=0.05).

**Results:** Treatment with latanoprostene bunod resulted in a significant (P < 0.01) decrease in mean diurnal IOP in normal (16.0 ± 1.0 to 10.4 ± 0.8 mmHg; mean±SE) and glaucomatous dogs (20.8 ± 0.7 to 13.9 ± 0.5 mmHg). While these values were lower than those reached with latanoprost (normal: 11.2 ± 0.7 mmHg; OAG:
14.1 ± 0.3 mmHg), the difference in treatment effect was not significant. Like latanoprost, latanoprostene bunod resulted in a highly significant (P < 0.0001) decrease in pupil diameter by 4 hours post-treatment (normal: 1.6 ± 0.1 mm; OAG: 1.7 ± 0.1 mm). While there was no observable change in aqueous humor flow, latanoprostene bunod significantly increased overall outflow facility from 0.2 ± 0 to 0.5 ± 0.1 μL/minute/mmHg (P = 0.01). Latanoprostene bunod was well tolerated by all dogs with only mild increases in conjunctival hyperemia.

**Conclusions:** Topical latanoprostene bunod administration appears to be safe for dogs with similar effectiveness in lowering IOP and decreasing pupil size compared to latanoprost. Supported by Michigan State University College of Veterinary Medicine Endowed Research Grant, Michigan State University startup funds, NIH grant R01-EY025752. None.

**G46 | Drug-free, non-surgical reduction of intraocular pressure for Four Months After Suprachoroidal Injection of Hyaluronic Acid Hydrogel**

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**Purpose:** To evaluate the use of an *in situ*-forming hydrogel, injected into the suprachoroidal space (SCS) of the eye with a microneedle for long-term reduction of intraocular pressure (IOP).

**Methods:** Eleven normotensive New Zealand White rabbits received a commercial hydrogel, an *in situ*-forming hydrogel, or HBSS injected into the SCS. The animals were evaluated for the efficacy and the safety of the procedure using a tonometer, an ultrasound biomicroscope, a fundus microscope, and a slit lamp. At the end of the study period, the animals were sacrificed, and enucleated eyes were used for outflow facility measurement or histopathology.

**Results:** SCS injection of a commercial hydrogel significantly (P < 0.01) reduced the IOP of normotensive rabbits for > 35 days with a mean ΔIOP of -2.23 ± 1.14 mmHg (range: -4.02 – -0.22 mmHg). *In situ*-forming hydrogel formulation also significantly (P < 0.01) reduced IOP for 119 days with a mean ΔIOP of -2.66 ± 1.34 mmHg (range: -5.83 – 0.17 mmHg). Clinical ophthalmic examinations indicated that the treatment was well tolerated. Histopathology showed minor hemorrhage and fibrosis at the site of injection, while ultrasound biomicroscopy showed a strong correlation between IOP reduction and the magnitude of SCS expansion. Outflow facility measurements demonstrated no difference in pressure-dependent fluid outflow by the conventional pathway, between treated and untreated eyes, suggesting that IOP reduction was due to increased unconventional outflow.

**Conclusions:** SCS expansion with an *in-situ* forming hydrogel enabled extended IOP reduction and could be useful for the treatment of ocular hypertension and glaucoma. Further studies evaluating the efficacy of IOP reduction on glaucomatous eyes are warranted. Supported by NIH grant R01EY025286. JJC and CRE; None, MRP; P.

**G47 | Comparison of Intraocular Pressure Reduction Following Administration of Four Intravenous Sedation Protocols in Normal Horses**

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**Purpose:** To compare the effects of four standing sedative drug protocols on intraocular pressure (IOP) in normal horses.

**Methods:** Twelve healthy horses received four intravenous sedation protocols with 48 hours washout between each in this randomized crossover trial: 0.5 mg/kg xylazine (VetOne, Idaho) and 0.01 mg/kg butorphanol (Zoetis, New Jersey) (SED1); 10 mcg/kg detomidine (Zoetis, New Jersey) and 0.01 mg/kg of butorphanol (SED2); 10 mcg/kg detomidine (SED3); and 0.5 mg/kg xylazine (SED4). Bilateral auriculopalpebral nerve blocks were placed, and one examiner used a rebound tonometer to measure IOP in triplicate before sedation (Tpre) and 5, 10, 15, 30, 45, and 60 minutes post-sedation (Tpost). Post-sedation readings were taken with the head elevated to the Tpre position. IOP values were compared using a mixed ANOVA model. Significance was set at P < 0.05.

**Results:** All protocols caused significant decrease in IOP compared to baseline (P < 0.0001). IOP reduction was most pronounced at Tpre5 for all treatments. IOP at Tpre (mean ± SD) was 21.8 ± 4.4 mm Hg. At Tpost5, IOP was 16.3 ± 3.8 mm Hg (SED1), 14.5 ± 2.9 mm Hg (SED2), 17.1 ± 3.8 mm Hg (SED3), and 16.9 ± 4.2 mm Hg (SED4). SED2 Tpost5 IOP was significantly lower than other treatments (P < 0.0001). Considering all time points following sedation, SED3 IOP readings were significantly higher than other treatments (P < 0.0001).

**Conclusions:** A combination of detomidine and butorphanol causes greater IOP reduction at 5 minutes than other commonly used sedation protocols. Conversely, IOP reduction is less pronounced when detomidine is used alone. Supported by LSU School of Veterinary Medicine start-up funds. None.
G48 | Clinical Comparison of Tear Film Breakup Time Measurements Using Three Different Methods of Fluorescein Solution Administration

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**Purpose:** To compare and evaluate the effect of three different techniques of fluorescein stain administration on Tear Film Breakup Time (TFBUT) measurement in normal canine eyes.

**Methods:** A prospective, randomized, three-way crossover study was conducted on dogs over 1 year of age with no known comorbidities or administration of oral/ophtalmic medications. All dogs received an abbreviated ophthalmic examination to rule out abnormal ocular surface. Using a 30-minute washout interval period, each dog’s right eye received: (a) direct application of fluorescein stain strip with 1 drop of sterile eyewash, (b) direct application of fluorescein stain strip with 2 drops of sterile eyewash, or (c) application of 1 drop from a pre-made fluorescein solution (dilution of 1 strip in 0.3 mL sterile eyewash). Eyes were assessed using the cobalt filter of a slit lamp biomicroscope. TFBUT measurements were summarized as mean ± standard deviation. Effects of humidity and temperature were assessed using mixed model analysis of covariance. After eliminating humidity and temperature as confounders, the methods were compared using mixed-model analysis of variance. All analyses were performed using SAS® version 9.4 (Cary, NC).

**Results:** Thirty-seven dogs met the inclusion criteria. Mean TFBUT ± standard deviation (SD) for the three described methods were the following: a) 16.58s ± 6.9, b) 15.98s ± 7.1, and c) 16.43s ± 8.1. Humidity (P = 0.40) and temperature (P = 0.38) did not affect TFBUT measurements. No differences between fluorescein stain application technique were observed (P = 0.92).

**Conclusion:** The technique of fluorescein solution administration did not affect TFBUT measurement in this population of healthy dogs. None.

G49 | Assessing Iris Vasculature Abnormalities in the Diabetic Dog

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1College of Veterinary Medicine, Michigan State University; 2Blue Pearl Veterinary Partners, Atlanta, GA

**Purpose:** To identity and characterize iris vasculature abnormalities in diabetic dogs, as compared to controls, using anterior segment angiography.

**Methods:** Ten diabetic dogs and 10 age-matched controls free of ocular/systemic disease were used. All dogs had a complete physical and ophthalmic examination and a complete blood count, serum biochemistry profile, urinalysis, and blood pressure measurement performed. Additionally, a urine culture, urine protein:creatinine ratio, 12-hour blood glucose curve, and fructosamine level were performed in diabetic dogs. Anterior segment angiography (indocyanine green; 1 mg/kg and sodium fluorescein; 20 mg/kg) was performed in all dogs via a full-spectrum camera and camera adaptor system using a standard sedation protocol. Statistical analysis (Wilcoxon rank sum and multiple linear regression) comparing groups was performed to identify potential factor associations.

**Results:** Arterial, capillary, and venous phases and phase intervals were identified in all dogs. Time to onset of all phases was significantly reduced in diabetic dogs, as compared to controls. Vascular disruptions within the pupillary region, as visualized with use of sodium fluorescein, were common in diabetic dogs. Severity of dye leakage into the aqueous humor and iris stroma was significantly greater in diabetic dogs. Stage of cataract, duration of disease, mean blood glucose, and fructosamine levels were significantly associated with vascular disruptions.

**Conclusions:** Anterior segment angiography demonstrated iridal vasculature abnormalities in diabetic dogs, changes which were not observed in controls. The severity of these changes appears to be associated with the stage of cataract formation, disease duration, and diabetes regulation status. Supported by the Robert and Louise Russel Fund. None.

G50 | Aqueous Humor Levels of TGFβ2 in Normal and Glaucomatous Canine Eyes

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**Purpose:** To measure TGFβ2 levels in the aqueous humor of normal and glaucomatous canine eyes.

**Methods:** Aqueous humor was collected from dogs with primary glaucoma undergoing enucleation, therapeutic aqueocentesis, or gentamicin injection, and from ophthalmologically normal dogs that were euthanized and enrolled in a body donation program. Samples were immediately frozen at -80°C. Levels of TGFβ2 were determined using a commercially available ELISA test previously validated for the canine species (Quantikine® ELISA MB200, R&D Systems, Inc., Minneapolis, MN55413,
USA). Data were statistically analyzed by Mann-Whitney U test. Significance was considered when $P \leq 0.05$.

**Results:** Aqueous samples from 14 normal eyes from 14 dogs and 26 glaucomatous eyes from 24 dogs were analyzed. Aqueous mean levels of TGFβ2 in normal eyes and eyes with glaucoma were 1133.84 pg/mL (±514.21) and 4852.24 pg/mL (±1690.45), respectively ($P$-value < .00001).

**Conclusions:** TGFβ2 levels are significantly elevated in the aqueous of glaucomatous canine eyes when compared to normal eyes. TGFβ2 is also increased in the aqueous humor of glaucomatous human eyes and is believed to play a key role in trabecular meshwork modification and decreased aqueous humor outflow. None.

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**G51 | Matrix Metalloproteinases and Tissue Inhibitors of Metalloproteinases Are Increased in Canine Primary Angle Closure Glaucoma**

SA Pumphrey; D Meola; S Pizzirani

*Department of Clinical Sciences, Tufts University
Cummings School of Veterinary Medicine*

**Purpose:** To characterize concentrations of matrix metalloproteinases (MMPs) and tissue inhibitors of metalloproteinases (TIMPs) in aqueous humor (AH) of normal dogs and dogs with canine primary angle closure glaucoma (CPACG).

**Methods:** AH was obtained from 12 eyes with CPACG during therapeutic interventions and from 18 eyes from ophthalmologically normal dogs following euthanasia and body donation. A multiplex fluorescence-based ELISA (Quantibody Human MMP Array 1, Ray Biotech, Norcross, GA) was used to assay AH MMP-1, MMP-2, MMP-3, MMP-8, MMP-9, MMP-10, MMP-13, TIMP-1, TIMP-2, and TIMP-4.

**Results:** MMP-1, MMP-2, MMP-3, MMP-8, MMP-9, MMP-10, TIMP-1, and TIMP-2 were all significantly increased in AH from dogs with CPACG. TIMP-2 showed a nearly twofold increase in dogs with CPACG.

<table>
<thead>
<tr>
<th>MMP</th>
<th>Normal (pg/ml)</th>
<th>CPACG (pg/ml)</th>
<th>$P$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMP-1</td>
<td>86,242</td>
<td>125,271</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>MMP-2</td>
<td>83,863</td>
<td>130,200</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>MMP-3</td>
<td>77,549</td>
<td>107,514</td>
<td>0.002</td>
</tr>
<tr>
<td>MMP-8</td>
<td>61,052</td>
<td>109,395</td>
<td>0.001</td>
</tr>
<tr>
<td>MMP-9</td>
<td>113,999</td>
<td>147,189</td>
<td>0.011</td>
</tr>
<tr>
<td>MMP-10</td>
<td>68,219</td>
<td>109,368</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>MMP-13</td>
<td>102,529</td>
<td>109,568</td>
<td>0.457</td>
</tr>
<tr>
<td>TIMP-1</td>
<td>24,079</td>
<td>39,356</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>TIMP-2</td>
<td>103,257</td>
<td>243,994</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>TIMP-4</td>
<td>87,618</td>
<td>107,192</td>
<td>0.049</td>
</tr>
</tbody>
</table>

**Conclusions:** Both MMPs and TIMPs are elevated in dogs with CPACG, suggesting abnormalities in proteolysis and extracellular matrix turnover in disease. The disproportionate elevation in TIMP-2 indicates that active inhibition of proteolysis may play a key role in loss of outflow capacity. None.

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**G52 | Ametropia as a Cause of Early Takeoff in Agility Dogs**

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$^1$Veterinary Clinical Science, Faculty of Health and Medical Science, University of Copenhagen, Denmark; $^2$Nordic Veterinary Specialist, Department of ophthalmology, Copenhagen, Denmark

**Purpose:** To determine whether there is a correlation between ametropia and Early Takeoff (ETO) in Danish agility dogs.

**Methods:** An online questionnaire regarding experience with ETO was performed. Thirty-nine dogs were recruited among survey respondents for a clinical study of ETO. All dogs underwent a jump test and physical and ophthalmic examination including measurement of refractive error (RE) with streak retinoscopy. Videos of jumps were evaluated for ETO and scored by two independent judges. Inter-observer agreement was measured.

**Results:** Of the 141 questionnaire respondents, 84% had previously heard about ETO and 72% recognized ETO as a problem in Danish agility. Of the 39 dogs in the clinical study, 10 were excluded, 8 because of cataracts. Mean RE in normal jumpers and ETO-cases were $-0.19D \pm 0.22D$ and $-0.87D \pm 0.33D$ ($P > 0.05$). Analysis including dogs with cataracts showed a significant difference in RE of normal jumpers and ETO-cases ($P = 0.012$) and in the proportions of emmetropic and myopic dogs with ETO ($P = 0.017$). The inter-observer agreement produced a weighted Cohen’s Kappa coefficient of 0.526.

**Conclusions:** ETO is widely known and recognized as a problem in Danish agility. The results suggest a correlation between refractive error and the presence and severity of ETO and indicate that myopia is possibly predictive of ETO. The moderate inter-observer agreement indicates a need for a more detailed definition and grading of ETO. Supported by grants from the Department of Veterinary Clinical Science, Faculty of Health and Medical Science, University of Copenhagen, Denmark and the Danish Kennel Klub. None.
G53 | Investigation of the Frequency of the ADAMTS-17 Mutation Causing Primary Lens Luxation in the Portuguese Podengo Dog Breed

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**Purpose:** To investigate and determine the prevalence of the ADAMTS-17 mutation causing primary lens luxation (PLL) in the United Kingdom population of the Portuguese Podengo.

**Methods:** Eighty-two client-owned dogs were included in this study. A total of 42 dogs (84 eyes) underwent a full ophthalmic examination combined with genetic testing for the G → A transition at ADAMTS17:c.1473 + 1 to evaluate the incidence of ophthalmic changes in homozygous and heterozygous (carrier) animals. Forty dogs underwent genetic testing only.

**Results:** Genetic testing for the ADAMTS-17 mutation confirmed 1/82 (1.2%) homozygous, 13/82 (15.8%) heterozygous, and 68/82 (83%) unaffected. In the dogs examined, there was no evidence of ophthalmic signs associated with lens instability (iridodonesis, phacodonesis, vitreal prolapse, or lens zonule breakdown), and none of the dogs exhibited signs of lens luxation or subluxation.

**Conclusions:** The ADAMTS-17 mutation causing PLL was confirmed in the Portuguese Podengo dog breed. Genetic testing for PLL should be considered prior to breeding. Due to the small population and pool sample size of the breed in the UK, selective breeding between homozygous and non-affected or between carriers and non-affected dogs is considered acceptable. Funding sources: None. Conflicts of interest: None.

G54 | Endoserter™ for the Delivery of a Descemet's Stripping Endothelial Keratoplasty (DSEK) Graft for Canine patients with Corneal Endothelial Disease

MD Armour1; AO Eghrari2
1Armour Veterinary Ophthalmology; 2Wilmer Eye Institute Johns Hopkins School of Medicine

**Purpose:** To determine the efficacy and ease of application of the Endoserter delivery device for insertion of canine DSEK tissue into the anterior chamber of clinically affected canine eyes with corneal endothelial disease.

**Methods:** Patients with corneal endothelial disease receiving a descemet’s stripping endothelial keratoplasty were selected to have the delivery of the tissue assisted with this device.

**Results:** Seven patients underwent corneal transplantation in one eye via assistance with an Endoserter. Graft insertion was considered easy to facilitate in all cases. Corneal clearing and graft acceptance were identified in 4 out of 7 patients. Patients with corneal thicknesses greater than 2 mm preoperatively all demonstrated corneal graft rejection. One patient initially cleared for 2 weeks postoperatively but corneal edema resumed 1 month postoperatively. In the accepted grafts, the corneal thickness decreased from 1.46 mm (range: 1.94–1.1 mm) to 0.82 mm (range: 1.0–0.77 mm).

**Conclusions:** Endoserter facilitation of DSEK graft insertion can result in a positive visual outcome in the majority of patients with corneal endothelial disease. None.

G55 | The Use of Restylane Hyaluronic Acid Injections and a Free Labial Mucocutaneous Graft for the Repair of Feline Eyelid Agenesis

KA Caruso; BD Reynolds; CJ Whittaker; J Smith
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**Purpose:** To describe a new technique that involves dermal expansion in conjunction with surgery to offer excellent postoperative outcomes for feline patients with eyelid agenesis.

**Methods:** A total of 25 eyelids from 15 feline patients were included in this study. Inclusion criteria were the presence of eyelid agenesis with secondary trichiasis. All surgical procedures were performed by a DACVO [KAC]. Subdermal Restylane® hyaluronic acid (Galderma Laboratories LP, Ft. Worth, TX) injections into the colobomatous regions were performed in 14/30 eyelids pre-operatively, 30/30 eyelids peri-surgically, and 4/30 eyelids post-operatively. Subdermal Restylane® injections were utilized to facilitate dermal expansion, and the ocular border of the colobomatous defect was surgically removed. A free labial mucocutaneous graft was then applied to the colobomatous region. Follow-up was performed on all patients, with a minimum period of 3 months post-operatively.

**Results:** Excellent aesthetic and functional results were obtained in 30/30 eyelids. Complications occurred in 3/30 eyelids and were minor in nature, including distal graft necrosis and suture site irritation.

**Conclusions:** Restylane® hyaluronic acid subdermal injection is a useful aid to facilitate dermal expansion to enhance the viability of surgical repair of feline eyelid agenesis by a free labial mucocutaneous graft. The injections are often performed without the need for sedation or anesthesia and can
also allow for post-operative manipulations to enhance eyelid cosmesis and functionality.

**G56 | Outcomes of Baerveldt Gonioimplantation in 17 Dogs (20 Eyes) with Primary Closed-Angle Glaucoma (2013-2019)**

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Department of Ophthalmology, Small Animal Specialist Hospital, Sydney, Australia

**Purpose:** To evaluate intraocular pressure (IOP) control and vision following placement of a Baerveldt gonioimplant in dogs with primary closed-angle glaucoma.

**Methods:** Medical records of canine patients diagnosed with primary closed-angle glaucoma and treated with a Baerveldt gonioimplant, with at least three months of post-operative follow-up, were reviewed. Successful IOP control was defined as IOP < 20 mmHg and vision by presence of menace response. Pre- and post-operative number of daily anti-glaucoma medications, complications, and interventions were recorded.

**Results:** Seventeen dogs (20 eyes) were included. At three months post-operatively, 15/20 eyes (75%) had controlled IOP and 14/20 eyes (70%) were visual. At one year post-operatively, 11/17 eyes (64.7%) had controlled IOP and 12/19 eyes (63.1%) were visual. At two years post-operatively, 8/14 eyes (57.1%) had controlled IOP and 7/15 eyes (46.7%) were visual. Eight of 10 eyes (80%) and 9/9 eyes (100%) that retained IOP control and vision at 14 months, respectively, remained controlled and visual at last recheck (range: 1.4–4.8 years). Mean IOP was 9.5 mmHg at 6 months, 11 mmHg at 1 year, and 8.75 mmHg at 2 years. Mean number of anti-glaucoma drops was 7 pre-operatively and 1.5 post-operatively.

Immediate complications included post-operative intraocular hypertension (14), anterior chamber fibrin (12), corneal ulceration (4), and hypotony (4). Long-term complications included cataracts (13; 3 were vision-threatening), uncontrolled glaucoma (5), endothelial degeneration (4), and bleb fibrosis (3).

**Conclusions:** Placement of a Baerveldt gonioimplant was effective in maintaining IOP control and vision in the majority of dogs with primary closed-angle glaucoma and reduced the number of daily anti-glaucoma medications. None.

**G57 | Intravitreal Triamcinolone Acetonide-Moxifloxacin in 18 Dogs (29 Eyes) Undergoing Phacoemulsification**

ME Julien; JC Wolfer
Toronto Animal Eye Clinic, Toronto, ON, CA

**Purpose:** To evaluate the efficacy of intravitreal injection of triamcinolone acetonide-moxifloxacin in dogs undergoing phacoemulsification as the sole treatment to prevent post-operative complications, such as uveitis, endophthalmitis, fibrin, hyphema, postoperative hypertension, glaucoma, corneal edema, ulcerative keratitis, and retinal detachment.

**Methods:** A total of 18 dogs (29 eyes) with cataracts were treated with a pars plana intravitreal injection of triamcinolone acetonide (SteriMax Inc., Oakville, ON) and 0.5% moxifloxacin hydrochloride ophthalmic solution (Vigamox; Alcon, Novartis Pharmaceutical Canada Inc., Dorval, QC) during phacoemulsification between 2019 and 2020 with 1-month minimum follow-up. A total of 8 dogs were concurrently treated with a pars plana intravitreal injection of bevacizumab (Avastin; Chiron Compound Pharmacy Inc., Guelph, ON). A total of 12 dogs had diabetic cataracts. Systane ointment (Alcon, Novartis Pharmaceuticals Canada Inc., Dorval, QC) was used postoperatively for 2 weeks. Systane ointment, concurrent systemic and ocular disease, procedure protocol, post-operative complications, and outcome were recorded. Cases were considered successful if no postoperative complications requiring topical and systemic treatment, aqueoucentesis, or intracameral injection of tissue plasminogen activator (TPA) were needed.

**Results:** The overall success rate for intravitreal injection of triamcinolone acetonide-moxifloxacin was 27.8%. The success rate for dogs treated with triamcinolone acetonide-moxifloxacin and bevacizumab was 25%. The mean postoperative follow-up duration was 13.5 ± 12.8 weeks. The most common complications were postoperative hypertension (33.3%), fibrin in the anterior chamber (22.2%), and uveitis (16.6%).

**Conclusions:** The use of topical or systemic medications and further intervention for postoperative complications is indicated for dogs undergoing phacoemulsification. Methods to intraoperatively improve postoperative hypertension may result in a higher success rate. None.

**G58 | Post-operative Outcomes of Phacoemulsification in Juvenile Dogs**

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1Animal Eye Clinic; 2Las Vegas Veterinary Specialty Center; 3Auburn University, School of Veterinary Medicine

**Purpose:** To evaluate the post-operative outcomes of phacoemulsification in juvenile dogs.

**Methods:** Medical records from two private practices were reviewed (2013–2020). Dogs less than 24 months old undergoing phacoemulsification were identified. Post-operative vision, concurrent ocular conditions, and surgical factors were evaluated. Statistical analysis of planned posterior capsulorhexis (PPC) with odds of posterior capsular opacification (PCO), pearl formation, or a positive vision outcome was performed. Associations of persistent hyperplastic primary
vitreous (PHPV) with age and positive visual outcome as well as lens placement with PCO, pearl formation, or a positive visual outcome were also evaluated.

Results: Phacoemulsification was performed in 46 eyes (31 dogs, 15 breeds) with a 17-month average follow-up time (range 2–48 months) and 14-month average age (range 6–24 months). Forty-one eyes (89%) were visual during the follow-up period, and all five non-visual eyes lost vision to glaucoma (range 4–48 months post-operatively). PPC was performed in 24 eyes (52%) and did not affect odds of PCO, pearl formation, or visual outcome. Pearl formation was noted in 10/46 eyes (22%). PHPV was present in 5 eyes (11%) and did not affect visual outcome. A lens was placed in 39 eyes (85%) and did not affect PCO, pearl formation, or visual outcome. Visual outcome was not affected by follow-up time or breed.

Conclusion: Phacoemulsification in young dogs has a high overall success rate (89%). Young dogs may be at higher risk of glaucoma post-operatively. PPC and lens placement do not appear to affect outcome. None.

G59 | Evaluation of Conjunctival Graft Complications and Factors that Lead to Loss of the Globe

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1Western College of Veterinary Medicine, University of Saskatchewan; 2Ontario Veterinary College, University of Guelph

Purpose: To describe the complications of conjunctival graft surgery and evaluate factors that lead to graft failure.

Methods: A case-control retrospective study was completed using data from the University of Saskatchewan Veterinary Medical Center between January 2015 and January 2020. Dogs, cats, and horses that underwent conjunctival pedicle graft surgery that subsequently developed a conjunctival graft complication were selected and reviewed.

Results: Twenty-two conjunctival grafts developed complications, including 16 dogs, three horses, and three cats. Graft complications resulting in globe failure occurred in 8/16 canine, 0/3 equine, and 3/3 feline eyes. Streptococcus spp. was cultured from 8/16 canine (Streptococcus canis), and 3/3 equine grafts with complications. Post-graft empiric antibiotics used in cases of graft complications included second generation fluoroquinolone (n = 18), tobramycin (n = 2), tobramycin and compounded cefazolin (n = 1), and moxifloxacin(n = 1). Of the eight failed canine globes, five of the ulcers isolated Streptococcus canis at the time of graft surgery. These grafts were described as initially becoming white, and malacic, then dehiscing and the globe perforating. Three globe failures did not have bacteria isolated at the time of graft surgery. These graft failures were described as the graft turning black (n = 2), or continued corneal collagenolysis (n = 1). All three equine grafts with complications were treated with second-generation fluoroquinolone monotherapy both prior to and post-surgery. All three equine globes were visual at last follow-up, 2/3 had partial graft attachment, and 1/3 had complete graft dehiscence.

Conclusions: Streptococcus species play a role in canine and equine conjunctival graft complications and failures. None.

G60 | Effectiveness of a Preoperative Retrobulbar Injection of 0.75% Ropivacaine for Intraoperative and Postoperative Analgesia Following Eye Enucleation in Dogs

EM Scott1; LV Vallone1; NL Olson2; MAL Lepiz1, BT Simon1
1College of Veterinary Medicine, Texas A&M University; 2School of Public Health, Texas A&M University

Purpose: To assess the efficacy of preoperative retrobulbar ropivacaine injection for intraoperative and postoperative analgesia in dogs following eye enucleation.

Methods: Prospective, randomized, double-masked placebo-controlled trial of 24 client-owned dogs requiring routine enucleation. Dogs were randomized to receive a preoperative inferior-temporal retrobulbar injection of either ropivacaine 0.75% (1 ml/10 kg) or equivalent volume of 0.9% saline (control). Intraoperative parameters recorded included heart rate (HR), respiratory rate, end-tidal CO₂, mean arterial blood pressure (MAP), and end-tidal isoflurane concentration. Masked observers assessed pain using a numerical rating scale and visual analog scale (VAS) preoperatively (baseline) and 0, 0.5, 1, 2, 3, 4, 5, 6, and 24 hours after extution. Rescue analgesic was administered if intraoperative HR or MAP increased by ≥ 20% baseline values or pain scores totaled ≥ 9/20 or scored ≥ 3/4 in any 1 category with VAS ≥ 35/100.

Results: Average HR increased in dogs receiving saline compared to dogs receiving ropivacaine. Rescue analgesia was administered to 17/24 dogs (intraoperatively: 4/12 control, 1/12 ropivacaine; postoperatively: 5/12 control, 7/12 ropivacaine), with no significant difference in the number of rescue events between groups. Time from retrobulbar injection to administration of rescue analgesic was shorter in control dogs compared to ropivacaine dogs ($P < 0.05$ for up to 4 or 6 hours, hazard ratio 1.727). Pain scores and VAS scores were significantly higher in control dogs versus ropivacaine dogs at 0–2 hours after extubation ($P < 0.05$).

Conclusions: Preoperative retrobulbar ropivacaine injection is effective at controlling intraoperative and early
postoperative pain in dogs undergoing enucleation. Supported by Texas A&M GINN Funds. None.

G61 | Long-Term Results (>1 year) in 19 Dogs Treated With Micropulse Transscleral Diode Cyclophotoagulation for Refractory Glaucoma

BD Story; JS Sapienza; K Kim
Long Island Veterinary Specialists, Plainview, NY, USA

Purpose: To report the long-term (>1 year) outcome of micropulse transscleral diode cyclophotoagulation (MP-TSCP) in dogs.

Methods: Retrospective study of 19 dogs treated with MP-TSCP. Dogs were evaluated at an average of 28 months (Range: 13–41 months) postoperatively. Reported outcomes were intraocular pressure (IOP), retention or loss of vision, number of medications, and additional procedures performed.

Results: Data from 19 dogs (24 eyes: 16 sighted, 8 blind) were available. Mean laser settings employed were 130.6 seconds (50–180 seconds) and 2277 mV (2000–3000 mV) at 31.3% duty cycle. Mean IOP one year postoperatively was significantly lower than preoperatively (17.83 mmHg +/- 12.20 versus 31.39 mmHg +/- 15.60, respectively; \( P = 0.001 \)). Medications were reduced from a mean of 3.5 preoperatively to 2.8 one year postoperatively (\( P = 0.1 \)). Micropulse TSCP was the sole therapy performed in 16/24 eyes resulting in long-term IOP control in 13/24 eyes and retention of vision in 5 of the 16 sighted eyes. Repeat MP-TSCP was performed in 10/24 eyes. Eight of 24 eyes required additional procedures (ciliary chemical ablation, repeat MP-TSCP + Ahmed valve, repeat MP-TSCP + Ex-press shunt, and SaLVO glaucoma implant + TSCP) with long-term IOP control in 6/8 eyes.

Conclusions: Micropulse TSCP can be an effective treatment for refractory glaucoma in select cases. Micropulse TSCP sole therapy resulted in long-term IOP control and retention of vision in 54% and 31% of eyes, respectively. Repeat MP-TSCP was required in 42% of eyes. Micropulse TSCP as sole therapy or coupled with additional glaucoma procedures controlled the IOP in 79% of cases and reduced medications postoperatively. None.

POSTER SECTION

P1 | A Retrospective Study on Canine and Feline Eyelid Tumors: 275 Dogs and 14 Cats (2014–2019)

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1Department of Ophthalmology, Angell Animal Medical Center, Boston, MA, USA; 2Department of Pathology, Angell Animal Medical Center, Boston, MA, USA

Purpose: To report the most frequently diagnosed canine and feline eyelid tumors and examine recurrence rate in relation to surgical margins.

Methods: Medical records and histopathology reports of all eyelid tumors submitted to Angell Animal Medical Center’s pathology department between 2014 and 2019 were studied. The following data were collected from medical records: patient breed, age, sex, tumor location, histopathologic diagnosis, excisional margins, length of follow-up, recurrence.

Results: 321 eyelid margin and 9 third eyelid tumors of dogs were included. Ten eyelid margin and 4 third eyelid tumors of cats were included. 98.1% (315/321) of canine eyelid margin tumors were benign, most commonly diagnosed as meibomian gland adenoma (194/321; 60%) followed by meibomian gland epithelioma (63/321; 19.6%). However, 77.8% of canine third eyelid tumors were malignant, most commonly adenocarcinoma, hemangiosarcoma, and mast cell tumor (29; 22% each). Only 5.2% of eyelid margin tumors recurred between 6 months and 4 years. Feline eyelid margin tumors were more often malignant (6/10; 60%), of which 40% (4/10) were mast cell tumor. Two of the 4 feline third eyelid tumors were malignant (squamous cell carcinoma).

Conclusions: The majority of canine eyelid margin tumors were benign and originated from the meibomian gland. Recurrence was very rare; therefore, surgical removal with clean margins was usually curative. Feline eyelid margin tumors are more often malignant, and further treatment or closer monitoring may be warranted. Third eyelid tumors of both dogs and cats are often malignant. None.

P2 | Feline Bacterial Keratitis Antimicrobial Resistance Trends Over a 10-year Period

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Animal Medical Center, New York City

Purpose: To document the most effective antimicrobials over a 10-year period and to evaluate for trends in antimicrobial resistance.
Methods: Positive feline corneal and conjunctival cultures (n = 458) from the greater New York area were provided from 01/01/2008 to 12/01/2019 by IDEXX microbiology services. The percentage of susceptibility was calculated for each antimicrobial per year and grouped over the 10-year period. The proportion of susceptible isolates was compared via Fisher’s exact among the individual antimicrobials for the grouped bacterial population and for Staphylococcus, Streptococcus, Pasteurella, and Pseudomonas species individually. The trend in percentage susceptibility for each antimicrobial was evaluated via linear regression.

Results: Over the 10-year period, the most effective antimicrobials against grouped aerobic cultures were bacitracin (97%), ciprofloxacin (91%), marbofloxacin (91%), and ofloxacin (91%) and the least effective antimicrobials were erythromycin (66%) and polymyxin B (73%). The most effective antimicrobials for the two most commonly isolated gram positive species, Staphylococcus and Streptococcus species, were chloramphenicol, ciprofloxacin, marbofloxacin, and ofloxacin. The two most common gram negative isolates, Pasteurella and Pseudomonas species, both showed strong susceptibility to tetracycline. A clinically significant trend in antimicrobial resistance was not observed for the grouped aerobic cultures or individually evaluated bacterial species.

Conclusion: Cultures derived from the cornea and conjunctiva of cats with bacterial keratitis did not demonstrate an increase in antimicrobial resistance over a 10-year period. Based on grouped and individual species susceptibility profiles, fluoroquinolones remain a reasonable empiric choice for the treatment of bacterial keratitis.

P3 | Pilot Study: Development of a Multiple Reaction Monitoring Method to Detect Inflammatory Cytokines in Canine Aqueous Humor

ML Henriksen1; LK Uhl1; CD Broeckling2; C Mehaffy2
1Comparative Ophthalmology, Department of Clinical Sciences, College of Veterinary Medicine and Biomedical Sciences, Colorado State University; 2Proteomics and Metabolomics Facility, Vice President for Research, Colorado State University

Purpose: To investigate whether target mass spectrometry (Targeted UPLC-MS/MS) using a multiple reaction monitoring method can be used as a relative-quantification method to detect inflammatory cytokines in canine aqueous humor (AH).

Methods: Four samples of 0.2 ml canine AH was used for this pilot study. Two samples were obtained from ‘control’ dogs that were euthanized for reasons unrelated to the eyes. For the inflammatory case group; one sample was from a dog with fibrin formation following Ahmed valve placement, and one sample was from a dog with post-operative ocular hypertension. Targeted UPLC-MS/MS was performed by Colorado State University’s Proteomics and Metabolomics Facility. A heavy labeled peptide pool corresponding to 145 peptides from 68 canine inflammatory proteins was obtained from JPT Peptide Technologies (SpikeMix Cytokines (Dog Canine)).

Results: The final methods included one method for proteins categorized as “Others”, one method for proteins categorized as “Chemokines” and three different methods for proteins categorized as “Cytokines”. Each method was optimized such that at least 12 points per peak were captured for each transition ion. The final method included 60 of the 68 proteins and 95 of the 145 peptides included in the commercial SpikeMix. Tumor-necrosis-factor-α, Interleukin-1α and Interleukin-1β were among the inflammatory cytokines found in canine AH. The total time for each of the five methods was 20 min.

Conclusions: The canine SpikeMix can be used as a relative-quantification method to detect inflammatory cytokines in canine AH. Future studies will be aimed towards detection of inflammatory cytokines in AH from dogs with intraocular diseases. None.

P4 | Panuveitis in a Golden Retriever – Could it be due to Multicentric Lymphoma or Disseminated COCCIDIOIDOMYCOSIS?

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Purpose: To describe the systematic approach for definitively diagnosing an ocular manifestation of systemic disease in a patient with multicentric lymphoma and concurrent disseminated coccidioidomycosis.

Methods: A 7-year-old male castrated Golden Retriever presented to Colorado State University’s Veterinary Teaching Hospital for a five-week history of blepharospasm, scleral injection, and epiphora from the right eye (OD), as well as a two-week history of progressive pain and lameness in the eye.
right hind limb. The patient was undergoing chemotherapy for multicentric T-cell lymphoma, diagnosed one month prior. Radiographs, an ophthalmic examination, as well as collection of cytologic samples via subretinal-centesis.

**Results:** Radiographic images displayed evidence of an aggressive osseous lesion along the right tibia suspicious for fungal or neoplasia. An ophthalmic diagnosis of panuveitis with serous retinal detachment OD was made. Cytology from the subretinal-centesis was non-diagnostic, with no organisms seen. One week later, the patient was diagnosed with secondary glaucoma OD (25mmHg). Enucleation was performed and the globe was submitted for histopathology. Histopathologic confirmation of fungal organisms in the vitreous confirmed ocular coccidioidomycosis as the causative agent for this dog’s retinal detachment. No signs of the previously diagnosed lymphoma were present in the ocular tissues and the histologic lesions.

**Conclusions:** Determining the underlying cause for panuveitis in a patient diagnosed with concurrent systemic diseases (multicentric lymphoma and disseminated coccidioidomycosis) that both can cause panuveitis can be a challenge due to overlapping clinical symptoms. Subretinal-centesis was non-diagnostic and histopathology was required in this case to definitively diagnose the underlying cause for panuveitis. None.

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**P5 | Primary Corneal t-cell Lymphoma in a Horse: A Case Report**

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**Purpose:** To describe a case of bilateral corneal T-cell lymphoma in an equine.

**Methods:** A five-year-old Belgian Warmblood gelding presented to the University of Florida for evaluation of increased opacity in both eyes (OU), with the left eye (OS) more affected than the right (OD). Medical records describing medical and surgical management were reviewed.

**Results:** Initial ophthalmic examination revealed bilateral mild blepharospasm, multifocal axial and dorsal anterior stromal corneal opacities with mild axial mid-stromal haze and edema, and superficial, branching corneal neovascularization. A presumptive diagnosis of immune-mediated keratitis (IMMK) OU was made. The lesions progressed despite two years of exhaustive options for medical management. Lamellar keratectomy and ocular surface reconstruction with amnion membrane transplantation was elected OS. The keratectomy specimen was submitted for histopathology and was consistent with immune-mediated keratitis. When keratectomy was performed OD seven months later, histopathology revealed sheets of atypical round cells with a high mitotic index. Immunohistochemistry on banked specimens OU revealed immunoreactivity to CD3 antibodies. An amended diagnosis of bilateral T-cell lymphoma was made. The patient recovered well from surgery and there have been no signs of recurrence or systemic involvement in four years following surgical intervention.

**Conclusions:** This is a unique case of primary corneal T-cell lymphoma in a horse. Prior to surgical management, the patient received topical immunomodulating medications including cyclosporine and tacrolimus for significant lengths of time. Both chronic inflammation and chronic administration of immunosuppressive agents are associated with malignant transformation. Surgical intervention provided both a diagnostic sample and therapeutic benefit. None.

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**P6 | Iridociliary Adenoma in a Greater Sulfur-Crested Cockatoo (Cacatua galerita galerita)**

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**Purpose:** Report the histological and immunohistochemistry findings of an iridociliary adenoma in a greater sulfur-crested cockatoo (Cacatua galerita galerita) without concurrent systemic involvement.

**Methods:** Ocular and physical examination, complete blood count, plasma biochemistry, and full body computed tomography were performed on a 34-year-old female cockatoo presenting with an anomalous left eye of 10 years’ duration. Enucleation was performed, and ocular contents were submitted for histopathology which included periodic acid-Schiff (PAS) and immunohistochemistry stains.

**Results:** Anomalies in the right eye included anterior para-central capsular cataract with nuclear sclerosis. In the left eye, unidentifiable black-brown hemorrhagic tissue protruded from outstretched eyelids. Computed tomography scan revealed an intraocular mass with mineralization without evidence of extraocular extension or metastatic disease. Gross pathology revealed a distorted globe with adhered dorsal lacrimal gland and nictitans. Histopathology showed complete effacement of normal intraocular structures, without corneal or scleral infiltration, by a mass composed of
pigmented polygonal to cuboidal neoplastic cells forming fronds, nests and packets supported by fine fibrovascular stroma. Neoplastic cells showed 3-fold anisocytosis and anisokaryosis, with 3 mitotic figures per 10 high power fields. Within the mass, there were areas of necrosis with formation of xanthogranulomas. Immunohistochemistry revealed cytoplasmic immunoreactivity for vimentin in most neoplastic cells, while Melan-A/PNL2 was expressed in 20–40% of cells. No reactivity for S100 was observed. Approximately 10–20% of neoplastic cells were associated with PAS-positive thick basement membranes. A diagnosis of iridociliary adenoma was reached. 

**Conclusion:** Psittacine iridociliary adenomas share similar clinical and pathological characteristics to those reported in canines. None.

**P7 | Ocular Manifestations and Outcome in 7 Dogs With Naturally-Acquired Canine Herpesvirus-1**

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**Purpose:** To describe the clinical presentation and response to therapy of client-owned dogs diagnosed with naturally-acquired canine herpesvirus-1 (CHV-1).

**Methods:** Medical records of dogs with confirmed CHV-1 infection by PCR who presented to Animal Eye Guys of South Florida between 2018 and 2020 were reviewed. A total of 7 dogs with 10 eyes affected were included. Data recorded included signalment, ophthalmic findings, treatment and response to treatment.

**Results:** The mean age at time of diagnosis was 0.85 years (range 0.33 to 1.5). Six dogs were a French Bulldog; one dog was a Boston Terrier. Ophthalmic examination abnormalities included unilateral conjunctivitis (1/7), bilateral conjunctivitis (1/7), unilateral ulcerative conjunctivitis (1/7), unilateral keratoconjunctivitis (2/7), bilateral ulcerative keratoconjunctivitis (2/7), uveitis (1/7), and nasal discharge or sneezing (2/7). Five dogs tested positive for mycoplasma cynos, bordetella bronchiseptica, or canine parainfluenza in addition to CHV-1. Corneal lesions were erosions, punctate to dendritic, or geographic with redundant epithelial edges. Famciclovir was used in six dogs with an average dosage of 48mg/kg twice a day for 2–3 weeks. Various topical antibiotics and lubricants were used as well. Mean time to resolution after start of famciclovir administration was 15.8 days. Recurrence of clinical signs was documented in one dog and was closely associated with elective surgeries.

**Conclusions:** CHV-1 infection should be considered in young dogs with conjunctivitis or keratitis. Famciclovir was an effective treatment choice. The significance of the high proportion of French Bulldogs in this study is unknown. None.

**P8 | Effect of Acupuncture as an Adjunctive Therapy for Keratoconjunctivitis SICCA in Dogs – A Pilot Study**

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**Purpose:** To assess and report the effect of acupuncture on tear production and quality in dogs with medically managed keratoconjunctivitis sicca (KCS).

**Methods:** Six dogs from the College of Veterinary Medicine research facility previously diagnosed with and variably treated for refractory or controlled KCS underwent baseline ophthalmic examination including scored blepharospasm, ocular discharge and redness, and Schirmer tear test I (STT) and tear film break up time (TBUT) measurements. Dogs underwent biweekly aqua-acupuncture (AAP) with vitamin B12 instilled via an insulin needle by a veterinary acupuncturist at 10 points on the face as well as 14 distal points. Ophthalmic examinations were repeated halfway through, at completion of, and one month after a twelve-week treatment course. Scored clinical signs and measurements were tested for change during treatment.

**Results:** AAP was tolerated by the dogs and all treatments were able to be administered. Blepharospasm (P = 0.031) and ocular redness (P = 0.031) significantly decreased over the course of treatment. There were no significant changes in ocular discharge (P = 0.142), STT (P = 0.507) or TBUT (P = 0.579) measurements during treatment. Previous KCS maintenance topical treatment was able to be reduced for one dog.

**Conclusion:** The addition of AAP to traditional topical therapy for KCS reduced some clinical signs associated with KCS (blepharospasm, ocular redness) despite not reducing ocular discharge nor increasing STT or TBUT in canine patients with conventionally controlled KCS. AAP warrants further investigation as an adjunct therapy for KCS in these patients as well as those with refractory or incompletely controlled disease. None.

**P9 | Bilateral Idiopathic Horner Syndrome in Three Dogs**

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**Purpose:** To describe the clinical presentation and response to therapy of client-owned dogs diagnosed with naturally-acquired canine herpesvirus-1 (CHV-1).
Purpose: To describe a case series of bilateral, presumed idiopathic Horner syndrome in three otherwise healthy dogs.

Methods: Cases were identified through presentation to the authors and medical record search.

Results: An eleven year old spayed female golden retriever, an eleven year old neutered male golden retriever and an eight year old neutered male Labrador retriever were affected bilaterally either simultaneously (2 dogs) or consecutively (one eye first with resolution, then the other eye within 3 months of the first; 1 dog). In the simultaneous cases, signs began in one eye and sometime later (3 days to a couple months) affected the other as well. All dogs had otherwise unremarkable ophthalmic, neurologic and physical examinations as well as systemic screening lab work. In the first and third cases, thoracic radiographs and thyroid hormone levels were normal. Also in the first case, magnetic resonance imaging and cerebrospinal fluid analysis were normal. All dogs had signs resolve within twenty minutes of topical application of dilute (1 to 2.5%) phenylephrine ophthalmic solution (Paragon BioTech, Inc., Portland, OR) consistent with postganglionic Horner syndrome. All dogs had resolution of Horner syndrome within six months of diagnosis.

Conclusion: This is the first report of a case series of bilateral, presumed idiopathic postganglionic Horner syndrome in dogs. None.

P10 | Bilateral Hyphema in a Golden Retriever

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Purpose: To describe the clinical appearance and document a case of hyphema secondary to thrombocytopenia due to suspect Trimethoprim Sulfamethoxazole (TMS) toxicity.

Methods: A six-year-old female spayed Golden Retriever was presented to Texas A&M Veterinary Medical Teaching Hospital for evaluation of sudden blindness, blepharospasm, and ocular discharge. The patient recently completed a 10-day course of TMS (960 mg PO BID) for a suspect urinary tract infection prior to presentation. Complete ophthalmic and physical examination were performed followed by an extensive work-up including infectious disease testing.

Results: Ocular examination revealed severe blepharospasm, corneal edema, miosis; extensive hyphema limited full intracocular examination. Physical examination revealed bilateral superficial cervical and popliteal lymphadenopathy and oral and ventral abdominal petechiae with ecchymosis. No infectious or neoplastic etiologies were identified. Blood work revealed a severe thrombocytopenia consistent with an immune-mediated pattern. Clinical signs resolved within 10 days of initiating prednisone (0.8 mg/kg/day PO; Oculus Innovative Sciences, Petaluma, CA, USA) and topical 1% prednisolone acetate (Allergan, Irvine, CA, USA) 4-6 times daily.

Conclusions: It is well known that thrombocytopenia is a differential for patients who develop bilateral spontaneous hyphema. Furthermore, it has been documented that uveitis is a reported side effect of TMS toxicity and hyphema was reported as a clinical observation in one review article. This is the first report to document testing, treatment, and treatment response associated with hyphema secondary to an idiosyncratic TMS toxicity in the veterinary literature to the author’s knowledge and highlights the importance of thorough medical history including drug exposure. None.

P11 | Association of Neutrophilic Contamination of Frozen Equine Serum Eyedrops With Severe Conjunctivitis in 8 Dogs and 1 Cat

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Purpose: To describe severe conjunctivitis associated with use of frozen equine serum and culture and cytology findings from the suspect serum.

Methods: Medical records of affected patients were reviewed. Aerobic and anaerobic bacterial culture and fungal culture were performed on multiple serum aliquots. Samples were also submitted for cytologic evaluation.

Results: Consistent with institutional practice for the last 12 years, serum was sterilely obtained from screened blood donor horses and was refrigerated overnight in sterile tubes with no additives to allow clot formation prior to centrifugation, then repackaged into sterile eyedrop bottles and frozen. All affected patients were originally prescribed serum eyedrops for ulcerative keratitis from the same donor and batch. Owners reported significant discomfort following serum application and patients presented with copious mucopurulent discharge and severe conjunctivitis, frequently with visible follicle formation. All patients demonstrated immediate marked improvement following cessation of treatment with serum eyedrops. Bacterial and fungal cultures from the eyedrops yielded no growth. Cytology revealed presence of intact neutrophils without evidence of erythrocytes or infectious organisms.

Conclusions: Absence of erythrocytes suggests the presence of neutrophils was due to migration into the serum rather than incomplete centrifugation. Infectious organisms may have been rendered nonviable by the freezing process but endotoxin or other bacterial components may have remained and caused
the clinical signs. Alternatively, histamine or other circulating host factors may be responsible. Serum for topical use should be collected and handled steriley and processed immediately to limit opportunity for contamination. None.

P12 | Successful Medical Management of Intracranial Abscess Secondary to Retrobulbar Abscess or Cellulitis: 4 Cases (2008–2018)

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**Purpose:** To describe 4 dogs with intracranial abscesses believed secondary to retrobulbar infections.

**Methods:** Records for 4 dogs with retrobulbar abscess or cellulitis and intracranial abscesses were reviewed.

**Results:** All dogs had initial signs (exophthalmos, periorbital swelling, jaw pain) consistent with retrobulbar disease. Three of the four dogs were less than 3 years old. Two dogs had been treated with prednisone for suspected masticatory myositis prior to presentation, and one dog had undergone previous oral exploratory surgery. Two dogs presented severely obtunded. Three dogs experienced seizures. One dog presented with clinical findings consistent with sepsis. MRI (2 dogs) or CT (2 dogs) demonstrated retrobulbar abscess (2 dogs) or cellulitis (2 dogs) along with intracranial subdural abscess. Sampling for bacterial culture and sensitivity was performed on one dog and yielded *Bacteroides* and *Clostridium* (not further speciated). Cerebrospinal fluid was obtained from one dog and showed a marked neutrophilic pleocytosis; no culture was performed. All dogs were treated with broad-spectrum antibiotics (enrofloxacin, cefpodoxime, and metronidazole in 3 dogs; enrofloxacin, clindamycin, and metronidazole in 1 dog) for 3–6 months. Repeat imaging was performed on 2 dogs showing complete resolution of orbital and intracranial lesions. One dog remained blind in the affected eye; all other dogs were neurologically normal at cessation of treatment. No dogs required long term anticonvulsants.

**Conclusions:** Intracranial abscess is a rare but severe complication of retrobulbar infections. Prior treatment with prednisone may be a predisposing factor. Extended broad-spectrum antibiotic treatment may lead to successful outcomes. None.

P13 | Bandage Contact Lens Monotherapy as a Treatment Option for Canine SCCEDS

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**Purpose:** To describe the ophthalmic findings and the outcomes of superficial chronic corneal epithelial defects (SCCEDs) in dogs which were treated solely with a bandage contact lens (BCL), or “BCL monotherapy.”

**Methods:** Three dogs were presented to the Tottori University Veterinary Medical Center with more than three-week history of unilateral non-healing corneal ulcer. All dogs responded poorly to medical management using topical antibiotic and acetylcysteine solutions prior to referral. All dogs showed signs of ocular pain such as photophobia and lacrimation. Ophthalmic examination revealed a para-axial corneal ulcer with loose epithelial margins. Fluorescein stain was retained in the affected cornea and appeared as a surrounding halo at the perimeter. The diagnosis of SCCEDs was confirmed. The BCL remained in place throughout the course of the treatment.

**Conclusions:** BCL monotherapy was effective to alleviate ocular pain immediately and to achieve complete resolution of SCCEDs in the dogs. BCL monotherapy is in contrast to traditional approaches where a BCL is usually applied adjunctive to mechanical interventions. BCL monotherapy, as an initial approach, could be a useful treatment option for canine SCCEDs. None.

P14 | An Acidic Chemical Corneal Ulceration Secondary to Nail Polish Spill in a Puppy

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**Purpose:** To describe the treatment of an acidic chemical corneal ulceration in a puppy secondary to nail polish spill.

**Methods:** A 12-week-old male neutered Australian Shepherd mix dog was presented to Colorado State University’s Veterinary Teaching Hospital acutely post-exposure to nail polish spilling on the left cornea. Initial ophthalmic examination revealed nail polish adhered to approximately 80% of the cornea. Copious flushing with eye wash was performed, but no breaks in nail polish adherence were noted. OS was treated with one single drop ofloxacin 0.3% ophthalmic
solution (Akorn, Lake Forest, IL) and one single drop atropine 1% ophthalmic solution (Akorn, Lake Forest, IL). The puppy was hospitalized overnight receiving one drop I-drop Vet ophthalmic lubrication (I-MED Pharma Inc., Dollard-des-Ormeaux QC, Canada) q1hour. Following six hours treatment with lubrication, the nail polish plaque loosened and was removed in one piece after topical analgesia was applied to the cornea. After removal of the plaque, a superficial corneal ulceration covering 100% of the corneal surface was noted secondary to acidic chemical burn.

**Results:** Following topical lubrication, ofloxacin, serum and atropine treatment for eight days, the superficial corneal ulcer was completely healed with no significant long-term consequences. The puppy also developed diffuse corneal edema that resolved after topical 5% hypertonic saline (Muro 128, Bausch & Lomb, Bridgewater, NJ) treatment.

**Conclusion:** This case report describes the management of an acidic chemical corneal ulceration secondary to nail polish spill in a puppy. Early assessment and vigilance in treatment was essential for a good prognosis and outcome. None.

**P15 | Ocular Lesions of Blastomyces dermatitidis in 21 Cats (1978–2019)**

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**Purpose:** To evaluate ocular lesions resulting from *Blastomyces dermatitidis* and determine the incidence of ocular involvement in cases of feline blastomycosis.

**Methods:** Medical records from the University of Tennessee College of Veterinary Medicine were reviewed for cats with confirmed *Blastomyces dermatitidis*. The group was subdivided into patients with ocular involvement and those without. Clinical signs, histopathologic findings, and response to treatment were evaluated. Incidence of ocular involvement across all cases with confirmed blastomycosis was evaluated.

**Results:** Thirty-five cats had confirmed blastomycosis. Twenty-one of those 35 cats (60%) had evidence of ocular abnormalities. Two of those 21 also had systemic hypertension and were not included in further analysis. Fifteen of the remaining 19 cats had bilateral ocular signs. Ten of the 19 had inflammatory ocular lesions and nine had neuro-ophthalmic findings. On presentation, six of 19 cats appeared completely blind and five were unilaterally blind based on menace responses and tracking. In the inflammatory group, 17 eyes from ten cats had ocular abnormalities. The most common inflammatory ocular lesions were anterior uveitis, active chorioretinitis and retinal detachment, occurring in 41%, 35%, and 24% of eyes, respectively. In the neuro-ophthalmic group, 15 eyes from nine cats had abnormalities. The most common neuro-ophthalmic signs were negative menace/tracking and negative pupillary light responses in 67% and 27% of eyes, respectively.

**Conclusions:** Results indicate both inflammatory and neuro-ophthalmic signs are common in cats with blastomycosis. Cats showing signs of anterior uveitis, posterior uveitis or neuro-ophthalmic signs should have blastomycosis considered as a differential diagnosis. None.

**P16 | Impact of Attire on Client Perceptions of Veterinarians**

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**Purpose:** To determine the effect that veterinarian attire and gender has on clients’ perceptions of veterinarians in a large academic specialty hospital.

**Methods:** Clients volunteered to answer a survey in the small animal waiting area of a large Midwestern academic veterinary hospital over a 3-month period. The survey consisted of demographic information, information about the nature of their appointment with their pet, and questions regarding their level of comfort with and the trustworthiness of a Caucasian male and Caucasian female model in 4 different types of attire: surgical scrubs, surgical scrubs with white lab coat, business casual, and business casual with white lab coat. Relevant effects of interest were estimated using linear mixed models.

**Results:** 505 clients participated in the survey yielding a total of 6,217 completed survey questions. Clients perceived veterinarians wearing white lab coats as more competent and reported more comfort with these veterinarians (*P* < 0.0001). When comparing surgical scrubs with no lab coat to business attire with no lab coat, surgical scrubs resulted in higher perceived competence and comfort levels (*P* < 0.0001). Male veterinarians were perceived as slightly more competent than female veterinarians (*P* < 0.005).

**Conclusions:** Wearing a white coat over both surgical attire and business casual increases perceived competency and comfort levels of clients compared to not wearing a white coat.
P17 | Effects of Pupil Dilation With Topical 0.5% Tropicamide on Retinal Vascular Parameters Assessed by Vampire® (Vascular Assay and Measurement Platform for Images of the Retina) Software in Healthy Cats

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Purpose: To investigate the effects of mydriasis obtained with topical 0.5% tropicamide (Visumidriatic 0.5%, Visufarma s.p.a., Rome, Italy) on retinal vascular parameters evaluated by the retinal imaging software VAMPIRE® in cats.

Methods: A longitudinal study on 40 clinically normal adult cats of both sexes was performed. Topical 0.5% tropicamide was instilled to dilate the right pupil only. The left eye was used as a control. Before pharmacological dilation (T0), infrared pupil-lometry of both pupil was performed and fundus images were taken from both eyes. Right eye fundus images were then captured 30 minutes after topical instillation of tropicamide (T1), when mydriasis was achieved. The vessel diameters (4 veins and 4 arteries) were measured with Vampire® annotation tool adapted for measuring the feline fundus. After normality assessment, t-test was used to analyze mean difference for vascular parameters of left and right eye; paired sample t-test was used to test the mean difference for the same vascular parameters at T0 and T1. Statistical significance level was set at alpha = 0.05 with Bonferroni correction accounting for multiple comparisons.

Results: Right and left eye showed no statistical differences for pupil and vascular parameters measurements at T0. At T1, only one artery measurement showed a significant difference with a mild mean vasoconstriction of about 4% (6.28 ± 0.84 vs 6.04 ± 0.59); none of the other vascular parameters resulted significantly different at this time point.

Conclusions: Topical 0.5% tropicamide seems not to affect the results of retinal vascular analysis using the retinal imaging software VAMPIRE®. None.

P18 | Triage Via Teleophthalmology for the Assessment of Ocular Urgency in a Veterinary Hospital During Covid-19 Pandemic Lockdown

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Conclusions: Triage via teleophthalmology application provided a reliable tool for managing ocular urgency. None.

P19 | Career-Based Cross Sectional Population Variations of Intraocular Pressure Measurement of Ex Vivo Porcine Eyes

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Purpose: To evaluate differences in intraocular pressure (IOP) measurements obtained by a veterinary teaching hospital population.

Methods: Ex vivo porcine eyes with and without eyelids were affixed to a support and intraocular pressure was controlled with a digital manometer. Veterinarians, students and nurses, with ≤ 5 (Group A) or > 5 (Group B) previous tonometry experiences, obtained IOP measurements with Tono-Pen XL® (TP) and TonoVet® (TV) tonometers (with eyelids; 204 (102TP/102TV), without eyelids; 184 (93TP/91TV).

Results: Median measured IOPs were less than manometric value for both TP and TV; on average, TP overestimated and
TV underestimated IOP. Tono-Pen IOPs were more variable. Nurses underestimated IOP by 2 mmHg more on average than veterinarians and students, but there were no significant differences in errors > 25 mmHg above manometric value (“high errors”) between career statuses. Group A more often obtained “high error” TP measurements than Group B, but differences were not significant. Presence of eyelids significantly increased measured IOP values and variability, especially for the TP, with significantly increased odds of obtaining “high error”. 

Conclusion: Across a variable operator population there was more risk of “high error” and variability of measured IOP with the TP than the TV. Presence of eyelids further increased variability, especially for the TP, leading to an on average overestimation of IOP despite known underestimation versus manometry. Any veterinary career status and experience level operator is more likely to obtain a more consistent IOP measurement with the TV than the TP in an ex vivo porcine eye model. None.

**P21 | Investigation of Classification Accuracy and Clinical Management Trends of Corneal Ulcer Types Between General Practitioners and Ophthalmologists**

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**Purpose:** Evaluate and compare corneal ulcer type classification accuracy and current management trends between veterinary general practitioners (GPs) and veterinary ophthalmologists.

**Methods:** A computer-based questionnaire was formulated utilizing 4 different corneal ulcer images for classification evaluation, diagnostics, medications, therapeutics, and re-check intervals for each ulcer type based on the respondents’ responses. An alternative significance threshold of 0.01 was used. Fisher’s exact test was used to compare classification accuracy of GPs and Ophthalmologists. Mann-Whitney test was used to examine comparisons between CE hours, last CE received, and re-check intervals between classified ulcer groups. Student’s t-test with Satterthwaite correction was used to test if accuracy of classification correlated with age.

**Results:** 25 GPs and 122 ophthalmologists participated in the questionnaire. Overall accuracy in corneal ulcer classification from lowest to highest was anterior stromal (33%), indolent (86%), superficial (89%) and deep stromal (86%). There was a significantly higher correct percentage for ophthalmologists for both indolent (91.8% ophthalmologists versus 56% GPs) and superficial (93.44% ophthalmologists versus 68% GPs) ulcers. Accuracy for indolent and superficial corneal ulcer classification was significantly higher with increased ophthalmology-based CE hours (20–30 hours/year for ophthalmologists, 8–12 hours/year for GPs). Regarding the individual ulcer types, there was a significant difference (P < 0.01) between the antibiotics, anti-collagenases, and therapeutic procedures chosen between GPs and ophthalmologists.

**Conclusions:** Inconsistencies in the classification of corneal ulcers is common among GPs resulting in management practices that can be unfavorable to corneal health. Continued CE is essential for accurate diagnosis, and appropriate diagnostic and treatment of corneal ulcerations. None.

**P20 | Electron Microscopy Evaluation of Ocular Tissues in a Case of Sudden Acquired Retinal Degeneration Syndrome (SARDS)**

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**Purpose:** To characterize the ultrastructural retinal pathology of a dog with a recent diagnosis of SARDS in which freshly fixed ocular tissues and necropsy were available.

**Methods:** A 10-year-old neutered male American Hairless Terrier dog presented with acute blindness. Physical examination, including neurologic examination, was normal except for blindness. An electroretinogram revealed no discernible retinal function. Three months later, pancreatitis and presumed extrahepatic biliary obstruction was diagnosed, and euthanasia was elected. Both globes were immersion fixed in Karnovsky’s fixative for transmission electron microscopy (TEM) of the retina. A complete necropsy was performed on the body after removal of the eyes.

**Results:** Necropsy revealed severe acute on chronic necrotizing pancreatitis and fat necrosis. Histology from necropsy samples revealed extensive lipid embolization, most prominent in the kidney and lungs. Foci of malacia were seen in sections of the brain, likely due to lipid embolization. The retina had outer photoreceptor degeneration with minimal inner retinal degeneration. Rare lipid emboli were seen in the choriocapillaris. The TEM changes in the choriocapillaris included swollen endothelial cells with occasional aggregates of necrotic debris within the stenotic capillary structures. Only rarely was a clear choriocapillaris lumen noted.

**Conclusions:** The retinal and choriocapillaris morphology in this case might support the hypothesis that inadequate chorial perfusion contributes to outer retinal dysfunction and degeneration in canine SARDS. None.
P22 | Intraocular Pressure as a Function of Age in a Large Cohort of Dogs, Measured With Tonovet®, Tonovet Plus®, and Tono-Pen Vet®

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Purpose: To assess the intraocular pressure (IOP) as a function of age in a large cohort of dogs and to assess repeatability and the correlation among three commercially-available tonometers: TonoVet® (TV), TonoVet Plus® (TVP), and Tono-Pen Vet® (TP).

Methods: Ninety-four mixed-breed dogs, 188 eyes, from an animal research colony ranging from 2 weeks to 9.8 years of age were selected for the study. All three tonometers were used for both longitudinal (12 dogs, 24 eyes, from 2 to 12 weeks of age) and cross-sectional measurements (seven age groups each consisting of 10 dogs, 20 eyes, and defined as follows: 6–9 months, 1–1.5 years, 1.5–2 years, 2–6 years of age and an additional age group of 12 dogs, 24 eyes, >6 years old). Generalized linear regression models were used to assess the association of IOP with age.

Results: A positive linear relationship between IOP and age was found from 2 weeks to 6 months of age. In the cross-sectional study, IOPs acquired with TV, TVP, and TP were statistically different across age groups. TVP provided similar repeatability but measured higher IOP values than the other two tonometers.

Conclusions: The IOP values from TVP should be interpreted based on the TVP reference values presented herein together with the patient’s clinical evaluation. The same instrument should be used for follow-up IOP measurements in individual dogs. For all three tonometers, IOP varied between different dog age groups. Supported by NIH/NEI-R01EY06855 and Foundation Fighting Blindness Center grants. None.

P23 | Effect of Different Tono-Pen Vet™ Probe Covers on Intraocular Pressure Measurements in Ex Vivo Canine Eyes

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Purpose: To evaluate the accuracy and precision of the Tono-Pen Vet™ tonometer using two different probe covers as compared to direct manometry in ex vivo canine eyes. A secondary objective was to compare the Tono-Pen Vet™ to the new TonoVet Plus™ tonometer.

Methods: The anterior chambers of 12 normal ex vivo canine globes were cannulated and calibrated manometry was performed. Five readings each were obtained at IOPs from 5 to 80 mmHg using the Tono-Pen Vet with the manufacturer recommended Ocu-Film® cover (Reichert, TP-OF) and with an alternative Softips® cover (Automated Ophthalmics, TP-ST), and also with the TonoVet Plus (TV-P). Data were analyzed by mixed effects ANOVA, and pairwise comparisons were made with Tukey adjustments within each IOP.

Results: There was no difference in IOP readings between TP-OF and TP-ST at any IOP, except at 80 mmHg where TP-OF exceeded TP-ST by 1.9 mmHg (P = 0.001). Both TP-OF and TP-ST measurements were significantly lower than TV-P for all manometric IOPs ranging from 10–80 mmHg (P < 0.001). The TV-P was accurate when estimating manometric IOPs throughout the pressure spectrum. Precision of estimated IOPs by the TP-OF, TP-ST, and TV-P decreased as IOP increased, especially with the TV-P.

Conclusions: There was no difference in the precision or accuracy of the Tono-Pen Vet tonometer when using the manufacturer recommended or alternative probe covers. The TonoVet Plus is accurate at all measured IOPs, but becomes less precise with increasingly elevated IOPs. None.


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Purpose: Comparison of post-surgical complications between trans-conjunctival (open) and trans-palpebral (closed) enucleation techniques.

Methods: A search of medical records from a specialty referral hospital database identified canine and feline patients that had undergone an enucleation between 2005 and 2013, and subsequent complication(s) which required another surgery. Several parameters were evaluated for significance.

Results: 9,109 enucleations were performed during the timeframe. Fifty-three (53) cases had complications leading to a second surgery. The overall enucleation complication rate was 0.58%. Postoperative complications included orbital cyst-draining tract formation (n = 38), incisional dehiscence...
Abstracts (n = 10), emphysema (n = 1), and others (n = 4). Forty-one (77%) cases were complications with the open enucleation technique, and twelve (23%) cases were complications with the closed enucleation technique. Complications began 14 to 913 days following enucleation (mean 139 days) for the open technique, and 7 to 1095 days following enucleation (mean 255 days) for the closed technique.

Conclusions: The overall complication rate for enucleation is low, however the open surgical technique complications are three and one-half times higher than the closed surgical technique. As documented in medical literature, conjunctival tissues incompletely removed during an enucleation surgery lead to these complications and the development of inclusion cysts, especially with the open surgical technique. None.

P25 | Lower Lid Entropion in Dogs: A Modified Technique of the Combined Hotz–Celsius and Wedge Resection Procedure

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Purpose: To describe a modification of the combined Hotz-Celsius and wedge resection technique for the treatment of the lower lid entropion in dogs, and evaluate its success rate.

Methods: To reduce tissue disruption, facilitate tissue handling and shorten surgical time, shortening of the eyelid was performed excising a rectangular shape on the eyelid margin only, in the central section, not extending below the first H-C incision. The eyelid margin surgical wound was then sutured before excision of the Hotz-Celsius crescent which had been outlined at the start of surgery. Records of thirty one dogs were reviewed for signalment, outcome, need of further surgery, and follow up from 6 to 48 months after surgery, (mean 30 months).

Results: 61 eyes with lower lid entropion were treated. The main breeds were English bulldog and English cocker spaniel and the average age was 23 months (range 3 months to 5.7 years). The success rate for a single surgery was 98.4%. One eyelid required a second surgical correction and 4 eyelids of three large breed dogs had wound breakdown.

Conclusions: This modified technique is successful at correcting lower eyelid entropion in dogs while being technically easier to perform and allowing eyelid kink correction , if present, at the same time. None.

P26 | Surgical Correction and Prophylactic Surgical Correction of Third Eyelid Gland Prolapse: A Retrospective Study

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Purpose: Evaluate the effectiveness of surgical techniques to correct third eyelid gland prolapse (TEGP), to prevent re-prolapse, and their effectiveness as a prophylactic treatment.

Methods: Multi-center retrospective analysis was conducted on medical records of 245 dogs (397 eyes) that had surgery for TEGP between 2008 and 2019. Data collected included age, sex, breed, eye(s) affected, prolapse duration, prophylactic treatment of the contralateral eye, occurrence of the prophylactically treated eye, medical management before surgery, duration of treatment prior to surgery, surgical procedure(s), post-surgical treatment(s), follow-up duration, re-prolapse of treated eye(s), time to re-prolapse, prolapse after prophylactic treatment, complications, and concurrent ocular conditions.

Results: Surgery was performed on 397 eyes. The Morgan pocket (MP) technique was performed in 375 eyes, orbital rim tacking in 1 eye, combined MP-orbital rim tacking in 7 eyes, and combined MP-intra-nictitans tacking in 14 eyes. Successful repositioning was attained in 374 (94%) eyes. Re-prolapse occurred in 23/397 (5.8%) eyes. Of the 397 eyes, 83 of the contralateral eyes were treated prophylactically based on surgeons’ preference. One prophylactically treated eye prolapsed. No correlation was found between surgical procedure(s) performed and re-prolapse (P = 0.11). Re-prolapse was statistically significantly more common in castrated males than in spayed females (P < 0.007).

Conclusions: MP technique alone or in combination with other surgical techniques was successful in correcting TEGP. No surgical procedure was significantly more effective at preventing re-prolapse. Benefits of prophylactic treatment of TEGP could not be determined. No concurrent ocular conditions correlated with TEGP. None.

P27 | Keratoconus Secondary to Transscleral Cyclophotocoagulation in a Siberian Husky: Case Report

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Purpose: This case report documents a pseudokeratoconus induced by a transscleral cyclophotocoagulation in a Siberian Husky.
Methods: A 4 year-old, male, Siberian Husky was examined at Vetweb Veterinary Ophthalmology with a history of chronic glaucoma not responsive to topical hypotensive drugs. During the ophthalmic exam, the right eye showed a severe conjunctival hyperemia, engorged episcleral vessels, miosis and moderate flare with an intraocular pressure (IOP) of 46 mmHg. Menace response was present and fundic exam revealed moderate retinal vascular attenuation and no retinal detachments. The left eye was calm with good ocular reflex and IOP of 21 mmHg. Gonioscopy revealed a bilateral goniodysgenesis. Cyclophotocoagulation with 820 nm diode laser was performed on the right eye. Following the procedure 0.1% nepafenac TID, 0.3% gatifloxacin TID and 1% prednisolone TID was applied topically and 0.3 ml of betamethasone injected subconjunctivally. Three days post-laser severe corneal edema and pseudokeratoconus was observed in the treated eye. Cross-linking and a third eyelid flap was performed. At two weeks recheck the right eye showed improved corneal transparency with resolution of the pseudokeratoconus. IOP was 16 mmHg and vision was preserved.

Results: Pseudokeratoconus induced by cyclophotocoagulation could be a complication after the procedure. Cross-linking along with a compressive third eyelid flap is a good management option.

Conclusions: Laser cyclophotocoagulation is a good option to control refractory glaucoma cases but the procedure is not complication free and patients should be closely monitored for the first week after the procedure. None.


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Purpose: To evaluate outcomes in horses treated with diode laser ablation for uveal cysts.

Methods: Medical records from the Hospital for Large Animals at the Cummings School of Veterinary Medicine were reviewed to identify horses with uveal cysts treated with diode laser ablation. Data collected included age, breed, sex, eye treated, behavioral complaints prior to presentation, effect of procedure on behavior, and complications associated with the procedure. Owners were contacted to provide information regarding resolution of behavioral complaints following the procedure.

Results: 69 eyes from 47 horses were treated (9 OS, 16 OD, 22 OU). The study population included 36 geldings and 11 mares, representing 18 breeds. Median age was 12 years (range 2–23 years). Owners of 34/47 horses (72%) reported one or more undesirable behaviors believed to be associated with the cyst: spooking or shying (29 horses), head bobbing (5 horses), or decreased performance (10 horses). Follow-up was available for 16 horses with an original behavioral complaint. For those horses, 10/16 (62.5%) of owners reported significant improvement in behaviors following cyst ablation, 3/16 (18.75%) reported some improvement, and 3/16 (18.75%) reported no change. No complications were reported in association with the procedure.

Conclusions: Diode laser uveal cyst ablation appears to be effective in resolving certain undesirable behaviors in horses. None.

P29 | Orbital Implant Use in Dogs Undergoing Enucleation: A Review of Owner Perceptions and Satisfaction

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Purpose: To evaluate owner satisfaction with orbital implant placement at the time of enucleation.

Methods: Medical records of dogs who presented to the Ophthalmology Service at the Virginia-Maryland Veterinary Teaching Hospital (VMVTH) from May 2007 to November 2019 for orbital implant placement were reviewed. Owners were telephoned with a series of questions to evaluate information on client satisfaction. Descriptive statistics were used when appropriate.

Results: A total of 186 dogs followed inclusion criteria. A total of 95 owner survey responses were completed (51.1%) with post-surgical median period of 6.3 years (range: 0.07–12.6 yr). Most owners, 85.3% (n = 81) were pleased with the outcome following surgery. Of owners surveyed, 6.3% (n = 6) were unsure and 8.4% (n = 8) would not consent to the procedure again. Reasons for dissatisfaction included post-operative pain, age of dog, lack of client communication.

Conclusion: Results of this study indicated high owner satisfaction rates for orbital implant placement at the time of enucleation. Owners considering implant placement should be advised about potential complications such as post-operative pain and prolonged healing time. None.

P30 | Causes and Outcomes of Dogs Undergoing Enucleation With Orbital Implant Placement: A Retrospective Study of 197 Cases

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Purpose: To describe the clinical and histopathologic diagnoses, and associated post-operative complications following the use of orbital silicone implant in dogs undergoing enucleation.
Methods: Retrospective review of medical records from dogs that underwent enucleation with orbital implant placement performed by the Virginia-Maryland Veterinary Teaching Hospital Ophthalmology Service between 2007 and 2019. Signalment, clinical and histopathologic diagnoses, concurrent ocular and systemic disease, perioperative treatments and associated complications were recorded.

Results: Enucleation with orbital implant was performed in 215 eyes of 186 dogs. Median age at surgery was 9.2 years (range: 0.2–17.9 years). Both eyes from twenty-nine dogs (15.6%) were enucleated. The most common pre-operative diagnoses that prompted enucleation were glaucoma (68.8%), uveitis (17.7%), cataracts (15.8%), intraocular neoplasia (13.0%), and lens luxation (10.7%). The most common histopathologic diagnoses were retinal degeneration (46.5%), uveitis (39.5%), cataract (29.8%), retinal detachment (27.4%), and secondary glaucoma (26.5%). Complications were recorded in 14 eyes (6.5%) of which 10 eyes (from 9 dogs) were treated for orbital cellulitis (80%), implant migration (10%), and implant extrusion (10%). Median complication time from surgery was 41 days (range: 11–541 days). The complication rate was 27.8% among diabetic dogs in the study population. Diabetes mellitus was associated with an increased risk of complications on chi-square analysis ($P < 0.0001$). None of the dogs with complications had a histopathology diagnosis of neoplasia.

Conclusion: Enucleation with orbital implant placement is a viable salvage procedure, with a low complication rate, for irreversibly blind eyes. Diabetes mellitus may be associated with the development of post-operative complications. None.