IEOC/Acrivet Equine Ophthalmology Symposium

University of Stirling, Management Centre
Stirling, Scotland

June 10 – 12, 2012
The goal of this symposium is to share, with a small group of dedicated clinicians and scientists, current clinical and basic research on equine ophthalmology. Abstract and case presentations, along with social events, will facilitate the development of multi-centered collaborative research.

This symposium is sponsored by:

Acrivet
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SYMPOSIUM PROGRAM
Map of meeting space: Page 49

Sunday, June 10

6:00pm – 9:00pm  Welcome Reception
Room: TBA (Stirling Centre) Dinner and 2 drinks provided for registered
attendees and guests

Monday, June 11

7:45am – 8:30am  Breakfast with sponsor
Room: TBA (Stirling Centre)
Room: Blaireatholl
8:30am – 8:35am  Introduction and Welcome – Rob Lowe
State of the Art Lecture
Dr. Derek Knottenbelt
8:35am – 9:45am  “Ocular, Orbital and Periorbital Neoplastic
Conditions of the Horse”
9:45am – 10:45am “The Clinical Challenges of the Equine
Periocular Sarcoid”
10:45am – 11:00am Break with sponsor
Room: Silver Glen
Scientific Abstracts (Moderator: TBA)
15 minute presentations, 5 minute Q&A
Room: Blaireatholl
11:00am – 11:20am R. Stoppini  “PHARMACOLOGICAL CYTOREDUCTION
AND SLIDING SKIN GRAFT (H-PLASTY)
FOR BILATERAL LOWER-EYELID
SQUAMOUS CELL CARCINOMA IN A
PONY”

Case Reports
10 minute presentations, 5 minute discussion

11:20am – 11:35am A. Dwyer  Topic: Eyelids
11:35am – 11:50am E. Giuliano  Topic: Nasolacrimal (NL) Disease - as a
Result of Suture Exostosis in a 15 Year Old
Thoroughbred

Roundtable Discussion
11:50am – 12:15pm  Eyelid Disease

12:15pm – 1:30pm  Lunch provided for attendees, with
Room: TBA (Stirling Centre) sponsor
Scientific Abstracts (Moderator: TBA)
15 minute presentations, 5 minute Q&A

1:30pm – 1:50pm  W. Townsend  “FEASIBILITY OF AQUEOUS SHUNTS AS THERAPY FOR EQUINE GLAUCOMA”

1:50pm – 2:10pm  A. Metzler  “EFFECT OF SEMICONDUCTOR DIODER LASER TRANSSCLERAL CYCLOPHOTOCOAGULATION IN BUPHTHALMIC EQUINE GLOBES”

2:10pm – 2:30pm  R. McMullen  “PREVALENCE OF NATURALLY OCCURRING REFRACTIVE ERRORS IN THE NORMAL ADULT EQUINE EYE AND POTENTIAL CORRELATION TO BREED, AGE, COAT AND IRIS COLOR, OR GENDER”

2:30pm – 2:50pm  A. Labelle  “EQUINE INTRAOCULAR MELANOCYTIC NEOPLASIA (EIMN): 52 CASES”

2:50pm – 3:10pm  Break with sponsor
Room: Silver Glen

Case Reports
10 minute presentations, 5 minute discussion

3:10pm – 3:25pm  D. Brooks  Topic: Uvea

3:25pm – 3:40pm  D. Brooks  Topic: Lens

3:40pm – 3:55pm  D. Brooks  Topic: Lens

3:55pm – 4:10pm  C. Plummer  Topic: Optic Nerve

4:10pm – 4:25pm  R. McMullen  Topic: Neuro-ophthalmology

4:25pm – 4:40pm  D. Whitley  Topic: Neuro-ophthalmology

Roundtable Discussion
4:50pm – 5:15pm  Collated reports from morning session

5:15pm  Close

5:30pm – 6:00pm  IEOC Member Business Meeting
Room: Silver Glen

7:00pm – 9:30pm  Dinner and entertainment provided
Room: TBA (Stirling Centre) for registered attendees and guests
**Tuesday, June 12**

8:15am – 9:00am  Breakfast with sponsor  
Room: TBA (Stirling Centre)

Room: Blaireatholl  
9:00am – 9:05am  Introduction and Welcome – Rob Lowe

**Scientific Abstracts (Moderator: TBA)**  
15 minute presentations, 5 minute Q&A

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:05am – 9:25am</td>
<td>B. Gilger</td>
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</tr>
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</tr>
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</tr>
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</tr>
</tbody>
</table>

**Case Report**  
10 minute presentations, 5 minute discussion

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:25am – 10:40pm</td>
<td>T. Launois</td>
<td>Cornea</td>
</tr>
</tbody>
</table>

10:40am – 11:00am  Break with sponsor  
Room: Silver Glen

11:00am – 12:00pm  Keynote Speaker: Mr. Sathish Srinivasan  
“The New or Evolving Approaches to the Medical Management of Ocular Surface and Corneal Disease”

12:00pm – 1:00pm  Lunch provided for attendees, with sponsor  
Room: TBA (Stirling Centre)

1:00pm – 2:00pm  Keynote Speaker: Mr. Sathish Srinivasan  
“Corneal Disease and Recent Advances in Corneal Transplantation Techniques”

**Panel Discussion**  
2:00pm – 2:30pm  Topic: Cornea

2:30pm – 2:45pm  Break with sponsor  
Room: Silver Glen
Scientific Abstract (Moderator: TBA)
15 minute presentations, 5 minute Q&A
Room: Blaireatholl

2:45pm – 3:05pm  C. Hartley  “CYLINDROCARPON KERATITIS AND UVEITIS IN AN EIGHT-YEAR-OLD MARE – PRESENTATION, DIAGNOSIS, TREATMENT & OUTCOME”

Case Discussions
10 minute presentations, 5 minute discussion

3:05pm – 3:20pm  M. Kallberg  Topic: Cornea
3:20pm – 3:35pm  E. Whitley  Topic: Cornea
3:35pm – 3:50pm  C. Plummer  Topic: Cornea
3:50pm – 4:05pm  A. Dwyer  Topic: Cornea
4:05pm – 4:20pm  A. Matthews  Topic: Cornea - Linear Keratopathy in a Horse: an Onset

4:20pm – 4:30pm  Presentation by Richard McMullen

4:30pm  Adjourn

4:45pm – 5:30pm  IEOC Board Meeting
Room: Silver Glen

7:00pm – 9:00pm  Dinner provided
Room: TBA (Stirling Centre) for registered attendees and guests
SYMPOSIUM INDEX
LISTED IN ORDER OF PRESENTATION

Program schedule........................................................................................................... Page 3

Monday, June 11th
State of the Art Lecturer, Dr. Derek Knottenbelt.................................................. Page 9
“Periocular and Adnexal Tumours of the Horse (Non-sarcoid)”
“The Challenges of the Equine Periocular Sarcoid.”
(Notes provided as a separate handout.)

Abstracts:

<table>
<thead>
<tr>
<th>Author</th>
<th>Title</th>
<th>Page</th>
</tr>
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<tbody>
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<td>11</td>
</tr>
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<td>15</td>
</tr>
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<td>16</td>
</tr>
<tr>
<td>R. McMullen</td>
<td>“PREVALENCE OF NATURALLY OCCURRING REFRACTIVE ERRORS IN THE NORMAL ADULT EQUINE EYE AND POTENTIAL CORRELATION TO BREED, AGE, COAT AND IRIS COLOR, OR GENDER”</td>
<td>17</td>
</tr>
<tr>
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<td>18</td>
</tr>
</tbody>
</table>

Case Reports:

<table>
<thead>
<tr>
<th>Author</th>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Dwyer</td>
<td>Eyelids</td>
<td>12</td>
</tr>
<tr>
<td>E. Giuliano</td>
<td>Nasolacrimal (NL) Disease: As a Result of Suture Exostosis in a 15 Year Old Thoroughbred</td>
<td>14</td>
</tr>
<tr>
<td>D. Brooks</td>
<td>Uvea</td>
<td>19</td>
</tr>
<tr>
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<td>Lens</td>
<td>21</td>
</tr>
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<td>Lens</td>
<td>23</td>
</tr>
<tr>
<td>C. Plummer</td>
<td>Optic Nerve</td>
<td>24</td>
</tr>
<tr>
<td>R. McMullen</td>
<td>Neuro-ophthalmology</td>
<td>26</td>
</tr>
<tr>
<td>D. Whitley</td>
<td>Neuro-ophthalmology</td>
<td>28</td>
</tr>
</tbody>
</table>
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“The New or Evolving Approaches to the Medical Management of Ocular
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<tr>
<td>B. Gilger</td>
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<td>32</td>
</tr>
<tr>
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<td>33</td>
</tr>
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<td>34</td>
</tr>
<tr>
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<td>35</td>
</tr>
<tr>
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<td>42</td>
</tr>
</tbody>
</table>

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<table>
<thead>
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<th>Author</th>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
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<td>Cornea</td>
<td>36</td>
</tr>
<tr>
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<td>Cornea</td>
<td>40</td>
</tr>
<tr>
<td>E. Whitley</td>
<td>Cornea</td>
<td>43</td>
</tr>
<tr>
<td>C. Plummer</td>
<td>Cornea</td>
<td>44</td>
</tr>
<tr>
<td>A. Dwyer</td>
<td>Cornea</td>
<td>46</td>
</tr>
<tr>
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<td>Cornea: Linear Keratopahy in a Horse - an Onset</td>
<td>47</td>
</tr>
</tbody>
</table>
Derek Knottenbelt qualified from Edinburgh University in 1970 and after a period in research, spent 12 years in private practice. During this time he developed an interest in equine medicine and in 1985 he joined the academic world. He moved to Liverpool in 1989 and has since become Professor in Equine Internal Medicine. He has published widely in the scientific and lay press and has authored several text books. He has received international awards for his welfare work, his science and in 2005 he was honored with an Order of the British Empire (OBE) by the Queen for his services to the horse. He is involved with national and international equine welfare and other charities. His main professional interests are in oncology, dermatology, ophthalmology and wound management.
MONDAY SESSION
ABSTRACTS & CASE REPORTS
Purpose. To describe the use of pre-surgical cytoreduction and sliding skin grafts (H-plasty) to treat bilateral lower eyelid squamous cell carcinoma (SCC) in a pony. Methods. A light colored, 9 year old, Connemara Pony mare, presented with putative bilateral lower-eyelid SCC. Both masses involved more than 50% of the eyelid margin, and included the medial canthus OS. Due to the lack of well-documented cytoreductive therapy options (i.e., hyperthermia, brachytherapy, photodynamic therapy, etc.), wide surgical excision following pre-surgical cytoreduction was recommended. Due to the size of the tumor and absence of local regional or distant metastasis, pre-surgical cytoreduction was facilitated using systemic Piroxicam (0,3mg/kg/q24 hours PO) and local application of Imiquimod cream (3 times a week for 3 weeks). Slight reduction in the size of the masses was noted OU. Bilateral surgical resection and sliding skin grafts were performed under general anesthesia. Tobramycin ointment was applied topically after surgery (q6h OU) until healed and systemic antibiotics and flunixin-meglumine were administered for 7 days (q12h PO). Results. Histopathology confirmed the diagnosis of bilateral SCC. All microscopic surgical margins were free from neoplastic cells. Normal palpebral function and good cosmesis were maintained bilaterally. SCC has not recurred within the surgery sites 2 years postoperatively, but suspected SCC was recently noted in previously unaffected areas of the eyelid margin OU. Conclusions. Pre-surgical cytoreduction with piroxicam plus imiquimod cream and blepharoplasty may be considered as a treatment option for palpebral SCC, especially when other antineoplastic options are unavailable.
AUTHOR AND ADDRESS:
AE Dwyer, DVM
Genesee Valley Equine Clinic, PLLC
925 Chili Scottsville Road
Scottsville, NY 14546
585-889-1170

TOPIC AREA:
Eyelids

CASE SUMMARY:
Three Paint horses were presented with neoplasia of the lower eyelid involving one quarter to one half of the palpebral margin. Two of the tumors were close to the nasal canthus and one tumor was close to the lateral canthus. The owners of all three horses declined referral to a university due to financial limitations. All three horses underwent standing excision of the masses at a general equine clinic. A variety of blepharoplastic techniques were used to restore eyelid function and cosmesis. The surgery site of all three horses was treated with local infiltration of cisplatin in sesame oil on the day of surgery. The horses received a varying number of additional cisplatin treatments at two week intervals. All three tumors were confirmed as squamous cell carcinoma on histopathology. Cosmetic results of the surgeries were photographed at all recheck examinations. Due to the size and location of the tumors at presentation, a guarded prognosis for resolution was given for all three cases. Short and long term results will be presented as well as a description of the author’s simple technique for local cisplatin administration.

KEY WORDS:
eyelid, blepharoplasty, squamous cell carcinoma

DISCUSSION POINTS:
• Patient restraint, sedation and head support for standing eyelid surgery
• Techniques for blepharoplasty when >1/3 of eyelid must be resected
• Technique for local infiltration of adjunctive chemotherapy (cisplatin) after excision of eyelid tumors
A 15-year old Thoroughbred gelding presented to the University of Missouri Veterinary Medical Teaching Hospital for a bony growth between the eyes. The owner noted marked increase in facial bone disfiguration and bilateral ocular discharge over the preceding 4-6 weeks. On physical exam, significant abnormal findings included epiphora OU and a raised, firm proliferation measuring approximately eight centimeters in diameter located near the frontonasal and extending to the frontolacrimal suture lines. There was minimal soft tissue swelling and no pain on palpation. The sinuses percussed normally and other than points on the lingual and buccal surfaces of the mandibular and maxillary teeth respectively, no abnormalities were noted on oral exam. Skull radiographs revealed prominent bony proliferation and separation of the nasal sutures, consistent with the diagnosis of nasofrontal suture exostosis. Complete ophthalmic examination was normal except for negative Jones test OU. Right NL flushing was successful OD but deemed very difficult OS with only marginal patency established. A review of this horse’s clinical findings and careful review of the literature will be presented to stimulate discussion of this relatively rare cause of nasolacrimal obstruction in horses.
FEASIBILITY OF AQUEOUS SHUNTS AS THERAPY FOR EQUINE GLAUCOMA

(WM Townsend, IM Langohr, MC Mouney) Department of Veterinary Clinical Sciences, College of Veterinary Medicine, Purdue University; Department of Pathobiology and Diagnostic Investigation, College of Veterinary Medicine, Michigan State University.

Purpose. To determine if aqueous shunts in normal equine eyes significantly decrease intraocular pressure (IOP) without causing vision threatening complications. Methods. Aqueous shunts were placed in 7 normal eyes of 4 horses. The shunts (Model VFP7 Ahmed™ glaucoma valve, Cara Life, Inc.) were placed dorsotemporally. Exams were performed daily for 7 days and then q 3 days through 4 weeks post-implantation. Horses were then euthanized and globes enucleated for routine histologic examination. The IOPs were compared using a paired student’s t-test. Significance was set at p<0.05. Results. The mean IOP on day -1 (20.7±3.0mmHg.) was significantly higher than in week 4 (12.6±2.4mmHg) (p=0.0012). The aqueous shunts remained in situ for the entire study. Two eyes developed corneal ulcers that resolved. Shallow anterior chambers were noted in two eyes after shunt placement which normalized after placement of full eye cup masks. Histologically, 7/7 eyes had fibrosis surrounding the implant. Minimal peripheral neovascularization and neutrophilic keratitis were noted in 5/7 eyes. Histologically, keratoconjunctival inflammation was scored as none in 3/7, mild in 2/7, moderate in 1/7, and marked in 1/7 eyes. Conclusions. After placement of aqueous shunts, a significant decrease in IOP was noted from day -1 to week 4 despite fibrosis surrounding the implants. No vision threatening complications were noted. Aqueous shunts represent a feasible therapeutic option for equine glaucoma. Supported by the state of Indiana and the PVM Research account funded by the total wager tax. Aqueous shunts, suture, and viscoelastic donated by Cara Life, Inc. None.
EFFECT OF SEMICONDUCTOR DIODOER LASER TRANSSCLERAL CYCLOPHOTOCOAGULATION IN BUPHTHALMIC EQUINE GLOBES.
(AJ Gemensky-Metzler, DA Wilkie, SE Weisbrode, S Kuhn) The Ohio State University College of Veterinary Medicine, The University of Tennessee College of Veterinary Medicine.

**Purpose.** To determine if previously described location and energy settings for semiconductor diode transscleral cyclophotocoagulation (TSCP) are appropriate for buphthalmic equine globes. **Methods.** Nine blind buphthalmic globes were measured and lasered under general anesthesia immediately prior to enucleation. A 10 MHz ultrasound probe was used to measure the axial globe length. A Jameson caliper was used to measure the horizontal and vertical corneal diameter. Sixty sites were lasered 4 mm posterior to the limbus in the dorsotemporal and ventrotemporal quadrants at the settings of 1500 milliwatts and 1500 milliseconds for a total energy of 2.25J/site. Globes were enucleated, fixed in 10% formalin then sectioned sagittally over the temporal aspect of the globe in two blocks. Five histologic sections were taken from each block and stained with hematoxylin and eosin for light microscopic examination. **Results.** Histologic lesions included coagulation of the sclera and the stroma of the pars plicata, iris base and pectinate ligament, coagulation and disruption of the ciliary pigmented and non-pigmented epithelium and uveal pigment dispersion. In 8 of 9 globes examined, substantial coagulation of the pectinate ligament and/or iris base and the most anterior ciliary processes was noted. Histologic changes were more pronounced in the base than tips of ciliary processes. No lesions were observed in the pars plana or choroid of any globe. **Conclusions.** Previously recommended sites for TSCP result in damage to the iris and iridocorneal angle in buphthalmic globes. Further investigation is warranted to elucidate the appropriate location for TSCP in buphthalmic equine globes. **None.**
PREVALENCE OF NATURALLY OCCURRING REFRACTIVE ERRORS IN THE NORMAL ADULT EQUINE EYE AND POTENTIAL CORRELATION TO BREED, AGE, COAT AND IRIS COLOR, OR GENDER (RJ McMullen Jr, MG Davidson, BC Gilger) College of Veterinary Medicine, North Carolina State University, Raleigh, NC, USA

**Purpose.** To evaluate the noncyclopleged refractive state in the normal adult equine eye and identify any correlation between breed, age, coat and iris color, or gender.  

**Methods.** Between 2007 and 2011, the refractive state of 461 client owned horses (847 eyes) of various breeds, age, coat and iris color, and gender was assessed via streak retinoscopy. When the mean refractive state exceeded ± 0.5 diopter (D), horses were considered ametropic (hyperopic or myopic). Following assessment for anisometropia, the values for both eyes were averaged for statistical evaluation. Statistical analysis consisted of ANOVA and Student’s-t and Tukey-Kramer evaluation of data pairs.  

**Results.** Mean ± SD refractive state of all eyes is -0.02 ± 0.83 D, iris color, age, and coat color were not associated with any statistical significance. Significance was identified between Thoroughbred and Arabian (p = 0.0302) and QH and Arabian (p = 0.0294) breeds, and between geldings (-0.09 ± 0.92 D) and mares (+0.16 ± 0.58 D) (p = 0.0087). Ametropia with a refractive error ± 1.00 D was identified in 13.23% (61/461) of horses. Astigmatism was identified in 47.42% (218/461). The remaining 242/461 (52.58%) horses were emmetropic. Anisometropia (refractive error of each eye from one horse differed by > 1.00 D) was detected in 1.74% (8/461).  

**Conclusions.** The impact of the breed and gender differences identified in the present study is unknown. Further research is necessary to evaluate the impact of naturally occurring refractive errors on performance in the horse. **None.**
Purpose. To document the clinical and histopathologic characteristics of EIMN, to establish a correlation between EIMN and cutaneous melanoma and to report treatment results and long-term outcomes. Methods. Retrospective review of medical records from horses diagnosed with EIMN. Follow-up data was obtained by survey of owners and veterinarians. Results. 52 cases were included. The mean age was 12.4 +/- 5.0 years. Arabian (13/52) was the most common breed, and 43/52 horses had a grey coat color. Cutaneous melanoma was identified in 26/39 horses that received a physical examination at time of EIMN diagnosis. 2/52 horses were reported to develop cutaneous melanoma post-EIMN diagnosis. 30/52 horses received no treatment, although regular recheck examinations were advised. Treatments included photocoagulation, oral cimetidine and administration of xenogeneic DNA vaccine. 12/52 horses were enucleated. Histologically, EIMN was composed of heavily pigmented, spindle to polygonal cells with a low mitotic index. 12/52 cases were lost to follow up. 3/52 horses had evidence of multicentric disease involving > 2 organs. Horses that received only monitoring were reported as visual with a median follow-up time of 2.0 years (IQR 2.0-4.1 years). Horses that received treatment were reported as visual with a mean follow-up time of 2.25 +/- 1.39 years. There was no statistically significant difference between follow-up times of horses receiving monitoring versus treatment (p=0.312). Conclusion. EIMN is associated with cutaneous melanoma and is more common in grey horses than non-grey horses. Optimal treatment of EIMN has not been established. Supported by Arabian Riders & Breeders, Inc. None.
CASE SUMMARY:

Case 1 A Trakehner gelding born in 1996 presented for an iris mass in the OD. This horse had the left eye removed several years previously for an iris “tumor”. The iris of the right eye contained a large brown mass that obliterated part of the anterior chamber and extended several millimeters into the ciliary body. The iris surface surrounding the iris mass was lasered with an argon laser using an indirect delivery system to disrupt blood supply to the tumor. The posterior extension of the mass disappeared over next 2.5 years. The anterior component also reduced in size.

Case 2 A Lusitano stallion born in 1995 presented for pigmented iris lesions in OU. Presumed melanomas were found in the skin and both eyes with the ventral mass in the left eye touching the cornea and iridocorneal angle. There was no posterior extension of the mass. The iris adjacent to the mass in left eye was lasered with an argon laser at the periphery of the lesion. The mass has decreased in size over the last 1.5 years. The surface melanomas in the right eye were also lasered and have not increased in size.

Summary Iridectomy/cyclectomy may not be necessary for therapy of large uveal masses in the horse. Disruption of the blood supply to the lesion with a laser can slow and/or inhibit “tumor” growth in some horses.

KEY WORDS:
Iris melanoma, argon laser

DISCUSSION POINTS:

Winky: This horse had the left eye removed several years previously for an iris “tumor”. The iris of the right eye contained a large brown mass that obliterated part of the anterior chamber and extended several millimeters into the ciliary body. The iris surface surrounding the iris mass was lasered with an argon laser using an indirect delivery system to disrupt blood supply to the tumor. The posterior extension of the mass disappeared over next 2.5 years. The anterior component also reduced in size.
Pita: Melanomas were found in both eyes with the ventral mass in the left eye touching the cornea and iridocorneal angle. There was no posterior extension of the mass. The iris adjacent to the mass in left eye was lasered with an argon laser at the periphery of the lesion. The mass has decreased in size over the last 1.5 years. The surface melanomas in the right eye were also lasered and have not increased in size.
A 2 year old Andalusian gelding presented for evaluation of bilateral cataracts. Mature cataracts were present OU. No uveitis was evident. ERG were normal. Ultrasound was normal but for the presence of prominent subcapsular echogenicity and linear opacities within the lens capsule. Phacoemulsification was performed on the OS. The lens cortex subcapsularly was “formed into a membrane”, was very viscous and did not phaco well but the gelding was visual postoperatively. Three years later the horse was presented for surgery of the OD. The same subcapsular “membrane” was present in the OD and the surgery was very difficult. Partial retinal detachment occurred secondary to posterior lens capsule rupture and nuclear loss into the vitreous although some behavioral evidence of vision was present. It is not understood what caused the cortex to be so prominent OU.
CASE SUMMARY:
An 8 year old Quarter horse mare presented for evaluation of a cataract in her left eye. A mature cataract with no evidence of uveitis was present. An ERG was normal and the US had anterior vitreal echogenicity. Phacoemulsification was performed and a large mobile vitreal opacity noted following removal of the nucleus and cortex. A rent in the posterior capsule could not be identified intraoperatively. Postoperatively, the retina was normal but a large piece of lens cortex remained in the anterior vitreous attached to the posterior capsule.

KEY WORDS:
Lens, capsule rupture

DISCUSSION POINTS:
Postoperative result: mobile vitreal tissue
CASE SUMMARY:
A yearling thoroughbred colt presented for evaluation of diminished vision and potential cataract removal. Direct and consensual PLRs were normal OD, but absent OS. Menace was positive OD, negative OS. Immature cataracts were present OU, but the fundus could be easily appreciated OU. Extensive chorioretinal scarring was present OD, absent OS. A grey-white 4.5 x 2.5 mm lesion was appreciated extending from the optic disc into the vitreal chamber OS.

KEY WORDS:
Optic nerve, posterior uveitis, congenital, acquired

DISCUSSION POINTS:
An optic neuropathy vs congenital remnant?
Impact on vision of chorioretinal lesions?
Utility and safety of a unilaterally blind horse?
AUTHORS AND ADDRESS:
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TOPIC AREA:
Neuro-ophthalmology

CASE SUMMARY:
A 2 year-old gelding was presented for evaluation of blindness OS and unresponsive pupil OU. Two weeks prior was the last of several episodes of poll type head trauma. At that time head tilt, ptosis OD and mydriasis OU were noted. Abnormal findings on the initial ophthalmic examination included: negative menace response OD and reduced OS, negative dazzle reflex OU, negative pupillary light reflexes (direct /indirect) OU, fixed mydriasis OU, and multifocal linear areas of depigmentation within the non-tapetal fundus OU. CBC, serum chemistry, CSF analysis (including EPM titers) were within normal limits. Electroretinography (ERG) values were slightly reduced OU. A CT-scan of the head revealed comminuted fractures of both pterygoid bones. Instillation of 1% pilocarpine OU resulted only in miosis OS after 50 minutes. A final diagnosis of central blindness OD and internal ophthalmoplegia OU was made.

KEY WORDS:
Neuro-ophthalmology, blindness, internal ophthalmoplegia, optical coherence tomography

DISCUSSION POINTS:
Unexpected bone lesion
Unilateral response to topical pilocarpine
Localization through the optic nerve
Association between fundus lesions and visual deficits

Figure 1: Optical coherence tomography (OCT) screen shot from the LEFT eye.
Figure 2: Fundus photograph from the LEFT eye at presentation.

Figure 3: Fundus photograph from the RIGHT eye at presentation.
UNILATERAL BLINDNESS IN AN ADULT QUARTER HORSE TREATED FOR BACTERIAL MENINGITIS CAUSED BY *ESCHERICHIA COLI*

**TOPIC AREA:**
Neuro-ophthalmology

**CASE SUMMARY:**
Bacterial meningitis in the adult horse is a rare and typically fatal condition in horses. This report involves a seven year old Quarter Horse gelding that initially presented following trauma to the left eye; subsequently the horse developed bacterial meningitis, and nasal and palpebral abscesses; all of which grew a pure culture of the same isolate of *Escherichia coli*, based on bacterial genotyping. The entry site of infection in bacterial meningitis is commonly related to a breach in the calvarium and extension of bacteria residing in the paranasal sinuses. This case is unique as no fractures of the head were noted and the origin of infection was speculated to be hematogenous from a nasal abscess. Following systemic antibiotic therapy the horse made a full recovery from the bacterial meningitis except for persistent blindness in the left eye.

**KEY WORDS:**
bacterial meningitis, blindness, equine, hematogenous

**DISCUSSION POINTS:**
1. Neurologic disease
2. Blindness
3. Pupillary light reflex abnormalities
4. Therapy and outcome

Figure 1. 7 year-old, Quarter Horse. Suspected trauma to the left periorbital area of several hours duration.
Figure 2. Acute neurologic signs on day 3, included depressed attitude with minimal response to stimuli, leaning, head-pressing, and truncal ataxia.

Figure 3. Two weeks after discharge from the hospital the horse is bright and alert. The horse seemed to adjust to blindness in the left eye, and was eating and drinking normally.
Keynote Speaker

Mr. Sathish Srinivasan
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Mr. Srinivasan is currently a consultant corneal surgeon at Ayr University Hospital, Ayr, Scotland. He has been invited to Stirling to talk about evolving issues in the medical management and surgical management of corneal disease in human patients. He has no previous experience of ophthalmology in the horse, but is very much looking forward to the Stirling Conference and the new experience of meeting with veterinary colleagues and discussing issues of common interest. He will keep his presentations informative and informal, and will welcome interactive questioning and discussion. He will be joining us on Monday evening for dinner, and will be participating in the Tuesday morning sessions.

Mr. Srinivasan completed his ophthalmology residency from Aravind Eye Hospital, India, higher surgical training from St. Paul’s Eye Unit, Liverpool and a two year clinical fellowship in Cornea, External Diseases and Refractive Surgery from the University of Toronto. His interests are in lamellar corneal surgery, micro incision cataract surgery and anterior segment reconstruction. He has published over 70 papers in peer reviewed journals, has over 50 scientific presentations to his credit in national and international meetings and serves as the associate editor of the International Ophthalmology Clinics. He is a recipient of the Achievement Award and International Scholar Award from the American Academy of Ophthalmology. Sathish is a long distance runner and avid photographer.

(Session notes are available as a separate handout)
TUESDAY SESSION
ABSTRACTS & CASE REPORTS
TWO STEP PENETRATING KERATOPLASTY (TSPK) FOR DEEP FUNGAL ABSCESSES IN HORSES (BC Gilger, AB Clode, RJ McMullen, JT Harrington, JE Hempstead, N Pinto) Department of Clinical Sciences, College of Veterinary Medicine, North Carolina State University, Raleigh, NC USA.

**Purpose.** To describe the surgical technique and outcome of cases with deep stromal abscessation treated with a two-step penetrating keratoplasty (TSPK).

**Methods.** Five consecutive horses presenting with chronic, deep, stromal abscesses of less than 6 mm in diameter were selected for this study and received a TSPK. With the horse anesthetized and following a retrobulbar nerve block, a 25% depth superficial keratectomy was performed that was 2 mm larger than size of the planned penetration keratoplasty (PK). Following the keratectomy, a PK was performed to remove the abscess. A full-thickness section of frozen equine cornea, 1 mm larger in diameter than the PK, was sutured into the 75% depth PK site. A conjunctival pedicle graft was then placed over the PK site and sutured to the previous superficial keratectomy incision. Routine postoperative treatment was tapered over 6 - 8 weeks after surgery. **Results.** The TSPK procedure allowed precise placement of the conjunctival pedicle flap and space for the expected postoperative swelling of the corneal graft. All 5 horses had no graft dehiscence or other complications after surgery. Short-term follow-up (<6 months) resulted in cosmetic, comfortable, visual eyes in all 5 horses. **Conclusions.** The TSPK procedure, a modification of the PK procedure, may minimize graft complications after surgery and postoperative complications appear to be decreased with the presence of a conjunctival graft in eyes receiving a PK for deep stromal abscesses. The cosmetic and visual outcome was excellent after a TSPK.

**Support: None**  
**COI: None**
LIMBAL SQUAMOUS CELL CARCINOMA IN A HAFLINGER HORSE LINE: CLINICAL FINDINGS AND PEDIGREE ANALYSIS (ML Utter¹, TL Cranford², RR Bellone²) New Bolton Center, University of Pennsylvania;¹ Department of Biology, University of Tampa.²

**Purpose.** To describe the signalment and clinical findings of limbal squamous cell carcinoma (LSCC) in an extended family of Halfinger horses, and to investigate the potential role of genetics in LSCC. **Method.** A retrospective record search was used to determine the incidence of LSCC in a hospital population, and to generate a list of affected Haflingers. Because 7/14 (50%) of the affected horses had originated from one farm, a secondary search of farm records was used to identify additional affected horses. Sex, age at diagnosis, treatment and outcome were determined for each affected horse. An extended pedigree tracing each affected horse back to a common sire was constructed. **Results.** Fourteen of 94 (15%) of the Haflingers who were presented to a single hospital from 2000-2011 were diagnosed with LSCC. Eight additional affected horses were identified at the farm where 7/14 affected horses originated, for a total of 22 affected horses, 12 male and 10 female, with an average age at diagnosis of nine years. A variety of treatments and outcomes including resolution and recurrence were represented. All affected horses could be traced within five generations to a single stallion within the “A” sire line in this breed. **Conclusions.** The Haflinger may be overrepresented amongst horses with LSCC, and may be diagnosed at a younger age than other breeds. Affected Haflingers appear closely related, suggesting a possible heritable basis for LSCC. Future research to investigate association of candidate genes with LSCC may help elucidate both the genetics and pathophysiology of LSCC. **None.**
Purpose. To identify corneal changes in horses with severe keratopathies two years or more following resolution of the condition. Methods. Medical records and archival image study of horses with severe keratitis and two years or more follow-up. Results. Five horses treated with deep lamellar endothelial keratoplasty for deep stromal abscesses had follow-ups of 2-8 years. Two horses with severe ulcerative fungal keratitis had follow-ups of 3 and 7 years. One horse with iris prolapse treated with penetrating keratoplasty and a conjunctival flap had a follow-up of 2.5 years. A striking reduction in corneal opacification occurred with time. Subepithelial opacification remained in areas of the cornea not affected by the initial disease in all cases. Stromal granulation tissue changed to stromal fibrosis in most cases. Endothelial disease resulted in one horse. Conclusions. A reduction in corneal opacification can be expected to occur over an extended period of time when therapy is discontinued in the horse with severe keratopathy. None.
LAMELLAR KERATOPLASTIES FOR THE TREATMENT OF DEEP STROMAL ABSCESSES IN THE STANDING SEDATED HORSE (RJ McMullen Jr, R Baker, C Bell, BC Gilger) College of Veterinary Medicine, North Carolina State University, Raleigh, NC, USA

**Purpose.** Describe the use of deep lamellar endothelial and posterior lamellar keratoplasties (DLEK and PLK) to facilitate surgery on standing horses under sedation. **Methods.** Four client-owned horses, for which the owners denied general anesthesia, underwent standing corneal lamellar transplant procedures for the treatment of deep stromal abscesses (DSA). Horses were placed in stocks, sedated, and local eyelid and retrobulbar blocks were performed to provide akinesia and analgesia. A cart, outfitted with thick pads, was used to support the horses’ heads. Minimal additional restraint was required. DLEK and PLK were performed on two horses each. Following the first DLEK, a mid-stromal two-step anterior lamellar keratectomy modification was used to facilitate rapid closure of the anterior chamber immediately following removal of the abscess. **Results.** Intraoperative complications (e.g., iridal and lens damage during reinflation of the anterior chamber) were limited to the first DLEK case. Follow-up was 30 and 37 months (DLEK); 3 and 5 months (PLK). All four horses had good cosmetic and postoperative visual outcomes. **Conclusions.** Modified lamellar keratoplasties, specifically DLEK and PLK, may be utilized to treat DSA in horses in which general anesthesia is not an option. Although surgery under standing sedation minimizes the risks associated with general anesthesia and recovery, good microsurgical skills are essential to minimize potential complications and to successfully adapt the surgical procedures for use in standing, sedated horses. **None.**
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TOPIC AREA:
Cornea

CASE SUMMARY:
A 13 yo Selle Français gelding, used for international show jumping despite blindness of a right phthisic eye with cataract and luxation of the lens, presented initially with an acute oedema of the cornea of the left eye. Bacteriologic, mycologic and cytologic investigations were unremarkable. Local anti-inflammatory and immune therapy (dexamethasone; cyclosporine) succeeded in alleviating inflammatory episodes. In quiescent periods, clinical signs of stromal keratitis, with central and ventro-temporal fibrotic areas and neovascularisation, were present. After two years, a central corneal ulcer developed which resolved after medical treatment. This episode convinced the owner that a lamellar keratectomy was to perform to treat the keratitis. The resected tissue was submitted for histopathology in a specialized center (Centre Hospitalier National d’Ophtalmologie des Quinze – Vingt, Paris). Neovascularisation and keratinisation were identified, but only limited histological signs of inflammation were present. Following keratectomy, fibrotic areas developed in the dorsal segment of the cornea.

KEY WORDS:
Immune mediated keratitis (IMMK), histology

DISCUSSION POINTS:
Can this clinical presentation (keratinisation, neovascularisation) be associated with a quiescent stage of the disease?
Can local anti-inflammatory therapy influence histology extensively?
Can placental graft reduce stromal fibrosis after lamellar keratectomy?
Thickening and keratinisation of the epithelium (H&E)

Thickening and keratinisation of the epithelium and inflammatory infiltrate in the stroma (thick arrow) (H&E)
Irregular appearance of the Bowman's layer with epithelial inclusion (thick arrow) and linear vascularity of the stroma (thin arrow) (H&E).

Thickening and keratinization of the epithelium (thick arrow) and irregular appearance of the Bowman's layer with epithelial inclusion (thin arrow) (PAS).
Thickening and keratinisation of the epithelium (thick arrow) and inflammatory infiltrate in the stroma (thin arrow) (Masson trichrome).

Irregular appearance of Bowman’s layer, keratinisation of the epithelium (thin arrow) and linear vascularisation of the stroma (thick arrow) (H&E).
CASE SUMMARY:
A 12yo mare was initially presented to the clinic spring 2008 with very mild signs of unilateral keratitis such as cellular infiltrate and corneal edema. The signs were interpreted as an immune mediated keratitis. The inflammation responded well to treatment with topical steroids followed by Ciklosporin. Over the years the keratitis got worse with vascular ingrowth and increasing cellular infiltrate. A keratectomy of about 2/3 of the cornea was performed in October 2009.

The horse did well without any treatment until August 2011 when the keratitis reappeared mainly in the areas that had not had surgery. Since treatment with topical steroids and Ciklosporin failed I put her on tacrolimus (Protopic cream). The horse showed signs of irritation with swelling of the conjunctiva and rubbing the eye. When she got two small ulcers the treatment with tacrolimus was discontinued. The horse was presented to me with two deep ulcers and severe uveitis. The ulcers eventually healed and at last recheck the horse was comfortable and showed no signs of keratitis.

Two previous IMMK cases have shown the same development. I.e. after have gone through severe ulceration or abscesses of the cornea the initial signs of IMMK have disappeared.

KEY WORDS:
Cornea, IMMK, Keratectomy, Tacrolimus

DISCUSSION POINTS:
Experience of treating IMMK with Tacrolimus
Can some infectious event of the cornea affect the immune response involved in IMMK?
Anyone trying anything else than immunosuppressive treatment of IMMK?
Purpose. To describe the presentation, diagnosis, treatment and outcome of Cylindrocarpon sp. keratitis and uveitis in an eight-year-old mare. Methods. Ocular examination including in vivo confocal microscopy (IVCM) was undertaken. Treatment of oral fluconazole (fluconazole, Teva UK Ltd., Castleford, U.K.) and flunixin meglumine (Equinixin®, Norbrook Laboratories, Corby, U.K.) with topical prednisolone acetate (Pred forte®, Allergan, Marlow, U.K.) and atropine (atropine Minims®, Chauvin, Kingston-upon-Thames, U.K.) by subpalpebral lavage was initiated. Surgical intervention by deep lamellar endothelial keratoplasty (DLEK) was followed by ex vivo confocal microscopy (EVCM), histopathology and fungal culture. Treatment was continued with topical and subconjunctival voriconazole (Vfend I.V.®, Teva UK Ltd., Castleford, U.K.) with oral fluconazole, trimethoprim/sulfadiazine (Norodine® granules, Norbrook Laboratories, Corby, U.K.), and topical ketorolac tromethamine (Acular®, Allergan, Marlow U.K.) and ofloxacin (Exocin®, Allergan, Marlow, U.K.) Results. The horse presented with a three-week history of ocular discomfort, including marked blepharospasm and increased lacrimation. Ophthalmic findings included miosis with conjunctival hyperaemia, moderate diffuse corneal oedema with superficial and deep corneal vascularisation and hypopyon. Two coalescing and indistinct areas of cream-yellow cellular infiltrate within the deep stroma and adherent to corneal endothelium of the lateral cornea were noted. ICVM failed to identify fungal elements within the lateral cornea. Initial aggressive medical treatment allowed DLEK to be performed on a smaller region of the cornea. Abscessated material extended from the posterior cornea and was adherent to the iris stroma. ECVM revealed branching filamentous fungal structures. Histopathology failed to identify fungal elements. Fungal culture identified Cylindrocarpon sp. fungi after four weeks. Topical and subconjunctival voriconazole was maintained for six weeks post-operatively and oral fluconazole for 10 weeks in total. The outcome was complete resolution of the keratitis and uveitis with focal corneal scarring and a small anterior cortical cataract. Conclusion. Intensive antifungal medication with oral fluconazole and topical and subconjunctival voriconazole and DLEK successfully resolved a case of Cylindrocarpon sp. keratitis and uveitis in a horse. ECVM was able to confirm the clinical suspicion of fungal keratitis and uveitis in this case, and was more expedient than fungal culture. Funding. MSD Animal Health funded the confocal microscope at the Animal Health Trust.
TOPIC AREA:
Cornea

CASE SUMMARY:
A 15-year-old, American quarter horse mare was presented for evaluation of a corneal mass in the left eye. Examination revealed a 2 cm x 1 cm, raised, pink mass extending from the ventromedial limbus to the center of the cornea. Intraocular structures could not be fully examined due to the corneal mass. Abnormalities were not observed in the right eye. A transpalpebral enucleation with intraorbital prosthesis placement was performed and the globe was fixed in formalin and processed for sectioning. Microscopic examination of the cornea revealed dense sheets of discrete round cells between corneal stromal lamellae, with three populations of lymphocytes: small, intermediate-sized, and large cells (Figure 1.). Neovascularization of the corneal stroma was present at the margin of the lesion. Immunophenotyping revealed a mixture of non-neoplastic T lymphocytes and neoplastic B lymphocytes, consistent with T-cell rich, B-cell lymphoma.

KEY WORDS:
Cornea, T-cell, B-cell, lymphoma, neoplasia

DISCUSSION POINTS:
- Incidence of T-cell-rich, B-cell lymphoma (TCRBCL)
- Morphologic and immunohistochemical examination required
- Immunophenotyping equine lymphoma
- TCRBCL as a subtype of diffuse, large B cell lymphoma

Figure 1. Corneal stroma infiltrated by populations of small, intermediate-sized and large lymphocytes.
CASE SUMMARY:
Fungal keratitis, although more often a problem in warm, humid climes, is a world-wide problem. Numerous clinical presentations with varied clinical behaviors exist, from superficial forms, to necrotic plaques to stromal lesions with keratomalacia and furrowing. Prognosis varies from guarded to awful. This presentation is not about one case in particular, but rather a way to introduce and stimulate a discussion about the different flavors of fungal keratitis and how we approach them, what we might be able to do differently, how we might study the problem scientifically.

Key Words: fungus, enzymatic destruction, blood vessels, cornea

DISCUSSION POINTS:
What factors contribute to the different clinical manifestations of fungal keratitis?
How should we approach the further study of this disease? Let’s design some studies.
Therapeutic intervention?

Figure 1: Fungal keratitis, plague form with considerable vascularization
Figure 2: Fungal keratitis, gritty, cake-frosting appearance.

Figure 3: Fungal keratitis, a groove appears.
CASE SUMMARY:
Two horses presented with acute corneal lacerations. Both traumas were similar L shaped flaps involving about 20% of the corneal surface and extending more than 50% stromal depth. One horse was referred to a university where the flap margins were sutured to the surrounding cornea. The other horse underwent simple excision of the flap and was managed at the home stable. Both horses had subpalpebral lavage tubes placed for topical therapy. Treatment was continued for 5-6 weeks in both cases. The case that was sutured had complications with malacia of the sutured flap remnants. The case where the flap margins were trimmed healed with no complications. Six weeks post injury, both cases had developed granulation tissue at the deepest regions of the original injury. The sutured case has been followed for three years and the granulation tissue resolved. The trimmed case has been followed for just six weeks, but is progressing well. Photographs of weekly progress of these two cases will be discussed.

DISCUSSION POINTS:
- Technique for resecting a corneal flap in the field
- Practice tips for owner administration of SPL therapy in the home stable
- Practice tips for installing an SPL at home: making the device durable in field conditions
LINEAR KERATOPATHY IN A HORSE: AN ONSET

TOPIC AREA: 
Cornea

CASE SUMMARY:
Linear keratopathy (LK) is a common incidental finding in the horse. A 10 yo Warmblood gelding, with a history of posterior uveitis OS, presented with acute onset curvilinear oedema bridging the horizontal corneal meridian OS (Fig 1). IOP was 31 mmHg OS and 19mmHg OD. The eye was pain free and the anterior segment was otherwise normal. Vitreal opacity and chorioretinopathy was evident, but appeared unchanged over 2 years. A diagnosis of acute ocular hypertension was made and treatment instituted using systemic and topical dexamethsone and topical dorzolamide. IOP normalised OS over 4 days as the oedema extended ventrally, before progressively clearing over a further 14 days. With corneal clearing a linear discontinuity in Descemet’s membrane bridging the horizontal corneal meridian, typical of LK, was evident and followed the curvilinear geographic course of the oedema at presentation (Fig 2). By day 18 small clumps of pigmented debris were noted adherent to the margin of the linear lesion. The eye has remained unchanged to date.

KEY WORDS: 
Linear keratopathy, ocular hypertension

DISCUSSION POINTS:
Does linear keratopathy result from transient ocular hypertension?  
Is there a favoured plane of cleavage in Descemet’s membrane along the horizontal meridian? 
Does linear keratopathy always represent a historic pathological event?
Fig 1: Initial presentation

Fig 2: Day 18