

Scientific Presentation Abstracts

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Comparison of Exercise vs. a Rolling Technique Under General Anesthesia for the Correction of Nephrosplenic Entrapment of the Large Colon in Horses: 97 Cases (2004–2010). Lisa Fultz¹, John Peloso¹, Steve Giguere², Aric Adams¹. ¹Surgery, Equine Medical Center of Ocala, Ocala, FL; ²Department of Large Animal Medicine, University of Georgia, Athens, GA.

Nephrosplenic entrapment of the large colon (NSEL) is caused by left dorsal displacement of the ascending colon that subsequently becomes entrapment over the nephrosplenic ligament. Medical treatment options include exercise or rolling under general anesthesia following the IV administration of IV phenylephrine.

A comparison of exercise versus a rolling technique under general anesthesia following IV phenylephrine is reported. It is our hypothesis that IV administration of phenylephrine that precedes a rolling technique under general anesthesia has a higher success rate than exercising for the treatment of NSEL.

The medical records of ninety-seven cases with a diagnosis of nephrosplenic ligament entrapment of the large colon presented to the Equine Medical Center of Ocala were reviewed. Horses with a gas echo proximal to the spleen that prohibited visualization of the kidney on ultrasound examination or identification of the ascending colon that could be palpated in or traced to the nephrosplenic space on rectal examination were included in the study. All horses received IV phenylephrine and were assigned to an exercised or rolled treatment group. A treatment success was defined as the resolution of signs of colic and a treatment failure was defined as the return of signs of colic.

The success rate of rolling was 48/55 (87.3%) while the success rate of exercising was 25/42 (59.5%). The success rate of rolling the 17 failed exercising attempts was 12/17 (70.5%).

The higher success rate of rolling under general anesthesia suggests that this therapy should be the initial recommendation for horses with NSEL.

Equine Bone Marrow-Derived Mesenchymal Stem Cells: Comparing the Sternum and the Ilium. Mackenzie K. Adams¹, Laurie Goodrich^{1,2}, Sangeeta Rao¹, Francisco J. Olea-Popelka¹, Nikki Phillips², John D. Kisiday^{1,2}, C Wayne McIlwraith^{1,2}. ¹Department of Clinical Sciences, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO; ²Equine Orthopedic Research Center, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO.

Bone marrow-derived mesenchymal stem cells (BMDMSCs) have been shown to improve healing of cartilage, bone and soft tissues of horses and other species. The two sites of equine BMDMSC harvest are the sternum and ilium, and site selection is based primarily on practitioner preference. The goal of this study was to determine the effects of harvest site and harvest fraction on stem cell quantity and rate of growth. We hypothesized that the concentration of cells would be higher in the sternum than the ilium, and in the first fraction of marrow harvested from either site compared to subsequent fractions. Furthermore, we hypothesized that cell growth rates would not differ between sites. Two sequential 5-ml marrow samples were taken from the sternum and ilium of seven horses prior to euthanasia. Nucleated cell counts (NCCs) were obtained for all samples pre and post marrow processing. Cells were expanded in culture for three passages and NCCs were obtained at each passage. There was no significant difference ($P > 0.05$) between the NCCs of the first sternum aspirate and first ilium aspirate. However, the NCCs of the first 5-ml aspirate were significantly higher than the second 5-ml aspirate for both sites ($P < 0.05$). There was no significant difference between growth rates for any of the groups ($P > 0.05$). These data should give practitioners confidence that both the sternum and ilium offer a rich supply of stem cells that have similar growth rate characteristics.

In Vitro Biomechanical Comparison of a Prototype 4.5 mm Narrow Locking Compression Plate Construct Versus a 4.5 mm Limited Contact Dynamic Compression Plate Construct for Arthrodesis of the Equine Proximal Interphalangeal Joint. Benjamin J. Ahern¹, Brent L. Showalter^{2,3}, Dawn M. Elliott^{2,3}, Dean W. Richardson¹, Liberty Getman¹. ¹Clinical Studies New Bolton Centre, University of Pennsylvania, Kennett Square, PA; ²Orthopedic Surgery, University of Pennsylvania, Philadelphia, PA; ³Department of Bioengineering, University of Pennsylvania, Philadelphia, PA.

Proximal Interphalangeal (PIP) joint arthrodesis is a common surgical procedure in horses. Stability of the PIP joint postoperatively is imperative to obtain rapid arthrodesis and return to athletic function. A newly developed Locking Compression Plate (LCP) PIP plate has been developed that should produce a more stable fixation. It was hypothesized that the LCP would produce a stiffer and stronger construct than a Limited Contact -Dynamic Compression Plate (LC-DCP). Eight pairs of PIP joints were instrumented with either a LCP or LC-DCP plate axially and two parasagittally positioned 5.5 mm transarticular screws. Each construct was tested in both cyclical and single cycle failure in 4-point bending. Displacement required to maintain a target load of 1 kN over 3600 cycles at 1 Hz was recorded. Maximum bending moment at failure was calculated. Statistical analysis was performed using t-tests and $P < 0.05$ was considered significant. All constructs were successfully tested and data recorded. In cyclical testing, significantly more displacement occurred in the LC-DCP (0.455 \pm 0.098 mm) than for the LCP (0.168 \pm 0.109 mm) constructs ($P = 0.016$). During single cycle testing there was no significant difference in the bending moment between the LC-DCP (148.72 \pm 19.42 N.m) and the LCP (164.61 \pm 17.57 N.m) constructs. All constructs failed by fracture of the bone associated with the transarticular screws and bending of the plates. Use of the LCP resulted in a stiffer construct of the same strength as the LC-DCP. This increased stiffness should result in less motion at the PIP joint in vivo and potentially lead to more rapid arthrodesis and return to athletic function.

Hemilaminectomy and Vertebral Stabilization for the Thoracolumbar Intervertebral Disc Associated Vertebral Instability in 11 Dogs. Takeshi Aikawa^{1,2}, Mitsuhiro Shibata¹, Moe Asano¹. ¹Aikawa Veterinary Medical Center, Tokyo, Japan; ²Veterinary Surgical Service Japan, Tokyo, Japan.

Thoracolumbar (T-L) intervertebral disc disease (IVDD) is the most frequent neurological disorder in veterinary medicine. A relationship between degenerative changes of the intervertebral disc and biomechanical functions of the lumbar spine has been documented in human biomechanical study. The disc associated vertebral instability (DAVI) is defined as vertebral segment that has dynamic spinal cord compression due to degenerated intervertebral disc. The diagnostic method and treatments for T-L DAVI have not been described in veterinary medicine.

Medical records (2005–2010) of dogs with a stress myelographic diagnosis of post-stress spinal cord dynamic compression without pre-stress compression that had hemilaminectomy and vertebral stabilization were reviewed.

Eleven dogs (mean: 4.7 years old) were identified. All dogs had acute onset of ambulatory or non-ambulatory paraparesis. The stress myelography demonstrated distinct post-stress ventral dynamic compression by bulging of the disc. The site of DAVI were at T11-12 (1 dog), T12-13 (6 dogs), T13-L1 (1 dog), L3-4 (1 dog) and T11-12-13 (2 dogs). The percentage of reduction on post-stress spinal cord compression was 5.7% to 27.2% (mean 18.5%). All dogs recovered postoperatively and remained to be ambulatory at follow up (mean: 24 months).

Disc degeneration may cause the loss of stiffness in the intervertebral disc with resulting increase in motion at the segment prior to disc herniation. Conventional imaging (Myelography, CT, MRI) may not exclude the possibility of DAVI. The use of stress myelography may be warranted to make a definitive diagnosis of DAVI. Hemilaminectomy with stabilization was an effective treatment for T-L DAVI resulting long-term neurologic improvement in all dogs.

Thoracolumbar Intervertebral Disc Extrusion in French Bulldogs: The Dissimilarity from that of Miniature Dachshund and the Association with the Congenital Vertebral Anomalies. Takeshi Aikawa^{1,2}, Moe Asano¹, Mitsuhiro Shibata¹, Hiroshi Fujita¹, Yasushi Hara², Masahiro Tagawa², Hiromitsu Orima³. ¹Aikawa Veterinary Medical Center, Tokyo, Japan; ²Division of Veterinary Surgery, Nippon Veterinary and Life Science University, Tokyo, Japan; ³Veterinary Radiology, Nippon Veterinary and Life Science University, Tokyo, Japan.

French Bulldog (FB) is a chondrodystrophoid breed with high risk of thoracolumbar intervertebral disc extrusion (T-L IVDE). T-L IVDE in FB and its association with the congenital thoracic vertebral anomalies have not been well evaluated.

Medical records of 47 FBs and 671 Miniature Dachshund (MD) with definitive diagnosis of T-L IVDE by myelography or MRI and hemilaminectomy by one surgeon were reviewed. The age, gender, vertebral anomaly, kyphosis/kyphoscoliosis, distribution of IVDE site, non-recovery and progressive hemorrhagic myelomalacia (PHM) development from Grade (G)5 (paraplegia with absent DPP) were compared between 2 breeds.

The age of FB was significantly younger ($P = 0.00001$) and the rate of male FB was significantly higher ($P = 0.0226$) than those of MD. The risks of vertebral anomaly and kyphosis/kyphoscoliosis in FB were both significantly higher ($P < 0.00001$) than those of MD. No dog had IVDE within kyphotic/kyphoscoliotic segment. The risks of FB with IVDE within typical site (T11-L3) was significantly lower ($P = 0.000487$) and within caudal site (L3-L7) was significantly higher ($P = 0.000119$) than those of MD. There was no significant difference ($P = 0.1818$) of non-recovery from G5 but the risk of developing PHM in G5 FB was significantly higher ($P = 0.0328$) than that of MD.

The T-L IVDE sites of FBs are different from that of MDs distributing T-L to caudal lumbar spine. The vertebral anomalies and kyphosis/kyphoscoliosis were not associated with the IVDE. FB appears to have T-L IVDE in younger ages, with higher male predisposition and with higher risk of developing PHM from G5 than those of MD.

Assessment of Postoperative Recovery, Time to Ambulation, Urinary and Fecal Incontinence in 831 Dogs with Thoracolumbar Intervertebral Disc Disease. Takeshi Aikawa^{1,2}, Hiroshi Fujita¹, Shinichi Kanazono¹, Yuki Yoshigae¹, Mitsuhiro Shibata¹. ¹Aikawa Veterinary Medical Center, Tokyo, Japan; ²Veterinary Surgical Service Japan, Tokyo, Japan.

In canine thoracolumbar intervertebral disc disease (T-L IVDD), the time to ambulation (TTA) and the risk of mild urinary/fecal incontinence (UI/FI) in recovered dogs have not been well evaluated.

Records of dogs (2000–2007) that had hemilaminectomy by one surgeon were reviewed. The TTA, the rate of early recovery (<14 days), the incidences of UI and FI in recovered dogs were statistically compared among preoperative grades. In dogs that had not recovered DPP, the incidence of dogs that became ambulatory, their urinary/fecal function and self-mutilation were evaluated.

Eight hundred and thirty-one dogs met the inclusion criteria with mean follow-up of 39.8 months. The recovery rates were G1-2 to G4b (95.0–98.7%) and G5 (52.1%). The mean and median TTA were G1-2 (4.8, 4), G3 (7.7, 7), G4a (10.5, 10), G4b (12.1, 10) and G5 (21, 21). The rate of early recovery were G1-2 (86.7%), G3 (81.9%), G4a (74.4%), G4b (69.7%) and G5 (36.4%).

In 709 recovered dogs, the UI rates were G1-2 (5.6%), G3 (5.3%), G4a (14.6%), G4b (18.4%) and G5 (38.2%). The FI rates were G1-2 (3.3%), G3 (2.9%), G4a (7.3%), G4b (10.5%) and G5 (18.2%), in 75 surviving dogs that had persistent DPP loss, 20 dogs became ambulatory and 5 dogs had episodic self-mutilations.

The rates of early recovery were lower and the mean and median TTA were longer with the worse preoperative grades. The results indicate the UI/FI can occur in recovered dogs from any preoperative grade and the worse grades were associated with a greater risk of UI/FI. The results suggested that preoperative grades can be used as a prognostic indicator for recovery, for TTA and for the risk of UI/FI.

Assessment of Acetabular Cup Positioning Following Total Hip Replacement from a Lateral Radiographic Projection. Anna Aman, Kirk Wendelburg. Animal Specialty Group, Los Angeles, CA.

Inappropriate acetabular cup position (ACP) is a risk factor for postoperative luxation following total hip replacement (THR). We hypothesize that radiographic position artifact of cranio-caudal pelvic tilt (CCPT) will cause significant inaccuracy in ACP measurements from a ventrodorsal radiograph (VDR); and ACP measurements of coronal version and angle of lateral opening (ALO) viewed from a lateral radiograph (LR) will be consistent and accurate.

Eleven VDRs were obtained after insertion of a CFX cup into the acetabulum of a Sawbones pelvis. For each radiograph, the pelvis was placed in varying degrees of CCPT. Fifteen LRs were obtained of a pelvis with the cup implanted in varying positions of coronal version and ALO. Five blinded observers measured the angles of version, inclination and ALO on each VDR and the ALO and coronal version on each LR.

An almost perfect level of agreement was observed for the repeatability of both the VDR and LR measurements. When varying degrees of CCPT were introduced, there was no agreement in the measurements of ACP from the VDRs. At all ACPs, measurements taken from the LRs were in agreement. Undetectable CCPT causes significant variability in cup measurements on VDRs, predisposing measurements to inaccuracy. Measurements obtained from the LRs of coronal version and ALO are accurate and consistent and can be used to determine ACP.

VDRs should not be used to assess measurements of ACP. Reproducible and accurate measurements of ACP obtained from the LR may allow for an understanding of the influence of ACP on luxation following THR.

In Vitro Comparison of 7 Polydioxanone and 2 Polyglactin 910 for Closure of Ventral Midline and Right Ventral Paramedian Celiotomies in Horses. Stacy L. Anderson, José Bracamonte, James L. Carmalt, David G. Wilson, Steven Hendrick. Large Animal Clinical Sciences, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, SK, Canada.

The objective of this study was to compare the bursting strength (BS) and mode of failure (MF) of ventral midline (VM) and right ventral paramedian (RVP) celiotomies closed with either 7 braided polydioxanone (7PD) or 2 polyglactin 910 (2PG).

A 25-cm VM or RVP celiotomy was created in 20 fresh equine cadavers. A 200-L polyurethane bladder was inserted into the abdomen. Celiotomies were closed in a simple continuous pattern using 1 strand of 7PD in 1 section or 2 single-stands of 2PG in 2 sections. The bladder was inflated with compressed air until construct failure. The horses' signalment, body weight, celiotomy type, suture type, MF and BS (mmHg) were recorded and analyzed statistically for interactions.

No significant difference was found between the mean BS of VM and RVP celiotomies nor between the mean BS of celiotomies closed with 7PD or 2 PG. Increasing age had a negative effect on BS ($P = 0.01$). When the effect of age was considered, RVP celiotomy had a significantly lower BS compared to VM celiotomy ($P = 0.032$). Suture type, but not celiotomy type, had a significant effect on MF ($P = 0.003$). Suture failure was the main MF for 2PG with 6 of 10 celiotomies failing at the suture, whereas fascial failure was the main MF for 7PD with all celiotomies failing at the body wall.

In this study, 7PD proved to be a superior suture material compared to 2PG for closure of VM and RVP celiotomies as failure occurred by fascial failure rather than suture failure.

Biomechanical Comparison of V-Loc and Biosyn Suture in Canine Incisional Gastropexies. Melissa Arbaugh, Eric Monnet. Colorado State University, Fort Collins, CO.

The purpose of this study is to compare the tensile strength of Biosyn suture in canine incisional gastropexies with V-Loc suture. We hypothesized that incisional gastropexies performed with V-Loc would be as strong as those performed with Biosyn in the acute model.

Twenty-four cadaveric stomachs and body walls were harvested from medium sized dogs euthanized for reasons unrelated to the study. The samples were divided into six groups: 2-0 Biosyn, 3-0 Biosyn, 4-0 Biosyn, 2-0 V-Loc and 3-0 V-Loc. Standard 4 cm incisional gastropexies were performed with each suture by the same individual. The tensile strength of the gastropexies was determined by placing the stomach and body wall within a distraction device. Failure was defined as either tearing of the suture or the tissue. The tensile strength (newtons) was compared between the different suture types and sizes.

Suture failure was not observed in any group. The mean and standard deviation of tensile strength for each group was as follows: 2-0 Biosyn (44.0 +/- 10.8), 3-0 Biosyn (40.9 +/- 4.9), 4-0 Biosyn (44.1 +/- 6.7), 2-0 V-Loc (51.2 +/- 5.1), and 3-0 V-Loc (44.9 +/- 5.7). There was no statistical difference between groups with regards to size ($P = 0.12$) or suture type ($P = 0.17$). The data was evaluated for interaction between suture type and size, and none was identified ($P = 0.58$).

Based on these data, V-Loc suture appears to be as strong as Biosyn suture for incisional gastropexies in the acute model. Suture size does not appear to affect tensile strength of an incisional gastropexy.

Does Preoperative Ionized Calcium or Parathyroid Hormone Concentrations Predict Hypocalcemia Following Parathyroidectomy in Dogs with Primary Hyperparathyroidism (17 Dogs)? Melissa Arbaugh, Daniel Smeak, Eric Monnet. Clinical Sciences, Colorado State University, Fort Collins, CO.

The purpose of this study is to evaluate predictors of postoperative hypocalcemia in dogs following parathyroidectomy. We hypothesize that the preoperative calcium concentrations will aid in predicting postoperative hypocalcemia. We also hypothesize that the slope of the regression line over the first 24 hours will aid in prediction of hypocalcemia following surgery.

Medical records were evaluated from years 2001–2009. Data evaluated included age, breed, sex, clinical signs, diagnostics performed, preoperative and postoperative iCa, preoperative PTH concentrations, and whether or not calcium supplementation was provided following surgery. Two groups were identified based on whether dogs became hypocalcemic (HO) (iCa < 1.2 mg/dl) or not (NHO) following parathyroidectomy.

Seventeen dogs were entered in the study, 12 developed hypocalcemia postoperatively. Preoperative (within 24 hours of surgery) iCa concentrations for the HO group 1.82 ± 0.22 mg/dl and the NHO group 1.83 ± 0.29 mg/dl ($P = 0.66$) were not significantly different. Calcium levels declined in a linear fashion during the 24 hours following parathyroidectomy and the slopes of the decay over that time were not significantly different between the two groups ($P = 0.42$). Preoperative PTH concentrations were not significantly different between the HO and NHO groups ($P = 0.51$).

Preoperative iCa levels or PTH levels are not predictive of postoperative hypocalcemia in dogs undergoing parathyroidectomy for primary hyperparathyroidism. Future studies to evaluate whether calcium supplementation should be provided on an individual basis with perhaps more emphasis on clinical signs than ionized calcium levels postoperatively may be warranted.

Cervical Wedge Resection for Treatment of Transluminal Cervical Adhesions and Subsequent Pyometra: 3 Clinical Cases. Carolyn E. Arnold, Steven P. Brinsko, Dickson D. Varner. VLAM, Texas A&M University, College Station, TX.

Cervical adhesions result from trauma at parturition or excessive manipulation of the cervix. In severe cases, adhesions may completely occlude the lumen resulting in pyometra. Without cervical patency, treatment of pyometra is limited and ovariectomy may be indicated. In the authors' experience, resection of a portion of the cervix can restore the lumen, enabling treatment and reducing recurrence of pyometra, and allowing the production of foals through assisted reproductive techniques.

Surgery was performed with mares restrained in a set of stocks using sedation and caudal epidural anesthesia. Following an aseptic prep of the perineum, a vaginal speculum was placed. Using stay sutures, the cervix was retracted caudally into the vagina. A wedge shaped portion of the cervix from the external os (~3–4 cm) to the internal os (~2–3 cm) was removed. A Bivona uterine lavage catheter was placed to facilitate uterine irrigation and maintain cervical patency in the postoperative period.

Surgery was performed as described above in three mares with extensive cervical adhesions that precluded uterine drainage, resulting in pyometra. Healing of the cervix with a patent lumen occurred in all 3 mares. Follow-up was achieved for 133–623 days. Pyometra had resolved in all 3 mares and two mares were bred and able to produce viable embryos. Intra-operative complications affected one mare, consisting of an inadvertent peritoneal perforation.

Cervical wedge resection may provide an alternative therapy to OHE for mares with pyometra due to intraluminal adhesion of the cervix. Mares may still produce foals using assisted reproductive techniques.

Effect of Stifle Angle on the Magnitude of the Tibial Plateau Angle Measurement in Dogs with Intact and Transected Cranial Cruciate Ligament: Cadaveric Study. Karanvir S. Aulakh¹, Tisha A. Harper¹, Otto I. Lanz¹, Gregory B. Daniel¹, Stephen Werre². ¹Small Animal Clinical Sciences, Virginia-Maryland Regional College of Veterinary Medicine, Blacksburg, VA; ²Biomedical Sciences and Pathobiology, Virginia-Maryland Regional College of Veterinary Medicine, Blacksburg, VA.

The objective of the study was to determine the effect of stifle angle on the magnitude of the radiographic tibial plateau angle (TPA) in normal and cranial cruciate ligament (CCL) – deficient stifles.

Three pairs of canine cadaver hind legs from three skeletally mature dogs were positioned in a custom made positioning device which allowed positioning of the legs at various stifle angles. A lateral radiograph of each specimen was obtained before and after transection of the CCL at four stifle angles 90°, 110°, 135° and 140–150° (i.e. maximum extension) based on goniometric measurements. Four observers determined the radiographic TPA twice for each radiograph with a minimum of 2 days between each measurement. The radiographic TPA measurements in all specimens at different stifle angles with intact CCL and transected CCL were compared with mixed-model ANOVA. The effect of stifle angle, CCL transection and

interaction between the two, on observer TPA measurement variability was also determined using the coefficient of variation.

TPA was not statistically different in the stifle angles for either the intact or transected CCL. There was also no statistical difference in the TPA between intact and transected CCL groups at any of the stifle angles. Stifle angle, CCL transection and interaction between the two did not have any significant effect for intra-observer and inter-observer variation.

The angle of the stifle during radiography does not influence the magnitude of the TPA measurement as determined on true lateral radiographs of the stifle and tibia in cadaveric canine legs.

Mechanical Evaluation of Roughened Screws in Equine Metacarpal Bone. Petrisor Baia, Gary Sod, Laura Riggs. Department of Veterinary Clinical Sciences, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA.

Bone resorption and screw loosening is commonly caused by cyclic loading during limb use. Improvement of bone-screw behavior in this construct can potentially add to the longevity of the implant. The role of a roughened surface to aid in osseointegration and implant fixation has been established in other species but not in equine. Our hypothesis is that roughened screws have significantly greater mean extraction torques when compared to regular AO screws.

Five adult horses were used. One metacarpus was randomly assigned to secure a 4.5 mm broad dynamic compression plate with 4 roughened screws on the dorsal diaphysis. Four cortical screws used to secure a similar plate in the contra lateral MC3 served as control. Plates were removed at 12 weeks and extraction torque was recorded. Paired t-tests were used for comparison and P -value was set at <0.05.

At 12 weeks, the mean extraction torque for roughened screws (3.24 ± 0.56) was significantly greater ($P < 0.0002$) than that of the regular AO screws (1.65 ± 0.34).

Bone tissue infiltrates the pores of the roughened surface of the screws increasing the contact surface and the mechanical anchorage. In our study the screw surface roughness is $2.14 \pm 0.48 \mu\text{m}$. We found that roughened screws have a significantly greater extraction torque when compared to the smooth AO cortical screws. Information obtained from this study may help in improving the contact surface of implants and subsequent fixation and stability of bone-implant constructs in equine fracture repair.

Synovial Fluid Concentrations of Bupivacaine Following Single Intra-Articular Injection in Canine Osteoarthritic Stifles. Sabrina L. Barry¹, Stephen A. Martinez¹, Neal M. Davies², Andreas Bachelez¹, Connie M. Remsburg², Mengwei Liu². ¹Veterinary Clinical Sciences, Washington State University, Pullman, WA; ²Pharmaceutical Sciences, Washington State University, Pullman, WA.

Intra-articular bupivacaine injection is commonly performed during stifle surgery in dogs. Although early clinical studies indicate that a single intra-articular bupivacaine injection is safe in dogs, more recent *ex vivo* studies suggest that bupivacaine may be cytotoxic to articular chondrocytes. A recent study used explanted chondrocytes bathed in 0.5% bupivacaine solution. The actual synovial fluid concentration of bupivacaine after intra-articular injection, however, is unknown. This study's purpose was to determine synovial fluid bupivacaine concentrations after a single intra-articular injection.

Eight client-owned dogs undergoing stifle surgery for cranial cruciate ligament disease were recruited. Prior to surgery, 0.2 ml/kg of 0.5% preservative-free bupivacaine (1 mg/kg) were injected into the stifle joint. Joint fluid samples were taken immediately after (T_0) and 30 minutes after injection (T_{30}), and analyzed with high-performance liquid chromatography.

Mean patient body weight was 31.7 kg (range 22–45 kg). Mean time to acquire the second sample was 30:07 (min:sec). At T_0 the mean (\pm SD) bupivacaine concentration was 2.670 ± 0.855 mg/ml (range: 1.900 to 4.371 mg/ml). At T_{30} , mean bupivacaine concentration was 0.692 ± 0.501 mg/ml (range: 0.206–1.812 mg/ml).

Bupivacaine concentration decreased quickly after single intra-articular injection. The concentrations documented in this report can be used to design *ex vivo* studies that more closely mimic the clinical setting.

Single-Use Versus Multiple-Use Instruments: Effect on Laparoscopic Skills Performance. Sabrina L. Barry, Boel Fransson, Benjamin Spall, John M. Gay. Veterinary Clinical Sciences, Washington State University, Pullman, WA.

The aim of this study was to determine whether laparoscopic skills are affected by instrument type.

Veterinarians from our institution who were familiar with the testing system were recruited. Laparoscopic skills were assessed with three tasks performed in a laparoscopic simulator: peg transfer, pattern cutting, and ligature loop placement. Two sets of instruments were compared. Instrument set A included grasping/dissecting forceps and scissors designed for

multiple use (Clickline[®], Karl Storz). Instrument set B included grasping forceps and scissors designed for single use (Endo Grasp[™] & Endo Shears[™], COVIDIEN). Skills were tested four times (twice for each set of instruments) in a randomized AB-BA or BA-AB crossover design. Scores generated using set A or set B were compared with a Wilcoxon matched-pairs signed rank test.

Fourteen veterinarians completed the study. Overall, participants scored significantly higher when using instrument set A (median 208, IQR 162–237) compared with set B (median 183, IQR 121–219) ($P = 0.0461$) with a 25 point difference between median scores. For individual tasks, a strongly significant difference was seen for the pattern cutting task, which utilized a grasper and scissors ($P = 0.0009$). The differences for the peg transfer and ligature loop tasks were not significant ($P = 0.0287$ and 0.4802 respectively; significance set at $P = 0.016$).

We concluded that laparoscopic skills were affected by instrument type. When developing and performing a high-stakes test to assess veterinarians' laparoscopic skills, the instruments used should be standardized.

Effects of Intraperitoneal Administration of Bilirubin on Infarct Area and Left Ventricular Function in a Rat Model of Acute Coronary Occlusion. Ron Ben-Amotz, Chris Adin, Feng Xu. Veterinary Clinical Sciences, The Ohio State University, Columbus, OH.

Bilirubin was considered to be a toxin that accumulates after catabolism of heme by the enzyme heme oxygenase. However, a mounting body of evidence suggests that bilirubin, at a physiological (non-toxic) doses, is a powerful antioxidant and anti-atherosclerotic agent. Interestingly, recent clinical studies have shown that human beings with genetically induced hyperbilirubinemia (Gilbert Syndrome) are protected against coronary heart disease. The purpose of this study was to investigate whether administration of exogenous bilirubin to normal rats would convey similar protective effects in an experimental model of coronary ischemia. Our hypothesis was that bilirubin administration (20 $\mu\text{M}/\text{kg}$, IP, 1 hour before injury) would decrease infarct area and preserve left ventricular function when compared to non-treated rats. Coronary ischemia was induced by temporary (30 min) ligation of the left anterior descending coronary artery in control rats ($n = 5$), bilirubin treated rats ($n = 5$), followed by a 1 hour period of reperfusion. Left ventricular function was estimated non-invasively using echocardiographic measurements of fractional shortening % and area shortening %. Effects of anesthesia on cardiac function were controlled for by using a sham group ($n = 5$). There was a significant reduction of infarct size in the bilirubin treated group compared to the non-treated group (13.34% vs. 25.5%, $P < 0.0067$). Left ventricular function decreased in both experimental groups after ischemia and reperfusion, although bilirubin provided a protective effect on fractional shortening during the period of ischemia (18.8 vs. 25.8%, $P = 0.034$). Based on the results of this study, bilirubin supplementation appears to provide significant decrease in infarct size although protective effects on left ventricular function were noted only during the period of ischemia.

Evaluation of Equine Compensation in Fifty-Five Clinical Cases of Lameness. Dionne Benson^{1,2}, Troy N. Trumble¹, Nicholas Ernst¹, Megan Swaab¹, Donna Groschen¹. ¹Veterinary Population Medicine, University of Minnesota, St. Paul, MN; ²Rood and Riddle Equine Hospital, Lexington, KY.

Clinical cases often involve multiple limb lameness. This retrospective study evaluated fifty-five clinical cases with various lameness types using both a traditional lameness examination and force plate data. Two sets of comparisons were made: (1) the PVF for clinical cases were compared within each horse (e.g., sound to lame contralateral limb, diagonal pair, and ipsilateral pair) and (2) clinical cases were compared with seven sound control horses to look for differences in PVF between lame and sound horses.

No statistically significant patterns emerged in PVF between the clinical cases and controls nor when comparing contralateral limbs, ipsilateral limb pairs, or diagonal limb pairs within the clinical cases. In a number of cases, however, the force plate data from the clinical cases reflected evidence of compensation. There were trends in compensation patterns when examined based upon the primary lameness identified subjectively. Patterns were specifically identified in primarily forelimb and primarily hind limb lamenesses. In 70% of the primary forelimb lameness cases force was shifted to the contralateral and ipsilateral limb. In 61% of hind limb primary lameness cases force was shifted to the ipsilateral and diagonal limb.

Descriptive analysis of peak vertical forces provided some insight into compensation patterns of lame horses even though no statistical differences could be identified. Controlled research studies are necessary to determine exact patterns of compensation with a known lameness or combination since clinical cases are complex.

Effective Knockdown of Interleukin-1 β in Osteoarthritis-Prone Guinea Pig Chondrocytes Influences Gene Expression of Additional Mediators Implicated in Disease Pathogenesis. Kelly S. Santangelo^{1,2}, Alicia Bertone^{2,1}. ¹Veterinary Biosciences, The Ohio State University, Columbus, OH; ²Veterinary Clinical Sciences, The Ohio State University, Columbus, OH.

Targeted reduction of gene products implicated in osteoarthritis (OA) via RNA interference (RNAi) may define contributions of specific molecular pathways to pathogenesis and offers potential as a therapeutic strategy. We recently constructed and validated an adeno-associated virus serotype 5 (AAV5) vector containing a U6-driven short hairpin RNA (shRNA) capable of reducing the interleukin-1 β (IL-1 β) transcript in OA-prone guinea pig chondrocytes. It was our hypothesis that in vitro application of this AAV5 vector would result in changes in expression of additional disease mediators. IL-1 β and an additional 9 transcripts were quantified using relative real time RT-PCR following transduction with our novel knockdown AAV5 vector. Percent gene expression levels relative to non-transduced and non-targeting AAV5 vector controls were calculated using the comparative CT (2- $\Delta\Delta\text{CT}$) method. Statistically significant decreases in IL-1 β expression were achieved by the targeting knockdown AAV5 vector relative to both control groups. Further, the targeting AAV5 vector statistically increased transcript levels of a key anabolic mediator, and significantly decreased expression of inflammatory cytokines and catabolic agents. To validate in vitro findings, our AAV5 vector or saline equivalent were injected into contralateral knee joints of Hartley guinea pigs. In vivo application resulted in a >50% reduction of the IL-1 β transcript relative to vehicle-only exposed cartilage. In conclusion, successful in vitro and in vivo reduction of the IL-1 β transcript was achieved via RNAi techniques. Importantly, this diminution influenced transcript levels of several major players involved in OA in the direction of beneficial disease modification, indicating that further in vivo investigations are warranted.

Comparison of Bilateral Ovariectomy Versus Ovariohysterectomy for the Sterilization of Pot Bellied Pigs: 14 Cases. Adam Biedrzycki, Sabrina Brounts. School of Veterinary Medicine, University of Wisconsin, Madison, WI.

The increased popularity of Vietnamese Pot Bellied Pigs (VPBP) as pets has resulted in an increased request to perform routine neutering procedures. While there have been several publications concerning bilateral ovariectomy (OVE), and ovariohysterectomy (OVH) in other species, there have been no reports evaluating these procedures and outcome in swine. Our aim was to evaluate the surgical technique and complications between bilateral OVE and OVH for routine neutering of pet pigs. Medical records of pig's presented for neutering from 2001–2010 were reviewed to determine history; signalment; clinical examination findings; surgical technique; intra-operative complications; postoperative complications; length of hospitalization and outcome. Long term follow-up was obtained via an owner telephone questionnaire. There were 14 intact female pigs with a mean age of 131 ± 86 days. Nine pigs underwent an OVE and 5 underwent an OVH. Surgical time for an OVE was significantly shorter than for an OVH ($P < 0.0001$). Fewer postoperative complications, such as hemorrhage, fever, inappetence and incisional site infections, were encountered with the OVE group than the OVH group. Return to normal behavior and appetite was significantly shorter for the OVE group than the OVH group. No long-term complications were reported. There was no significant difference in client satisfaction of outcome between the two procedures. OVH is technically more complicated, time consuming and associated with greater morbidity compared to an OVE. OVE is a safe and recommended alternative to OVH as the procedure of choice for routine neutering of swine.

The Effect of Short and Longer-Term Treatment with Manuka Honey Gel on Second Intention Healing of Wounds Contaminated with Feces and Non-Contaminated Wounds on the Distal Aspect of Equine Forelimbs. Andrea S. Bischofberger¹, Ashley Kelly¹, Christina Dart¹, Nigel Perkins², Leo Jeffcott¹, Andrew Dart¹. ¹Biomedical Research and Clinical Trials Unit, University of Sydney, Camden, NSW, Australia; ²Ausvet Animal Health Services, Toowoomba, NSW, Australia.

Manuka honey modulates healing of distal limb wounds in horses. The consistency of honey requires application under a bandage. Manuka honey gel (66% manuka honey and 34% water based gel) can be applied without a bandage. The study hypotheses were that 1. The gel would be as effective as manuka honey in minimizing wound retraction; 2. Treatment with the gel throughout healing would improve overall healing time and 3. Manuka honey would enhance healing of wounds contaminated with feces.

Five full thickness skin wounds (2×2 cm) were created on both metacarpi. Wounds on one forelimb were covered with horse feces for 24 hours while wounds on the contralateral limb were left non-contaminated. Wounds were randomly assigned different treatments: manuka honey, manuka honey gel applied for 12 days, manuka honey gel applied throughout healing,

gel control applied for 12 days and untreated control. Wound area was measured on day 1,7,14,21,28,35 and 42, and overall healing time recorded.

Wounds treated with manuka honey and manuka honey gel were smaller than gel control and untreated control wounds until day 35. Wounds treated with manuka honey gel throughout healing healed faster than all other wounds. There was no effect of manuka honey gel on healing of contaminated wounds.

Treatment of wounds with manuka honey gel reduced wound retraction and overall healing time. As a gel, manuka honey can be used safely to promote healing of equine clinical wounds without need for a bandage thereby reducing complications and costs associated with long-term bandaging.

The Effect of Prosthesis Tension, Position and Number on the Area of the Rima Glottidis in Normal Equine Laryngeal Specimens. Andrea S. Bischofberger¹, Marta Wereszka¹, Ines Hadidane¹, Nigel Perkins², Leo Jeffcott¹, Andrew Dart¹. ¹Biomedical Research and Clinical Trials Unit, University of Sydney, Camden, NSW, Australia; ²Ausvet Animal Health Services, Toowoomba, QLD, Australia.

The cricoarytenoid dorsalis muscle has 2 distinct neuromuscular compartments that act synergistically to modulate the area of the rima glottidis. Surgically prostheses placed coincident to each compartment may optimize the area of the rima glottidis.

Three prostheses were preplaced at different positions in the cricoid. A cranial prosthesis through the dorsal cricoid spine 70% along the total cricoid length measured from the caudal rim. A dorsal prosthesis through the caudal rim of the dorsal cricoid spine and a lateral prosthesis 1 cm lateral to the dorsal cricoid spine. In 14 larynges, the area of the rima glottidis was measured after loading each prosthesis in 5 newton (N) increments from 0–35 N. In 8 larynges, the 3 prostheses were tied alone and in combinations each at a fixed load of 15 N and the area of the rima glottidis measured.

The area of the rima glottidis increased as load on the prosthesis increased reaching a maximum area at 20 N. Compared to any single prosthesis, tying 2 and 3 prostheses in combination resulted in a larger cross sectional area at 15 N, however there was no significant difference between the combinations of 2 and 3 prostheses.

Applying 20 N to the prosthesis optimized the area of the rima glottidis. Two and 3 prostheses yielded a greater area of rima glottidis compared to one prosthesis. Using a prosthesis corresponding to the medial cricoarytenoid dorsalis muscle compartment provided no benefit in terms of rima glottidis area over a conventional 2 prosthesis technique in cadaveric specimens.

Effect of Local Anesthetic Deposition into Structures of the Equine Foot on Subsequent Magnetic Resonance Images. Belinda Black¹, Nicola C. Cribb¹, Stephanie Nykamp¹, Donald R. Trout¹, Jeffrey J. Thomason². ¹Clinical Studies, University of Guelph, ON, Canada; ²Biomedical Sciences, University of Guelph, ON, Canada.

The effect of diagnostic anesthesia on the interpretation of MRI is unknown. Our objective was to determine if mepivacaine injection in the foot would cause iatrogenic variation detectable with MRI. We hypothesized that MRI will detect an increase in joint fluid at 24 h, but not 72 h post-injection and that abnormalities at needle site entries will be detectable.

Fifteen sound adult horses had baseline MRI performed up to 6 d prior to injection of the podotrochlear bursa (PB), digital flexor tendon sheath (DFTS), distal interphalangeal joint (DIPJ) and palmar digital nerve block (PDNB). MRI was repeated at 24 h and 72 h post-injection then objective and subjective measurements were made.

MRI measurements made >24 hours after mepivacaine injection of the DIPJ, PB and a PDNB did not alter significantly from baseline values. Compared to baseline values, MRI at 24 h and 72 h after injection of the DFTS revealed a significant increase in synovial fluid volume. DIPJ and PB fluid volume increased over time.

Mepivacaine injected into the DIPJ, PB and a PDNB does not interfere with MRI interpretation >24 hours after, however, DFTS injection caused increased synovial fluid, detectable on MRI for at least 72 hours. The increased DIPJ and PB fluid volume over time may result from prior general anesthesia.

In conclusion, DFTS injection can cause an increase in synovial fluid detectable on MRI for at least 72 hours. No effect of mepivacaine injection into the DIPJ, PB or PDNB was detected in normal horses.

Incidence of Trans-Cortical Tibial Fractures with Self-Tapping and Non-Self-Tapping Screws in a TPLO Model. Christina L. Boekhout, Alan R. Cross. Georgia Veterinary Specialists, Atlanta, GA.

Investigation of self-tapping screws (STS) and non-self-tapping screws (NSTS) has yet to determine the superior screw type. In this retrospective

study we compared the two screw types in a clinical setting. The objective of this study was to compare the incidence of radiographically apparent trans-cortical diaphyseal tibial fractures between STS and NSTS in a tibial plateau leveling osteotomy (TPLO) model.

STS and NSTS were compared by reviewing postoperative TPLO radiographs. Three screws distal to the tibial osteotomy served as the in-vivo model for canine cortical bone. A trans-cortical fracture was defined as the presence of a saucer-shaped radiolucent defect on the periosteal surface of the trans-cortex surrounding the screw and the presence of radio-opaque material (bone) separate from the trans-cortical periosteal surface. The effect of screw type and screw composition on the incidence of trans-cortical fractures was evaluated.

STS had a significantly higher ($P = 0.006$) incidence of trans-cortical fractures (18.0%) compared to NSTS (0.8%). The effect of screw material on the incidence of trans-cortical fractures was not statistically significantly different ($P = 0.485$). Systemic conditions that compromise diaphyseal bone quality may warrant the use of NSTS when internal fixation is required. We suspect the increased incidence of trans-cortical fractures in STS is attributed to the shorter cutting flute compared to that of a tap utilized with a NSTS.

The Effects of Mixing Pharmaceuticals with Equine Stem Cells Prior to Treatment of Orthopedic Injuries in the Horse. Laurie Bohannon¹, Naomi J. Walker², Julie W. Burges³, Larry D. Galuppo¹, Dori L. Borjesson². ¹Surgical and Radiological Sciences, School of Veterinary Medicine, University of California, Davis, CA; ²Pathology, Microbiology, and Immunology, School of Veterinary Medicine, University of California, Davis, CA; ³University of California-Davis Veterinary Blood Bank, School of Veterinary Medicine, University of California, Davis, CA.

Mesenchymal stem cells (MSCs) are widely used to treat equine orthopedic injuries that are unresponsive to conventional therapies. Potential complications after intra-articular injection of MSCs include joint inflammation or septic arthritis. Given this, many clinicians have elected to co-inject MSCs with either antibiotics or hyaluronic acid (HA). The effects of these ancillary products on MSC health are unknown. The objective of this study was to evaluate the effects of these ancillary products on MSC function. We hypothesized that incubation of bone marrow (BM)-derived MSCs with therapeutic doses of Gentocin, amikacin, and HA would not alter MSC product pH, viability, or proliferative potential.

Equine BM-MSCs from 3 adult horses were used. Five million MSCs from each donor were incubated with Gentocin (750μ at 50 mg/mL), amikacin (500μ at 125 mg/mL), HA (1.8 mL at 5.5 mg/mL), or 1% penicillin/streptomycin (control) under sterile conditions. MSC viability and product pH were serially measured.

Serial flow cytometric analysis showed that the incubation of MSCs with Gentocin and amikacin resulted in >95% MSC death after 45 minutes or 2 hours, respectively. Rapid MSC death prohibited further analyses with these additives. The incubation of MSCs with hyaluronic acid and penicillin/streptomycin for up to 6 hrs resulted in sustained MSC viability of 80%. All additives resulted in decreased product pH however remained constant over time.

MSCs tolerate co-incubation with HA (effects on viability and pH are minimal). The practice of mixing MSCs with aminoglycoside antibiotics are toxic to equine BM-MSCs and is not recommended for clinical practice.

Stimulus-Dependent Release of Tissue-Regenerating Factors by Equine Platelets. Bettina M. Dunkel¹, David M. Bolt¹, Roger K. Smith¹, Fiona Cunningham². ¹Veterinary Clinical Sciences, Royal Veterinary College, Hatfield, United Kingdom; ²Veterinary Basic Sciences, Royal Veterinary College, Hatfield, United Kingdom.

Platelet rich plasma (PRP) is increasingly used for the treatment of equine orthopedic injuries. However, the specific effects of different stimuli on the release pattern of regenerative and pro-inflammatory factors from equine platelets are unknown and an optimal treatment protocol remains to be established. The aim of this study was to identify a stimulus that enhanced release of histopromotive factors (platelet derived growth factor BB (PDGF) and transforming growth factor β 1 (TGF)) without causing concurrent release of a pro-inflammatory mediator (CCL5).

Washed platelet concentrates from 6 healthy ponies were prepared. Growth factor (GF) and CCL5 release was measured using commercially available ELISAs for human proteins following incubation with or without thrombin, chitosan or equine recombinant tumor necrosis factor (rTNF) at different concentrations over 24 h and subsequently over 96 h. Additionally, non-coagulated samples were analyzed.

Regardless of whether a stimulus was present or what stimulus was used, PDGF and TGF release was maximal between 0.5–1 h when clot formation took place and very little release was observed after 24 h. GF release was

minimal in non-coagulated samples. In contrast, CCL5 release was not associated with coagulation and appeared to persist for much longer. High concentrations of TNF caused significantly greater release of CCL5 at 6 h than any other stimulus tested.

GF release from equine platelets was dependent on coagulation but independent of the coagulation-initiating stimulus. Release of pro-inflammatory mediators was independent from coagulation and more sustained. Supernatants collected from coagulated platelets could be an alternative treatment option to PRP.

Retrospective Study of Orthopedic Infections in Equine Long Bone Fractures and Arthrodeses Treated by Internal Fixation: 96 Cases (2006–2010). Alvaro G. Bonilla, Benjamin J. Ahern, Dean W. Richardson, Raymond C. Boston, Tom P. Schaefer. Department of Clinical Studies New Bolton Center, University of Pennsylvania, Kennett Square, PA.

Surgical site infections (SSIs) result in repair breakdown and loss of many long-bone fracture equine patients. Recalcitrant SSIs are commonly associated with biofilm formation on hardware components requiring difficult revision surgeries in attempt to resolve the infection. We reported infection rates following long bone fracture repair and arthrodeses to be at 28%. The objectives of this follow-up study were to determine whether recent advances in fracture repair decreased the rate of SSI in patients, and to re-evaluate which factors continue to be prognostic indicators. The overall infection rate in fractures repaired changed from 28% to 14.6%. This figure remains high and continues to be an important factor in the pre-surgical considerations of long bone fractures. While the duration of hospital stay decreased for infected cases, antimicrobial therapy increased when compared to our previous study. Horses with SSIs have a significantly lower chance of discharge as well as increased hospitalization and medication requirements. Method of repair (ORIF vs. MIF) showed no significant association with SSIs or outcome. As a result, awareness of the factors increasing the chance of SSI and its effect on discharge remain unchanged and continue to be an essential repertoire to the clinician. In this study RLP was not associated with improved outcome which may be aligned with the trend of increased severity of infections. Surface modifications of orthopedic hardware under development in our laboratory rendering implants microbicidal could be a promising technology to further decrease SSI in an attempt to eliminate implant associated infections.

Correction of Rotational Deformity of the Pes with Plate Fixation in 5 Dogs. Randy J. Boudrieau¹, Michael P. Kowaleski¹, Massimo Petazzoni². ¹Clinical Sciences, Cummings School of Veterinary medicine at Tufts University, North Grafton, MA; ²Clinica Veterinaria Milano Sud, Milano, Italy.

Metatarsal rotation, or external rotation of the pes, is a congenital deformity of unknown cause in large breed dogs. Excellent results have been reported with deformity correction/arthrodesis at the proximal intertarsal joint utilizing external skeletal fixation. We hypothesized that internal fixation would simplify the surgery and postoperative management. The study's purpose was to describe the surgical technique and outcome of metatarsal rotation using plate fixation in 5 dogs (8 limbs). Pre- and postoperative pes rotation and any complications were recorded. In-hospital evaluation of limb function and alignment, and length of time to radiographic healing were reviewed. Long-term outcome was assessed by owner telephone interview. Mean preoperative metatarsal rotation was 57.9° (range: 50–71°). Standard and locking plate fixation spanned the tarsometatarsal joint in 4 limbs. In the remaining limbs, locking plate fixation was confined to the tarsus. Mean postoperative rotation was 11.5° (range: 8–16°). A metaspint was applied for a mean of 7.8 wk (range: 4–12 wk); all arthrodeses were healed at this time, and all dogs were sound. Incidental implant failures occurred only in cases where the fixation spanned the tarsometatarsal joint, and were removed in one dog. Mean long-term follow-up was 21.2 mo (range: 11–42 mo). All dogs had returned to full activity; none had any other complications or further surgery. All owners were fully satisfied with the outcome. Locking plate fixation confined to the tarsus appears to be a viable method of treatment for metatarsal rotation, and may be the most appropriate fixation method in large breed dogs.

Predictors of Outcome Following Development of Support Limb Laminitis in Horses with a Unilateral Lameness. Celine Bourzac¹, Nicola C. Cribb¹, Sheila Laverty², Judith B. Koenig¹, Donald R. Trout¹. ¹Clinical Studies, Ontario Veterinary College-University of Guelph, ON, Canada; ²Clinical Studies, Faculty of Veterinary Medicine, University of Montreal, Saint Hyacinthe, QC, Canada.

Support limb laminitis (SLL) is a devastating sequel to severe unilateral lameness in horses. We hypothesized that prediction of outcome at the

onset of SLL could be made from historical, clinical and radiographic information.

Medical records for horses with unilateral lameness were reviewed (1982–2007). Horses that developed SLL were included in the study. Signalment, weight, nature of unilateral lameness, position of the affected limb, duration of non-weight-bearing lameness, the number of days between injury and development of acute and chronic SLL and whether rotation or sinking of the 3rd phalanx occurred were recorded. Prophylactic procedures against laminitis, treatments and outcome (euthanasia or discharge) were recorded.

Twenty-seven horses met the inclusion criteria. Eight were discharged and 19 euthanatized. Rotation of the 3rd phalanx ($P = 0.01$, OR = 12.3) predicted a negative outcome and there was a trend ($P = 0.06$, OR = 7.0) for the nature of the initial injury (fracture) to do so. A decrease in phenylbutazone administration within 3 days prior to the laminitis diagnosis ($P = 0.028$, OR = 8.3) was identified as a positive predictor.

Rotation of the 3rd phalanx in the supporting limb (SL) may be evidence of a very severe or advanced chronic SLL. Decreased phenylbutazone levels most likely indicate a lesser severity of the unilateral lameness. Alternatively, high doses of phenylbutazone may have masked signs of laminitis. Fracture pain may increase loading of the SL, worsening severity of laminitis and therefore outcome.

Measures to prevent laminitis and reduce pain in the injured limb should be taken especially in horses with limb fracture.

Does Method of Jejunocostomy Affect Incidence of Complications or Survival in Horses? Jennifer A. Brown¹, Susan Holcombe³, Louise L. Southwood⁴, Rolf M. Embertson², Chris R. Byron⁵, Joe G. Hauptman³. ¹Tampa, FL; ²Rood and Riddle Equine Hospital, Lexington, KY; ³College of Veterinary Medicine, Michigan State University, East Lansing, MI; ⁴College of Veterinary Medicine, University of Pennsylvania, Kennett Square, PA; ⁵Knoxville, TN.

Jejunocostomy is performed as end-to-side (E2S) or side-to-side (S2S) anastomosis when devitalized distal ileum warrants resection. Surgeons strongly favor one method or the other, despite a lack of evidence of increased morbidity or mortality associated with either procedure. The purpose of this retrospective study was to determine the effect of E2S vs. S2S on development of postoperative reflux, postoperative colic, re-operation, and short- and long-term survival. We hypothesized that method of jejunocostomy would have no significant effect on development of complications or survival.

Data collected from the medical record and analyzed included signalment, physical examination and clinical pathologic data, surgical lesion, length of resected intestine, method of anastomosis, postoperative reflux and colic, re-operation, survival to discharge, and 6 and 12-month survival. Data were analyzed using multiple logistic regression with significance set at $P < 0.05$.

One hundred and fifty horses from 5 referral veterinary hospitals were included in the study. Side-to-side jejunocostomy was performed in 90 horses and E2S in 60 horses. There was no significant difference in postoperative complications or survival between the E2S and S2S techniques. PCV and TS at hospital admission were associated with development of postoperative colic. PCV at hospital admission was associated with re-operation. Age was associated with the development of postoperative reflux and long-term survival.

Based on these results there is no evidence to suggest that either S2S or E2S is superior regarding postoperative complications or survival, and supports the use of either procedure in horses.

In-Vivo and Ex-Vivo Effect of Meloxicam on Chondrocyte Metabolism in Osteoarthritic Canine Cartilage. Steven Budsberg¹, Aaron M. Stoker², Spencer Johnston¹, Bill Liska³, Lisa Reno¹, James L. Cook². ¹Small Animal Medicine and Surgery, University of Georgia, Athens, GA; ²Comparative Orthopaedic Laboratory, University of Missouri, Columbia, MO; ³Gulf Coast Veterinary Specialists, Houston, TX.

The study objective was to assess effects of meloxicam on chondrocyte metabolism in a naturally occurring osteoarthritic (OA) canine cartilage model. 21 dogs with coxofemoral OA at the time of total hip replacement (THR) were used. Cartilage was harvested from two groups: 16 dogs that received no NSAID for at least 14 days prior to THR (group 1), and 5 dogs that received meloxicam for at least 14 days before THR (group 2). Cartilage Explants: Group 1 dogs had meloxicam added to culture medium at 0.0 (Cm:control), 0.3, 3.0 and 30.0 ug/ml. Group 2 explants were cultured with medium alone (MPM:cm). Tissue Matrix Analysis: Sulfated GAG, total collagen content, and cartilage DNA content were measured. Media analysis: GAG, chondroitin sulfate 846 (CS-846), Nitric oxide (NO), PGE2, MMP-2,-3, and -13 were measured. Tissue gene expression: RNA extraction and gene expression analysis for matrix molecules were measured by RT-PCR. Statistical Analysis: a repeated measures analysis of

variance was used for data comparisons. Cartilage matrix analysis revealed meloxicam had no effect on GAG, HP or DNA content at any time point. Media analysis revealed lower PGE2 on day 3 concentrations in all three meloxicam treated subgroups compared to Cm:control. Ex-vivo meloxicam pretreated cartilage showed no differences within or between MPM:cm and Cm:control groups in GAG, HP or DNA content at any time point. These data suggest that meloxicam treatment of naturally occurring OA cartilage did not induce degradation over 30 days of treatment. Meloxicam effectively decreased inflammatory mediator production (PGE2) in OA chondrocytes.

Effects of Serum and Autologous Conditioned Serum on Equine Articular Chondrocytes Treated with IL-1. Eric Carlson, Allison A. Stewart, Kelly Carlson. University of Illinois, Champaign, IL.

The purpose of this study was to evaluate the effects of autologous horse serum (HS) and ACS on equine cartilage proteoglycan metabolism in an IL-1 model. Our hypothesis stated there would be no difference in proteoglycan metabolism in IL-1 treated equine cartilage combined with HS or ACS.

Articular cartilage, HS, and ACS were collected from 5 horses. Cartilage was digested and chondrocytes were isolated and formed into pellets. Treatment groups consisted of 10% HS only, 10% HS with IL-1, 20% HS with IL-1, 10% ACS with IL-1, and 20% ACS with IL-1.

GAG synthesis and release, total GAG concentration, total DNA content, and media MMP3 and IL-1Ra content were evaluated. Non-normally distributed data were logarithmically transformed and presented as mean \pm SE log values. A 1-way repeated-measures ANOVA was performed. P values ≤ 0.05 were considered significant.

Comparing positive and negative controls, treatment with IL-1 caused a decrease in pellet GAG synthesis and total pellet GAG concentration. There was no difference in GAG release, DNA content, or media IL-1Ra. There was an increase in media MMP-3.

Comparing treatment groups, there was no difference in GAG synthesis or release, total GAG concentration, total DNA content, or media MMP-3 content. Media from ACS treatment groups had higher concentrations of IL-1Ra compared to HS treatment groups.

Treatment with ACS increased IL-1Ra concentrations, but failed to significantly affect proteoglycan cartilage metabolism. Furthermore, ACS had no significant effect on media MMP-3 concentrations compared to HS.

Incidence of Postoperative Sepsis in Equine Arthroscopy Without Antimicrobial Prophylaxis. James Carmalt^{1,2}, Hanna Borg¹. ¹Hallands Djursjukhus, Slöinge, Sweden; ²Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, SK, Canada.

Arthroscopy has become the standard treatment methodology for intra-articular osteochondral "chip" fractures, osteochondrosis and as an adjunct modality during internal fixation. Despite this, there is no consensus on the need or use of antimicrobial prophylaxis. We report on elective arthroscopic surgeries performed over a three year period without antimicrobial prophylaxis, in keeping with our current practice policy. Computerized practice records were accessed and the information from 444 consecutive elective arthroscopic surgeries between 2008 and 2010 were obtained. Age, sex, breed, joints explored, number of portals, anesthesia time, complications and outcome were entered on a spreadsheet program. Statistical analysis was performed and the level of significance set at $P < 0.05$. During this period of time 636 joints were explored. 18 horses had complications (defined as fever, surgical site infection, cellulitis, wounds associated with inappropriate bandaging or septic joints). Of these, 9 had a single episode of fever, 2 had wounds associated with bandaging, 2 had surgical site infections and 1 horse had cellulitis post-surgery. 3 horses had a septic joint (and no other complication). The incidence of sepsis was 0.47% joints or 0.67% horses. All horses survived and returned to function. This joint infection rate compares favorably with other published work citing 0.9% sepsis in horses following arthroscopy where horses received pre or perioperative antimicrobial therapy. In the current climate of antibiotic resistance and a concerted effort by medical professionals to reduce antimicrobial usage we would submit that most horses undergoing routine, elective arthroscopy do not need antimicrobial therapy.

Novel Imaging Modality for In Vivo 3D Tracking of Equine Metacarpophalangeal Joint Kinematics: A Preliminary Study. Bronwen Childs¹, Elizabeth L. Brainerd², Daniel Miranda³, Joseph J. Crisco³, Carl A. Kirker-Head¹. ¹Orthopedic Research Laboratory, Tufts Cummings School of Veterinary Medicine, North Grafton, MA; ²Functional Morphology and Biomechanics Laboratory, Brown University, Providence, RI; ³Department of Orthopedics, Brown University, Providence, RI.

Equine distal limb injuries frequently involve the metacarpophalangeal (MCP) joint and adjacent structures. Their prevention and management

will be enhanced by an understanding of in vivo 3D MCP joint motion that exceeds the precision and accuracy of existing kinematic analysis systems. In this proof of concept study, our goal was to assess the feasibility and safety of using a new imaging modality called XROMM (X-ray Reconstruction of Moving Morphology) to characterize equine MCP joint motion with six degrees of freedom. XROMM links bi-planar fluoroscopic x-ray videos with morphologically accurate 3D bone models derived from computed tomography to obtain highly precise ± 0.096 -mm reconstructions of the joint in motion. We used a single healthy pony embedded with 1-mm diameter radiopaque bone markers. Data is reported for the duration of the stance phase of a pony walking at a speed of 1.3 m/s and the range of motion for flexion and extension is 4.74° with the peak extension (0.26°) at 74% of the stance phase and medial to lateral rotation of 1.63° and 1.02°. We report a precision of 0.096-mm under the in vivo recording conditions, thus improving on previous measurements of equine 3-D joint kinematics that reported precision of 0.3 mm and accuracy of 0.88 mm. These results validate the use of XROMM in equids and serve as a basis for our on-going studies linking XROMM derived kinematic data with simultaneously derived force plate ground reaction data.

In Vitro Comparison of Construct Elongation Associated with the Lateral Circumfabellar Suture, TightRope CCL and SwiveLock Bone Anchor for Extracapsular Stabilization of the Cranial Cruciate Ligament-Deficient Stifle in Dogs. Christina J. Choate, Antonio Pozzi, Daniel D. Lewis, Caleb C. Hudson, Bryan P. Conrad. Comparative Orthopaedics and Biomechanics Laboratory, University of Florida, Gainesville, FL.

The purpose of this study was to perform a cadaveric analysis of the elongation associated with five methods of femoral attachment and four prosthetic materials used clinically for extracapsular stabilization of cranial cruciate ligament (CrCL)-deficient stifles. We hypothesize that techniques utilizing osseous fixation (TightRope and bone anchor) will elongate less than those reliant on soft tissue integrity (circumfabellar techniques).

Cadaveric femora were collected from 50 skeletally mature dogs euthanized for reasons unrelated to this study. Femurs were randomly assigned to one of five treatment groups: circumfabellar FiberWire (CFW), circumfabellar nylon leader material (CNL), single TightRope (TR), double TightRope (2TR), or SwiveLock bone anchor (BA). Elongation at failure, conditioning elongation, and peak to peak elongation were measured using a mechanical testing machine. Ten isolated loops of each prosthetic material were subjected to the same mechanical testing procedure.

The BA construct had the least peak to peak elongation and BA and CNL constructs had the least elongation at failure and conditioning elongation. The CFW constructs had the greatest conditioning elongation, and CFW and CNL constructs had the greatest peak to peak elongation.

Elongation of extracapsular stabilization techniques in the short-term postoperative period is increased when the prosthetic material is anchored within the femorofabellar ligament compared to osseous anchorage. However, the prosthesis and the method of securing the free ends also affect elongation in the construct. Extracapsular stabilization techniques relying on circumfabellar fixation may be less effective in mitigating cranial drawer motion due to their propensity for elongation.

Confounding Factors in Algometric Assessment of Mechanical Thresholds in Normal Dogs. Kevin Coleman¹, Chad Schmiedt¹, Kristin Kirkby³, Amanda Erickson², B. Duncan Lascelles². ¹Small Animal Medicine and Surgery, College of Veterinary Medicine, University of Georgia, Athens, GA; ²Small Animal Clinical Sciences, College of Veterinary Medicine, North Carolina State University, Raleigh, NC; ³Small Animal Surgery, Seattle Veterinary Specialists, Kirkland, WA.

Validated objective or semi-objective measures of tissue sensitivity are needed for clinical pain research. Algometry is a non-invasive method of measuring tissue sensitivity. The purpose of this study was to evaluate algometric readings in normal dogs in a design that would also look at possible confounding influences.

Nineteen skeletally-mature orthopedically and neurologically normal retriever or retriever mix dogs were recruited. Fourteen common surgical sites were selected for algometric pressure testing (Commander, JTech; 1 cm²). Threshold response was defined as a higher center recognition of the stimulus, and recorded in pounds of force. Sites were tested in the same order, and the testing sequence repeated 3 times for each side of the dog. The patients were tested in the morning and evening of a single day; this was repeated 10–14 days later, allowing 4 separate data collections for each patient. Data were analyzed using ANOVA or ANCOVA.

When all the data was included in the analysis, dog, order, site, time, day, repetition (all above $P < 0.0001$) and site order ($P = 0.0217$) significantly affected the algometer readings. When just the first reading for each site was analyzed, dog, site, and sex (all $P < 0.0001$) significantly affected algometer

readings. These data suggest that learning occurred over repeated collection time points. Dogs anticipated the algometer stimulus and reacted at lower thresholds. Therefore, establishment of normal algometric measurement for dogs using this methodology was not possible. Algometry will only be useful if careful experimental design can negate these potential confounding influences.

Complications and Biostatistics Associated with Tibial Plateau Leveling Osteotomy 1,519 Cases. Thomas Coletti¹, Mark Anderson¹, Mary Jean Gorse¹, Richard Madsen². ¹Veterinary Specialty Services, St. Louis, MO; ²Statistics, University of Missouri, Columbia, MO.

Prior studies have reported TPLO complication rates up to 28%. We hypothesized the level of complications reported would be lower and less severe with experienced surgeons.

Medical records of TPLO surgeries from January 2005 until December 2009 were reviewed. A total of 1,519 surgeries performed on 1,231 dogs were identified. Statistical analysis was performed on all complications occurring within 6 months following surgery. Data was collected from the three board-certified surgeons in the practice, each having experience of over 100 TPLO surgeries prior to January 2005.

Total complication rate was 11.4%. Major complication rate (those requiring a surgical intervention or a prolonged lameness greater than 12 weeks) was 3.1% and minor rate was 8.3%. Newfoundland and German shepherds had a total complication rate of 24% and 31.1% respectively.

At presentation, 13.9% of dogs had bilateral cruciate ruptures. The cruciate ligament was completely torn in 86% and partially torn in 13% of the stifles. The medial meniscus was torn in 40% of stifles. Our study shows predisposing factors for complications include a TPA >30 degrees and being a German shepherd. The only protective factor was being a Labrador retriever.

This study is from a large metropolitan area and represents an accurate description of the biostatistics of cruciate ligament disease in dogs. This is the lowest complication rate yet described for TPLO. The majority of complications resolved with minor therapy. Owner and surgeon satisfaction is high with this procedure and the complication rate is low.

Effect of Proximal Rotational Ulnar Osteotomy on Ex Vivo Elbow Contact Mechanics and Three-Dimensional Kinematics in Dogs. Laura C. Cuddy, Antonio Pozzi, Daniel D. Lewis, Bryan P. Conrad, MaryBeth Horodyski, Stanley E. Kim, Scott A. Banks, Noel Fitzpatrick. Comparative Orthopaedics and Biomechanics Laboratory, University of Florida, Gainesville, FL.

Fragmented medial coronoid process is the most common cause of thoracic limb lameness in dogs. Simulation of the supinated pose of the proximal ulna with a proximal rotational ulnar osteotomy (PRUO) may unload the medial elbow compartment.

PRUO will significantly reduce mean and peak contact pressures in the medial elbow compartment with corresponding increases in the lateral compartment.

Digital pressure sensors measured contact area, mean contact pressure and peak contact pressure in the medial and lateral elbow compartments in unpaired thoracic limbs harvested from 12 dogs (26 ± 3.6 kg) subjected to 200 N axial load. Three-dimensional static poses of the elbow were obtained using a Microscribe digitizing arm. Each specimen was tested at three elbow flexion angles (115°, 135° and 155°), with the antebrachium in neutral, 28° supination and 16° pronation. A transverse ulnar osteotomy was performed 15 mm distal to the medial coronoid process. The proximal ulna was rotated cranio-lateral around the radial head and stabilized with a dynamic compression plate with a 30° twist. The testing protocol was repeated. Repeated measures analysis of variance with post-hoc Bonferroni correction was performed.

Mean and peak contact pressures significantly decreased in the medial and increased in the lateral elbow compartment. The tip of the medial coronoid process rotated 20.7° caudolateral and translated 4.7 mm caudal and 2.7 mm distal to the center of the radial head.

PRUO shifts mean and peak contact pressures from medial to lateral elbow compartments, and may have therapeutic value in dogs with medial compartment disease.

The Use of a Percutaneously Controlled Hydraulic Occluder for the Treatment of Refractory Urinary Incontinence in 18 Female Dogs. Rachael L. Currao, Allyson Berent, Chick Weiss. Department of Diagnostic Imaging and Interventional Radiology, The Animal Medical Center, New York, NY.

Refractory urinary incontinence (RUI), where traditional medical/surgical techniques fail, is a major dilemma. The purpose of this retrospective study was to evaluate the efficacy and safety of a percutaneously controlled hydraulic occluder (HO) for the treatment of RUI in female dogs.

The hypotheses were: 1) This procedure is safe and effective; 2) This device can be considered in patients with urethral sphincter mechanism incompetence alone and in conjunction with other anatomical urinary defects.

An uninflated silicone ring (HO) was surgically placed around the proximal urethra, connected to a subcutaneous injection port, and inflated with sterile saline as needed to maintain continence. RUI was assessed using an owner subjective continence score.

All 18 dogs were reported to have dramatic improvements in continence scores following HO placement. The continence rate after HO placement was 61% in the 18 patients, though only 12/18 clients were compliant with appropriate recommended inflations. In compliant dogs, 11/12 (91.6%) became continent. Seven of 18 (39%) did not require percutaneous inflation to achieve continence. In 12 compliant dogs, 4/4 with USMI alone; 6/7 with previous EU fixation; and 1/1 with a severe urethral anatomical anomaly were continent. Severe complications were seen in 3/18 dogs resulting in the development of a urethral stricture.

Overall, the placement of an HO device provided a safe and effective alternative when traditional options failed. The technique was associated with a few major complications, and the HO can be considered an alternative for treatment of RUI in dogs.

A Retrospective Analysis of Return to Function Following Colic Surgery in 195 Cases (2003–2010). Weston Davis, Callie Fogle, Mat Gerard, Jay Levine, Anthony Bilkslager. Veterinary Teaching Hospital, North Carolina State University, Raleigh, NC.

Return to intended use and performance following colic surgery is of major concern to the equine industry and there is minimal objective data on this topic. The purpose of this study was to investigate return to functional use of horses following colic surgery and factors associated with a negative outcome. It was hypothesized that prognosis for return to use and performance would be good, but that multiple variables (especially postoperative complications) would impact outcome.

Medical records of horses that underwent exploratory celiotomy for acute colic were reviewed (2003–2010). Horses were excluded if they survived less than 6 months, had no intended use preoperatively, or were lost to follow-up. Information retrieved included history, signalment, use, and selected pre-, intra-, and postoperative factors. Phone interviews were used to obtain follow-up data. Logistic regression was used to investigate associations between clinical data and outcome, reported as odds ratios with a 95% confidence interval.

At 6 months, 68% were performing their intended use and 56% were at or above their preoperative performance. At one year, 76% were performing their intended use and 69% were at or above their preoperative performance. Animals that failed to return to use/performance at follow-up were more likely to have had previous celiotomy, stall rest for an orthopedic condition, a non-strangulating lesion type, incisional hernia, diarrhea, or laminitis.

The overall return to general use and performance following colic surgery is fair. Multiple pre and postoperative factors may alter return to use and performance.

Stereolithography of Complex Angular & Rotational Deformities (Femoral Malunions) as an Aid in Surgical Planning and Treatment with Locking Plate Fixation in 3 Dogs. Michael D. DeTora, Randy J. Boudrieau. Cummings School of Veterinary Medicine, Tufts University, North Grafton, MA.

Correction of angular limb deformities is frequently performed to re-establish normal function and cosmetic appearance. Complex rotational and torsional angular limb deformities are typically challenging cases to assess radiographically. Stereolithography (SLA) is a rapid prototyping technology used to produce exact anatomic bone replicas from CT data using computer aided design software. We hypothesized that preplanning with SLA biomodels would facilitate correction of complex distal femoral malunions; furthermore, a novel locking plate system (Advanced Locking Plate System [ALPS]; KYON, Zürich, Switzerland) also was hypothesized to permit uncomplicated fracture fixation. Three dogs (4 limbs) were identified with complex angular and rotational distal femoral deformities. Full-size exact replica epoxy bone biomodels were produced by ProtoMED® (Westminster, CO), and were used as templates for surgical planning prior to in vivo correction. Corrective osteotomies were first performed on the SLA biomodels, which were planned using direct observation and a guide wire technique, and plate fixation applied. This preliminary experience was then used at the time of the definitive surgical correction. All pre-contoured implants (ALPS) were applied at the definitive surgical procedure with minimal modification. All femurs healed without complications. All dogs had markedly improved functional outcomes (only one dog had a persistent mild lameness) at the final in-hospital follow-up at a mean of 16.8 mo after surgery. Long-term follow-up obtained at a mean of 35.4 mo revealed all owners to be highly satisfied with the outcome. SLA preoperative

planning and ALPS fixation were performed without difficulty, and resulted in uncomplicated healing with excellent results.

Hand Assisted Laparoscopic Ovariectomy via Colpotomy in Standing Mares. Dustin Devine. Veterinary Clinical Sciences, Oklahoma State University, Stillwater, OK.

There are many indications for ovariectomy in mares. Laparoscopic surgical methods have been demonstrated to reduce morbidity as well as shorten convalescence periods in patients. This purpose of this project was to determine the feasibility of an alternate technique for performing bilateral ovariectomy in standing mares. Proposed advantages would be a reduction in patient morbidity, shortened convalescent times, and improved cosmesis through use of fewer skin incisions with this technique.

A total of 19 adult mares were included in the study. The mares were operated standing sedated in stocks with caudal epidural performed. The abdomen was approached laparoscopically using two, left paralumbar portals. A third colpotomy incision was made to permit hand assistance for the procedure and ovary retrieval from the abdomen. The ovaries were removed using either a chain excraser ($n = 8$) or LigaSure™ device ($n = 11$).

The procedure was successfully performed in all except one mare (18/19), this mare was of large stature and working length of the equipment was insufficient to complete the task.

The results of this work demonstrate that bilateral laparoscopic ovariectomy by means of two, same-sided portals in combination with hand assistance via colpotomy is a technically feasible, safe and effective practice in small (312 kg) to average sized mares (≤ 495 kg).

Foaling Rates and Factors Associated with Fetal Outcome After Colic Surgery in Pregnant Thoroughbred Mares in Central Kentucky. Niklas J. Drumm², Rolf M. Embertson¹, Scott A. Hopper¹, Brett J. Woodie¹, Alan J. Ruggles¹, Lawrence R. Bramlage¹, Rolf Fimmers⁴, Johannes Handler³. ¹Surgery, Rood & Riddle Equine Hospital, Lexington, KY; ²Surgery, Pferdeklinik am Kottenforst, Wachtberg, Germany; ³Equine Reproduction Unit, Clinic for Horses, Freie Universitaet Berlin, Germany; ⁴Institut fuer Biometrie, Universitaetsklinikum Bonn, Germany.

Colic surgery in the pregnant broodmare raises owners concerns not only for the mare, but also for the fetus. This paper investigates foaling rates and factors associated with fetal outcome following colic surgery in the pregnant Thoroughbred mare.

The medical records of Thoroughbred mares, which had colic surgery performed from 1993 through 2007 at the Rood and Riddle Equine Hospital, were reviewed. Age of the mare, date of surgery, fetal age, duration of colic at admission, pack cell volume at admission, surgical diagnosis, duration of anesthesia, intraoperative hypotension, intraoperative hypoxia, time of hospitalization and surgeon were recorded. Data about foaling was obtained from the North American Jockey Club.

Of 268 mares, 170 (63.43%) had a live foal after surgery. The predominant factor associated with foaling rate after surgery was fetal age at the time of surgery ($P = 0.0008$). Mares bred less than 40 days before surgery had a reduced foaling rate compared with mares 40 days or longer post breeding: 47.50% vs. 69.64%. Other factors influencing foaling rate were mares age ($P = .002$), small intestinal vs. large intestinal lesion ($P = .034$), surgeon ($P = .03$) and duration of intraoperative hypotension ($P = .04$).

This evaluation of a large homogenous population provides the clinician with information that may aid in prognosticating and managing the pregnant mare with surgical colic.

Effects of Intra-Articular Tiludronate on Synovial Fluid Parameters and Joint Health in Horses. Katja Duesterdieck-Zellmer¹, Lindsey Moneta^{1,2}, Elena Gorman². ¹Department of Clinical Sciences, College of Veterinary Medicine, Oregon State University, Corvallis, OR; ²Department of Biomedical Sciences, College of Veterinary Medicine, Oregon State University, Corvallis, OR.

Systemically administered tiludronate has been reported to have beneficial effects in horses with osteoarthritis. Despite a lack of data about safety or efficacy of intra-articularly administered tiludronate, veterinarians are anecdotally utilizing this route of administration. In-vitro data on equine articular cartilage explants showed lower concentrations of tiludronate ameliorating proteoglycan loss and decreasing chondrocyte apoptosis, whereas high concentrations had detrimental effects. We hypothesized that a low intra-articular dose of tiludronate does not have negative effects on joint health in horses.

Four horses without front limb lameness and clinically and radiographically normal carpal joints were treated with tiludronate (0.17 mg), injected into one middle carpal joint. The contralateral joint was injected with 1 ml NaCl. Horses underwent lameness exams throughout the study. Joint

fluid from both carpal joints was sampled prior to treatment and 5 minutes, 24 and 48 hours, 7 and 14 days later. Synovial tiludronate and proteoglycan concentrations, nucleated, differential cell count and total protein concentration was determined. Results were analyzed by repeated measures ANOVA ($P < 0.05$).

No negative effects of tiludronate were found upon lameness exam or synovial fluid cytology. Mean tiludronate concentration in synovial fluid 5 minutes after injection with tiludronate was 1,353 ng/ml. Synovial fluid proteoglycan concentration was decreased in joints treated with tiludronate 7 days after treatment, but not in saline injected control joints.

Intra-articular injection of a low dose of tiludronate into horses' middle carpal joints did not have any short-term detrimental effects and appeared safe at the administered dose.

Quantitative Analysis of the Intramedullary Arterial Supply of the Feline Tibia—Is There a Causal Relationship to Delayed and Nonunion Fracture Healing? Danielle R. Dugat¹, Mark C. Rochat¹, Jerry W. Richey², Mark E. Payton³.

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Clinical observations suggest that feline tibial fractures are prone to delayed union and nonunion healing complications. This study sought to quantitatively describe the intramedullary arterial supply of the adult feline tibia and determine if the arterial supply is different from that of adult small dogs, who seemingly do not exhibit the same rates of delayed and nonunion fracture healing. Our null hypothesis was that the intramedullary arterial density and diameter of the nutrient artery in the adult feline tibia was the same as the age and size matched dog.

Using microvascular injection and modified Spalteholz techniques, cadaveric feline and canine pelvic limbs were obtained to prospectively characterize the intramedullary arterial supply of the tibia. Processed specimens were evaluated using the ImageJ morphometric program. Statistical comparisons were made between cats and dogs for the intramedullary arterial density and diameter of the nutrient artery.

There was no significant difference in the intramedullary arterial density between dog and cat tibiae. The feline nutrient artery diameter (0.5497 \pm 0.0552 mm) was significantly different than the canine nutrient artery (0.2976 \pm 0.0423 mm) in the distal section of bone. Dogs subjectively exhibited more branching vessels in the distal and mid-diaphyseal sections of bone.

Delayed fracture healing in the feline tibia does not appear to be due to diminished intramedullary arterial supply. However, a lack of diffuse arborization of the arterial supply to the middle and distal feline tibia may explain, in part, why feline tibial delayed or nonunions may be more common than in canine tibial fractures.

A Retrospective Evaluation of the Effect of Antibacterial-Impregnated Sutures on Surgical Site Infection and Inflammation in 283 TPLO Procedures. Sean Etter, Guillaume R. Ragetly, David J. Schaeffer, R. Avery Bennett. Veterinary Clinical Medicine, University of Illinois, Champaign, IL.

The study objective was to compare infection and inflammation rates between polydioxanone and poliglecaprone 25 and triclosan-impregnated polydioxanone and poliglecaprone 25 for a standardized orthopedic procedure (TPLO).

283 dogs that underwent a TPLO procedure between November 2005 and December 2009 were included in this retrospective study. The variables recorded included age, surgery and anesthesia durations, body weight, body condition score, propofol use, postoperative administration of antimicrobials, presence of a preoperative infection, use of a TPLO jig, technique of joint exploration, suture materials used to close the different layers of the incision, and use of staples. The outcome variables included superficial inflammation, infection, or infection/inflammation.

No confounding factor was found to have an effect. The rates of infection or inflammation did not differ between surgeries where triclosan-impregnated sutures were used ($n = 160$, 19% and 9%, respectively) and those where non-impregnated sutures were used ($n = 113$, 15% and 11%). The use of staples compared to sutures decreased the infection/inflammation rate (16% compared to 29%).

Triclosan-impregnated sutures may not work as effectively *in vivo* where the environment is not controlled or where triclosan may elute quickly from the suture. It is unlikely that our findings are related to a statistical error since the power was high (80%) and the infection/inflammation rate was greater for the impregnated sutures. The decreased complications associated with staples could be due to the decreased tissue reaction. Further studies are needed to understand and overcome the limitations of the commercialized antibacterial-impregnated sutures.

Augmentation of Trauma Hardware in a Proximal Femoral Osteotomy Model — Pilot Study in Yucatan Miniature Pigs. Nicole Fawns, Suzanne Stewart, Tom P. Schaefer. Comparative Orthopaedics Research Laboratory, School of Veterinary Medicine at the University of Pennsylvania, Kennett Square, PA.

Proximal femoral fractures are common in elderly patients as a result of low energy falls. Osteoporosis increases the risk of fracture making internal fixation difficult due to poor bone quality resulting in unstable repairs, protracted immobility, pain and increased mortality. Here we report the development of an animal model to evaluate augmentation materials in combination with proximal femoral repair systems for peritrochanteric fractures. More specifically, this model centers on the postoperative clinical parameters reflective of construct stability, mobility and pain. Nine skeletally mature Yucatan miniature pigs were enrolled in this pilot study. Utilizing a lateral approach to the femur a proximal trochanteric osteotomy was performed and repaired using a modified Dynamic Hip Screw system. In five animals the repair was augmented via the cannulated lag screw delivering PMMA into the cancellous bone of the femoral neck and head. Four animals received no augmentation and served as control. Postoperative pain scores were documented for 14 days. CT scans were performed at 10 days, 6 weeks and 3 months postoperative and helped monitoring construct integrity. Animals with augmented repairs started immediately weight bearing following anesthetic recovery. Conversely, animals in the control cohort were non-weight bearing for the first 3–5 days postoperative and would gradually progress to toe touching in the course of the first 14 days postoperative. Control animals had large, poorly remodeled callus at the osteotomy site while treatment animals presented with evidence of undisturbed fracture remodeling. Herein, we present a model suitable for translational trauma research in the proximal femur.

Critical Study of the Results of the Treatment of Appendicular Bone Neoplasias with Reimplantation of Autoclaved Autologous Bone Graft Associated with Platelet Rich Plasma in Limb Sparing Surgery in Dogs. Cassio A. Ferrigno, Andressa G. Nitrini, Vanessa C. Ferraz, Kelly Ito, Stermann Franklin, Denise Fantoni. Surgery, University of Sao Paulo, Brazil.

Autoclaved autologous graft in limb sparing surgery is successfully used in human oncologic surgeries, and may represent an alternative when bone bank or prosthesis are not available. The alternative procedure is attractive because it preserves the original anatomy, has low costs and promotes satisfactory clinical results in humans. Our research promoted the use of autologous graft, autoclaved for 5 minutes at 132 C, at 2 atm of pressure associated to platelet rich plasma, in 10 dogs with appendicular bone neoplasia. For the evaluation, clinical and radiographic studies were made at 7, 14, 21, 28, 60, 90, 180 and 360 days. Results showed that the mean time for metastasis was of 187 days and occurred in 40% of the animals, pulmonary metastasis happened in 20% of the patients and the mean survival time was of 271 days. The conclusion was that the technique is feasible and that the studied times and pressures cause little alteration in bone resistance.

Maximum Length of Greater Omentum Pedicle Flap Through Subcutaneous Tunnel for Long Bones in Dogs. Cassio A. Ferrigno, Kelly Ito, Vanessa C. Ferraz. Surgery, University of Sao Paulo, Brazil.

Human omentum can promote angiogenic activity in adjacent structures in which it is applied. In veterinary medicine, there is little research with greater omentum flap as angiogenic and immunogenic inductor. It was designed an experimental study which aimed to obtain a greater omentum pedicle flap and conduct it so long as possible through a subcutaneous defect in order to reach long bones (femur, tibia, humerus, radius/ulna). For the experiment it was used 30 dogs cadavers, the results were conclusive and confirmed the possibility of reaching the omentum flap for long bones. Results were satisfactorily accomplished and in 100% of the cases the flap reached the distal half of the evaluated bones. The averages of the different flap length were: 30.87 cm when double layer was used; 54.37 cm in simple layer; and 92.7 cm when the flap was built in L. The maximum length of the omentum has secured the possibility of reaching the distal metaphases of all the bones studied. The average length exceeded 29.87 cm to femur, 20.73 cm to tibia/fibula, 25.13 cm to humerus, and 16.27 cm to radius/ulna. It was concluded that the omentum pedicle flap can be taken through the subcutaneous defect until the distal metaphase of the long bones of dogs.

Structural Analysis of Canine Medial Coronoid Disease by Micro CT: Radial Incisor Versus Tip Fragmentation. Noel Fitzpatrick¹, Tanya Garcia-Nolen³, Anjolie Daryani³, Shinya Watari³, Kei Hayashi². ¹Fitzpatrick Referrals, Godalming, United Kingdom; ²Surgical and Radiological Sciences, Uni-

versity of California, Davis, CA; ³JD Wheat Veterinary Orthopedic Research Laboratory, University of California, Davis, CA.

It has been established that medial coronoid disease is characterized by pathology of subchondral bone with formation of microcracks characteristic of local fatigue failure before cartilage disease becomes apparent. Two distinct types of fissuring/fragmentation of the medial coronoid process have been observed: transverse tip fragments (TTF) and radial incisor fragments (RIF). Our hypothesis was that these patterns represented separate biomechanical entities.

Twelve samples were excised by subtotal coronoid osteotomy from patients 20–40 kg bodyweight: 4 including a “tip” fragment, 5 including a large fragment involving both the tip and incisor (“incisor/tip”), and 3 including an “incisor” fragment. Four normal “control” samples were excised from un-diseased weight-matched cadavers. All samples were imaged using a high-resolution micro-CT specimen scanner. Preferred void angle (predominant trabecular orientation) and degree of anisotropy were determined on both horizontal and sagittal planes.

Trabecular orientation was significantly different between “control” and “incisor” groups, and “control” and “incisor/tip” groups, on horizontal plane imaging and on sagittal plane imaging ($P < 0.05$). There was no difference in anisotropy between groups on sagittal plane imaging. Conversely, trabecular orientation was not significantly different between “control” and “tip” fragment groups.

This intimates that TTF and RIF arise from different mechanical loading environments and that RIF represents significant canalicular architectural alteration due to chronic abnormal torsional loading conditions preceding fragmentation, whereas TTF was more typical of an acute overload scenario with “crumbling” of the fragment-parent interface. Medial coronoid pathology is not a single disease entity but rather a spectrum of aberration of articular force distribution.

Sliding Humeral Osteotomy: Reduction of Major Complication Rate to Zero and Clinical Outcome Equivalence With or Without Focal Coronoid Treatment. Noel Fitzpatrick, Judith Bertran. Fitzpatrick Referrals, Godalming, United Kingdom.

Our objective was to determine the medium-term complication rate with a refined sliding humeral osteotomy (SHO) technique to treat end stage medial elbow compartment disease (MCD) and to compare clinical outcome of this technique with and without subtotal coronoid osteotomy (SCO) and fragment removal (FR).

34 Dogs (48 limbs) with end stage MCD (Outerbridge ≥ 4) had signalment, lameness score, and preoperative imaging findings recorded. An 8-hole locking stepped SHO plate was applied to the medial aspect of the humerus, stabilizing a transverse mid-diaphyseal humeral osteotomy with modified technique. Outcome measures included lameness score (0–5), manipulation pain score (0–2), force-plate and owner assessment. Measurements were recorded preoperatively, at 6 weeks, at 12 weeks and at 4 to 17 months. Complication rate was compared to that found in the previously published data and intervening transitional methodology.

Of 48 limbs operated, 22 had concomitant SCO+FR. Age was 36.07 \pm 29.15 months and body weight ranged 22.3–49.8 Kg. Preoperative lameness score and manipulation pain score were 2.15 \pm 0.65 and 1.5 \pm 0.55 respectively. Lameness improved significantly in all limbs by week 12 (0.23 \pm 0.46) and resolved in 42/48 limbs at the last follow-up. There was no difference in outcome with or without SCO+FR. Complication rate was 4.17%, with an incidence of major complications requiring surgical revision of 0.00%. Force-plate data for 10 dogs revealed significant improvement in lameness at 6 months (t-test; $P < 0.05$).

SHO with or without SCO+FR improves lameness and pain in young to middle aged dogs affected by MCD and has a low complication rate.

Pantarsal Arthrodesis in Dogs: A Clinical Comparison of Dorsal vs. Medial Plate Techniques Without Coaptation. Noel Fitzpatrick, David Sajik, Christos Nikolaou. Fitzpatrick Referrals, Godalming, United Kingdom.

Pantarsal arthrodesis is indicated for intractable tarsal injuries. Internal fixation using medial, lateral, dorsal, and plantar plate application and external skeletal fixation has been described. Dorsal plating is mechanically suboptimal and external coaptation has been reported as an essential adjunct. Our hypothesis was that the major complication rate for both dorsal and medial plate-screw application would not differ.

Case records were reviewed for all dogs treated with medial or dorsal plate application between 2005 and 2010 with radiographic follow-up to at least 12 weeks. 35 dogs met inclusion criteria. Mean weight was 26.68 kg. Dorsal plate application was performed in 25 and medial in 10. A 3.5/2.7 hybrid plate was used for all medial applications. Dorsally applied plates included 3.5/2.7 and 3.5/3.5 pancarpal arthrodesis plates contoured to 138 degrees

(n = 18) and custom 3.5/2.7 140 degree plates (n = 7). 14 dorsal plates were applied by MIPO technique. No external coaptation was employed.

Major complication was experienced in 16% of dorsal plate applications versus 40% of medial applications. Major complications encountered included metatarsal fracture (1D, 1M), plate breakage (1D) or implant reaction/discomfort (1D, 2M), tibio-calcaneal screw removal (1D), and metatarsal pad ulceration (1M).

Plate breakage and metatarsal fracture have been commonly reported for dorsal plate application but occurred rarely in our case series and may be further ameliorated by tapering of the custom plate to occupy more than 70% of the metatarsal length. The custom plate also facilitates application of MIPO technique, reducing postoperative swelling, optimizing limb alignment and promoting early limb use.

Bi-Oblique Dynamic Proximal Ulnar Osteotomy: Surgical Technique, Computed Tomographic Assessment of Radio-Ulnar Congruency Over 12 Weeks and Clinical Outcome in 87 Dogs. Noel Fitzpatrick, Alexandre Caron, Vincent Wavrilie, Fitzpatrick Referrals, Easing, United Kingdom.

Our objectives were to describe a bi-oblique dynamic proximal ulnar osteotomy (BODPUO) technique, to interrogate resultant radio-ulnar joint modification using computed tomography (CT) and to evaluate clinical outcome in a large case series.

Clinical reports and radiographs from 2006 to 2011 were reviewed. Eighty-seven elbows were included in the clinical study. CT measurements were taken on 17 elbows. The osteotomy was made in a bi-oblique fashion with a proximodistal, caudocranial and lateromedial orientation.

The mean caudocranial and lateromedial osteotomy angles were $55 \pm 7^\circ$ and $49 \pm 11^\circ$, respectively. The most caudoproximal point of the cut was located at a mean of $38 \pm 4\%$ of the total ulnar length (from the olecranon process). At the last follow-up (mean 26.2 weeks), the mean lameness scores were statistically significantly lower than preoperatively (t-test; $P < 0.05$). Complications were recorded in 13 elbows (15%). No complication required secondary surgical intervention. Thirty-seven BODPUO were re-examined radiographically up to 4 months postoperatively: 92% (34/37) were radiographically healed. CT measurements documented a significant increase in radio-ulnar joint space at the mid-coronoid level, at the level of the base of the coronoid process and at the level of the lateral coronoid process (t-test; $P < 0.05$). No other measurements were significantly different.

We conclude that dogs treated with BODPUO as described are significantly less lame four months post-surgically than preoperatively. CT documents transverse but not sagittal motion of the proximal ulnar segment. Further studies are required to interrogate the effect of BODPUO on elbow congruency in three dimensions.

Development of an Inexpensive Method for Processing Platelet Rich Plasma in the Horse. Robin L. Fontenot¹, Carolyn A. Sink², Nicole M. Weinstein³, Stephen Werre³, Linda A. Dahlgren¹. ¹Large Animal Clinical Sciences, Virginia-Maryland College of Veterinary Medicine, Virginia Tech, Blacksburg, VA; ²Veterinary Teaching Hospital, Virginia-Maryland Regional College of Veterinary Medicine, Virginia Tech, Blacksburg, VA; ³Biomedical Sciences and Pathobiology, Virginia-Maryland College of Veterinary Medicine, Virginia Tech, Blacksburg, VA.

Platelet rich plasma (PRP) is a common treatment for equine tendon and ligament injuries but can be expensive. Safe, cost-effective PRP preparation would make it more widely available. The purpose of this project was to compare simplified methods of PRP preparation to a commercial system. We hypothesized that one of these simple methods would concentrate platelets 3-fold with minimal WBC concentration. Citrated equine blood (n = 26) was collected and processed using three tube centrifugation methods and a commercial system reported to concentrate platelets 4-fold. Platelet, white and red blood cell counts, and mean platelet volume were measured and compared to whole blood. Aerobic and anaerobic cultures were performed. Significant differences between groups were determined by one way ANOVA. Significance was set at $P < 0.05$. Mean platelet concentration was less than 3-fold for all four methods; however, the conical tube method resulted in the greatest number of samples with platelet concentrations of greater than 2.5-fold and only the conical tube and commercial methods achieved any samples with greater than 3-fold concentration. Mean WBC fold change for the commercial method was significantly lower than the other three methods which were all greater than four-fold. WBC:Platelet ratios for the conical tube and commercial methods were less than 2 and deemed to be in a potentially useful clinical range. Six of 280 samples (2.1%) cultured positive and were not different between groups. Based on these results, the conical tube method is safe and may be a suitable clinical alternative to commercial systems in low budget cases.

Grade III Cranial Horn Tears of the Equine Medial Meniscus Alter the Contact Forces on the Articular Surface of the Medial Tibial Condyle. Jennifer G. Fowlie^{1,2}, Steven P. Arnoczky², Michael Lavagnino², Tristan Maerz³, John A. Stick¹. ¹Large Animal Clinical Sciences, Michigan State University, East Lansing, MI; ²Laboratory for Comparative Orthopaedic Research, Michigan State University, East Lansing, MI; ³Orthopaedic Research, William Beaumont Hospital, Royal Oak, MI.

Osteoarthritis is a common sequela of cranial horn meniscal tears in the equine medial femorotibial joint. We hypothesized that grade III cranial horn tears of the medial meniscus would lead to altered distribution and magnitude of contact forces on the medial tibial condyle.

A vertical load (1800 N) was applied to cadaveric stifles at 130° , 140° , 150° and 160° , and the peak pressure and contact area on the medial tibial condyle was recorded. Testing was repeated following creation of a grade III cranial horn tear of the medial meniscus and after resection of the simulated tear.

In the intact specimens, a significantly smaller tibial contact area was observed at 160° stifle angle compared to 150° , 140° and 130° ($P = 0.005$, 0.010 and 0.036 respectively). Creation of a non-displaced grade III cranial horn tear in the medial meniscus did not significantly ($P > 0.05$) alter the pressure or contact area measurements at any stifle angle compared to the intact specimens. Resection of the simulated tear resulted in a significant increase in peak pressure in the central region of the medial tibial condyle at 160° relative to the intact ($P = 0.026$) and torn (0.012) specimens.

Mechanical overloading of the tibial condyle in horses with grade III meniscal tears may lead to secondary osteoarthritis if the torn segment is removed or displaced. Restoration of preservation of a maximal volume of meniscal tissue in the tear defect should be the goal of treatment.

Long-Term Survival After Surgery for Epiploic Foramen Entrapment Compared with Other Strangulating Diseases of the Equine Small Intestine. David Freeman¹, David Schaeffer². ¹Large Animal Clinical Sciences, University of Florida, Gainesville, FL; ²Veterinary Biosciences, University of Illinois, Urbana, IL.

Epiploic foramen entrapment (EFE) is a common cause of colic, although reports on survival rates have produced conflicting results. The purpose of this study was to determine long-term prognosis after surgery for EFE compared with prognosis after surgery for other small intestinal strangulating diseases. Data were recorded for 74 horses that had surgery for strangulating lesions of the small intestine and were discharged. Horses were assigned to 3 groups, EFE (18 horses), strangulation by lipoma (24), and miscellaneous strangulating diseases (32). Kaplan-Meier survival probabilities were determined and the Tarone-Ware, Mantel, and Breslow-Gehan methods were used to detect differences between groups. The mortality rate after discharge was determined as the number of deaths/horse year and the rate for colic after discharge was recorded as number of horses that had colic/horse year. The rates generated and standard errors were analyzed by CONTRASTM, with significance set at $P < 0.5$. Horses that had EFE had similar long-term survival data as horses with strangulating lipoma, but probability of long-term survival was less than horses with miscellaneous strangulating diseases. When the expected effect of age at time of surgery on long-term survival was considered, horses with EFE had a worse probability of long-term survival than horses with other strangulating diseases of the small intestine. Horses with EFE were significantly more prone to colic than horses discharged after surgery for other small intestinal lesions. Factors that contributed to these findings could not be identified but could be related to cribbing in some cases.

Long-Term Survival After Jejunocostomy, Jejunojunostomy and No Resection for Strangulating Diseases of the Equine Small Intestine. David Freeman¹, David Schaeffer². ¹Large Animal Clinical Sciences, University of Florida, Gainesville, FL; ²Biosciences, University of Illinois, Urbana, IL.

There are few reports on comparisons between methods for anastomosis in equine small intestine, although available evidence would suggest that jejunocostomy has poorer survival data than other methods. The purpose of this study was to compare long-term survival between jejunocostomy, jejunojunostomy, and no resection as treatments for strangulating diseases of equine small intestine. The hypothesis was that no resection would yield superior long-term data. Data were recorded for 74 horses that had surgery for strangulating lesions of the small intestine and were assigned to 3 treatment groups, jejunocostomy, jejunojunostomy, and no resection. Kaplan-Meier survival probabilities were determined and the Tarone-Ware, Mantel, and Breslow-Gehan methods were used to detect differences between groups. Mortality rate after discharge was determined as the number of deaths/horse year and colic after discharge was recorded as number of horses that had colic/horse year. The rates and standard errors were

analyzed by CONTRASTM, with significance set at $P < 0.5$. Horses that had no resection had similar long-term survival data as horses that had jejunocostomy or jejunojunostomy, but were less prone to colic after discharge. Data for survival after discharge were similar for jejunocostomy and jejunojunostomy, regardless of whether or not mortality during hospitalization was included in the analysis. Based on results of this study, the surgical method for treating a strangulating lesion had no effect on long-term outcome in horses. However, the finding that horses that did not have a resection were less prone to colic after discharge emphasizes the need for accurate prediction of intestinal viability.

Effect of Transection of Cranial Arm of Medial Glenohumeral Ligament for Shoulder Stability in Adult Beagles. Yukihiro Fujita¹, Shinya Yamaguchi², Miyoko Saito¹, Makoto Muto¹. ¹Laboratory of Surgery II, Azabu University, Sagami-hara-shi, Japan; ²Yamaguchi Pet Clinic, Koto-ku, Japan.

Medial glenohumeral ligament (MGHL) appears as a Y shape and the function for shoulder stability of cranial or caudal arm is not sufficiently studied. This study evaluated the effect of transection of the cranial arm of MGHL on shoulder stability. The care and handling of the animals were carried out in accordance with the "Animal Experiment Guideline, 2000." Orthopedic and radiographic examinations and joint fluid analysis before, at 2, 4 and 6 weeks after arthroscopically assisted transection of the cranial arm of MGHL were performed on six beagles. Arthroscopic examination was performed before and at 6 weeks after transection. The severity of the cartilage injury at humeral head and glenoid cavity was evaluated, and six regions of joint tissues were observed to evaluate for the severity of villus proliferation and vascularization. During this experimental period, there were no abnormal findings in orthopedic and radiographic examinations and joint fluid analysis. In the arthroscopic evaluation, there were findings of synovitis in the cranial region of subscapularis tendon, the region between biceps and subscapularis tendons, and the cranial region of biceps tendon at 6 weeks after transection. In all six regions; biceps tendon, intertubercular groove, subscapularis tendon, the area between biceps and subscapularis tendons, MGHL, and the caudal porch, there were significant differences in villus proliferation and vascularization between before and at 6 weeks after transection. Results indicate that transection of the cranial arm of MGHL alone does not affect greatly shoulder stability, but could be one of the causes for inflammation of the shoulder joint.

Prevalence of Pulmonary Metastases in Dogs with Mast Cell Tumors: Retrospective Study of 115 Cases Between 2005 and 2010. Jessica W. Fung, Sarah E. Boston. Department of Clinical Sciences, Ontario Veterinary College, Guelph, ON, Canada.

Mast cell tumors (MCTs) are one of the most commonly diagnosed skin malignancies in dogs. Though normally present as cutaneous or subcutaneous masses, metastasis is possible. Pulmonary metastases are thought to be less common than visceral metastases. Objectives of this retrospective study are to determine the prevalence of pulmonary metastases based on three-view thoracic radiography and risk factors for this. Our hypotheses are that a three-view thoracic radiograph is an extremely low-yield test and that undifferentiated MCT is a risk factor for pulmonary metastasis.

Based on medical records from 2005 to 2010, 115 dogs met the inclusion requirements of a histologically and/or cytologically diagnosed cutaneous or subcutaneous MCT, staging with three-view thoracic radiographs at the time of presentation and absence of concurrent neoplastic disease.

One dog (0.9%) had a nodular lung pattern consistent with pulmonary metastases; it presented for local recurrence of an intermediate grade MCT that was incompletely excised. Abdominal ultrasound revealed nodular hepatopathy and nodular splenopathy suggestive of visceral metastases.

Draining lymph nodes were assessed cytologically and/or histologically in 51/115 cases (44.4%) and metastasis was present in 32/51 (62.7%). Abdominal ultrasound was performed in 104/115 cases (90.4%) and gross abnormalities of the liver, spleen and/or intra-abdominal lymph nodes were present in 43/104 (41.4%).

The results of this study reveal a very low rate of pulmonary metastases confirming it is a low-yield test in the staging of MCTs. Risk factors could not be determined because of the limited number of positive cases. Survival time was not assessed in this study.

Clinical Use of Computed Tomography and Surface Markers Assist Internal Fixation Within the Equine Hoof. Janik C. Gasiorowski, Dean W. Richardson. Surgery, University of Pennsylvania, Kennett Square, PA.

Internal fixation of the equine distal phalanx (DP) and distal sesamoid bone (DSB) remains a challenging surgical endeavor. This paper describes computed tomography (CT) and hoof surface markers to assist internal fixation within the confines of the hoof wall.

Medical records of horses ($n = 9$) that had preoperative CT imaging for internal fixation of the DP or DSB were reviewed. CT imaging was performed immediately after positioning of the anesthetized horse. Drill bit entry point and direction were selected by performing a second CT series with grids of barium paste dots at proposed entry and projected exit sites. Fracture fragments were measured while the horse was prepared for surgery. An aiming device was used to guide the drill bit in two cases. Post-implantation CT images were obtained to check screw position and length.

Nine horses fit the selection criteria. Diagnoses included fracture of the DP with articular involvement ($n = 8$) and fracture of the DSB ($n = 1$). Postoperative scans were performed in 8 cases. Screw position and length were considered near optimal in all cases. There were no significant malpositions of bits or screws. Fracture reduction was evident in all cases. Preoperative planning times (at least two CT image acquisitions and grid creation) ranged from 10–20 minutes. Time from induction to surgery decreased rapidly over the first three cases suggesting a steep learning curve for this planning technique.

The combination of CT and surface marker grids allowed accurate positioning of screws in clinical DP and DSB fractures. The technique was simple and rapid. An aiming device is useful for the technique.

Physicochemical and Bioadhesive Surface Analysis of Hydrogen Peroxide Gas Plasma Sterilized Nylon and Polyethylene Lines Used for Stabilization of the Canine Stifle Joint. Matthieu Gatineau¹, Alexander O. EL-Warrak¹, Rodrigo Franca², Christian Bolliger¹, Michael Mourez¹, Marie Archambault¹. ¹Surgery, University of Montreal, QC, Canada; ²Laboratoire de Bioprocess, Ecole Polytechnique, University of Montreal, QC, Canada.

Objective—Compare the effects of hydrogen peroxide gas plasma (HPGP), ethylene oxide (EO) and steam (ST) sterilizations on the physicochemical and bioadhesive properties of nylon and polyethylene lines used for stabilization of the canine stifle joint.

Study Design—In vitro study.

Samples—Non-sterilized, HPGP-, EO- and ST-sterilized samples of 36.3-kg test nylon leader line (NLL), 57.8-kg test nylon fishing line (NFL) and 2-mm Ultra High Molecular Weight Polyethylene (UHMPE) were used.

Methods—Surface analysis of NLL, NFL and UHMPE non-sterilized and HPGP-, EO- and ST-sterilized samples was carried out by X-ray photoelectron spectroscopy (XPS), contact angle (CA) measurement, and atomic force microscopy (AFM). *Staphylococcus intermedius* and *Escherichia coli* bacterial adherence were also tested.

Results—Surface oxidation was observed on all samples sterilized with HPGP, EO or ST process. All sterilization methods significantly increased the CA for the NLL, NFL and UHMPE. The roughness was not significantly affected by the method of sterilization for NLL, NFL and UHMPE. Bacterial adherence was significantly affected by the method of sterilization for NLL, NFL and UHMPE. UHMPE had significantly higher CA, roughness and bacterial adherence compared to NLL and NFL, no matter which sterilization method was used.

Conclusion—The effects of HPGP on the chemico-physical and bioadhesive properties of nylon and polyethylene lines compared positively to EO or ST, making HPGP an attractive alternative. UHMPE may not be a suitable material for suture prostheses regarding bacterial adherence properties. Future studies are required to determine the clinical significance of these findings.

Hip Dysplasia in Canine Small and Toy Breeds: Retrospective Study. Julie Anne Gervais, Alexander O. EL-Warrak, Guy Beauchamp. Département des Sciences Cliniques, Université de Montréal, Saint-Hyacinthe, QC, Canada.

Objective—Identify epidemiologic data on hip dysplasia in canine small and toy breeds

Study Design—Retrospective study

Samples—Twenty-nine small and toy canine breeds medical records

Methods—Parameters from signalment, results of the orthopedic exam and results of the radiographic exam were collected. Data was statistically analyzed using Spearman correlation test to assess the relation between the body condition score and the degenerative changes and relation between the age and degenerative changes. Exact chi-square test was employed to define if there was a relation between the reason for presentation and the orthopedic examination. Cochran-Mantel-Haenszel test was used to identify if there was a relation between the reason for presentation and the degenerative changes.

Results—The most prevalent breed was the Pug. The clinical presentation is not bimodal. A positive and significant correlation between the body condition score and degenerative changes ($P = 0.01$) was found. A significant association between the reason for admittance and orthopedic

examination ($P = 0.003$) was found. No statistically significant correlation between age and degenerative changes neither a significant variation in degenerative changes in regard of reason for admittance were identified.

Conclusion—Hip dysplasia is a problem that is clinically present in small-breed dogs and its clinical presentation is not bimodal. Conversely, the lack of correlation between radiology and clinical assessment is present, as in large breeds. Also, overweight and obesity can accentuate the degenerative lesions as classically reported. To achieve a more complete understanding of epidemiology, evolution and significance of hip dysplasia in small-breed dogs, prospective studies with larger samples and standardized exams are needed.

Mechanical Comparison of Median Sternotomy Closure in Dogs Using Polydioxanone and Wire Sutures. J. Alberto Gines¹, Guillaume Chanoit^{1,2}, Miguel Angel Vives Valles³, William J. Browne¹, John F. Tarlton¹, Ed Friend⁴. ¹Small Animal Surgery, University of Bristol, Bristol, United Kingdom; ²Bristol Heart Institute, Bristol, United Kingdom; ³Small Animal Surgery, University of Extremadura, Caceres, Spain; ⁴Small Animal Surgery, Langford Veterinary Services, Bristol, United Kingdom.

The goal of this study was to compare the mechanical properties of two different materials for canine median sternotomy closure in an *in vitro* biomechanical study.

Twelve canine (greyhounds) cadaveric entire sternum and portion of associated ribs and musculature were used. Median sternotomy leaving the manubrium intact were closed using polydioxanone and stainless steel wire in a figure of eight pattern. In the suture group ends were trimmed to 3 mm. In the wires group, the wire were cut at 5 twist and left unbent. Constructs were loaded in a servohydraulic material testing system and compared at loads of 125, 150, 200, 250, 300, 350 and 400 N, and at failure.

Displacement at loads up to 400 N did not reveal any statistical difference between the polydioxanone and the stainless steel wire. The loading forces to create failure of the construct were superior for the stainless steel; however the displacement seen at failure was not significantly different between polydioxanone and stainless steel wire. Polydioxanone has therefore similar properties to stainless steel wire *in vitro* when distractive forces are applied on different loads up to 400 N.

Polydioxanone can potentially be an alternative for primary median sternotomy closure in medium/large breed dogs for which use of absorbable sutures is desirable such as diabetic or osteoporotic patients, pediatric patients or dogs with prominent sternal bone, loss of muscle coverage or faulty sternal osteotomy.

Blinding Terminology in Randomized Controlled Clinical Trials in Dogs and Cats: A Retrospective Study of 195 Trials and a Prospective Study of Terminology Interpretation. Michelle Giuffrida, Dorothy C. Brown, University of Pennsylvania, Philadelphia, PA.

Blinding is used in clinical trials to minimize bias associated with data collection. The terms "single-," "double-," and "triple-blind" are used to describe blinding status of key trial persons. We hypothesized that there is significant variability in the way studies describe blinding and in how clinicians interpret blinding terminology. Reports of 195 clinical randomized controlled trials (RCTs) were retrospectively collected by search of 11 peer-reviewed journals over a 5-year period. Details of trial methodology were recorded and analyzed. Veterinarians practicing in a university hospital provided information regarding position, experience, and interpretation of blinding terminology via an anonymous prospective questionnaire. Blinding was reported or inferred in 131 RCTs, yet complete descriptions of who was blinded were present in only 42 reports (32%). Studies that used the terms "single-blind" or "double-blind" were significantly less likely to contain clear descriptions of the role of blinded study personnel, compared with studies reported as "blind" or in which blinding was inferred through trial methodology. Authors who used the term "double-blind" reported the blinding status of individuals in seven different ways. We concluded that blinding was commonly employed as a means to reduce bias associated with collection and interpretation of data in veterinary RCTs. However, most reports of blinding methodology were incomplete and there was no consistency in how blinding terminology was used by authors or interpreted by veterinarians. Ambiguous reporting hinders the ability of practitioners to assess the validity of trial results and make informed decisions about applying study findings to their patient populations.

Ventral Decompression of Equine Cervical Spinal Canal for Treatment of Spinal Cord Compression. Barrie D. Grant, Barrie Grant Equine Consultant, Bon-sall, CA.

The current procedure used for the treatment of equine cervical spinal stenosis is a modification of the original Cloward procedure used in humans utilizing a ventral (anterior approach) to place a threaded titanium implant that results in fusion of the intervertebral space at the area of compression. The technique is used for both dynamic and static compression. In the dynamic cases compression on the spinal cord in flexion is prevented by the fusion in a neutral position and in stenotic cases compression is relieved when the arthritic articular facets and excessive synovial tissue atrophy after fusion occurs. The morbidity and mortality for this procedure is significantly reduced when compared to a dorsal decompression procedure. There are a limited number of cases of severe static kyphosis (most commonly seen at C2/C3 or herniation of intervertebral disc material into the spinal canal that can benefit from a ventral decompression procedure. This procedure was developed to assist patients with these conditions.

After a clinical and myelographic workup has been completed the patient is placed in dorsal recumbence under general anesthesia. The cervical area is placed into a cervical brace to reduce movement during surgery. The approach to the affected level is the same procedure as used in the placement of the implants. The 25 mm circular hole between the two vertebrae is extended to the spinal canal using constant intraoperative monitoring with repeated digital radiographs or fluoroscopy. The removal of the cortical bone and disc material is facilitated with special spinal drills and reverse cutting rongeurs. It is very important to stay on the midline to avoid the large lateral venous sinuses. After the dura is exposed the area is enlarged to the extent of the 25 mm drill hole. The vertebra can be stabilized with the insertion of the titanium or stainless steel implants and use of autologous bone graft.

Five patients have undergone this procedure over a 25-year period. 4 cases had severe static kyphosis of C2/C3 that permitted the anterior aspect of C3 being displaced into the neural canal. At the time of myelography no movement of the affected site could be demonstrated. The 4th case was a herniation of degenerate disc material into the spinal canal. Histopathology of the herniated sample obtained at surgery confirmed the origin of the offending material. 4 cases survived surgery with minimal complications and all these cases improved clinically with one horse surviving over 19 years as an athlete. The fifth case is a 2/3 stenosis and has survived the first postoperative month.

Mucosal Injury and Inflammatory Cells in Response to Brief Ischemia and Reperfusion in the Equine Large Colon. Astrid Grosche¹, Alison J. Morton¹, Graham S. Andrea¹, Jeffrey R. Abbott², John F. Valentine³, Maximilian M. Polyak¹, David E. Freeman¹. ¹Large Animal Clinical Sciences, College of Veterinary Medicine, University of Florida, Gainesville, FL; ²Infectious Diseases and Pathology, College of Veterinary Medicine, University of Florida, Gainesville, FL; ³Medicine, College of Medicine, University of Florida, Gainesville, FL.

Intestinal ischemia and reperfusion (I/R) can activate inflammatory cells in the equine colon, although effects on different types of inflammatory cells have received little attention.

We performed a study on anesthetized horses to assess early mucosal injury, the reaction of mucosal neutrophils, eosinophils, mast cells, and macrophages, and cyclooxygenase (COX)-1 and -2 expression in response to I/R in equine large colon.

Large colon ischemia was induced for 1 h followed by 4 h of reperfusion in 6 horses, and mucosal biopsies were sampled before and after ischemia, and after 1 h, 2 h and 4 h of reperfusion. EPON-embedded semi-thin sections were stained with toluidine blue (histomorphometry, mast cells), and paraffin-embedded samples were used for LUNA stain (eosinophils) and immunohistochemistry. The number and distribution of mucosal macrophages (CD163), neutrophils (calprotectin), eosinophils and mast cells were determined, and mucosal COX-1 and -2 expression was identified.

Ischemia caused epithelial cell and nuclear swelling (nuclear width: control: 2.7 ± 0.2 vs. ischemia: $4.2 \pm 0.2 \mu\text{m}$; $P < 0.01$), subepithelial edema (control: 0.2 ± 0.1 vs. ischemia: $3.2 \pm 0.2 \mu\text{m}$; $P < 0.01$), and increased epithelial apoptosis (control: 14.3 ± 4.1 vs. ischemia: 60.4 ± 14.0 apoptotic cells/mm epithelium; $P < 0.01$). COX-2 expression ($P < 0.01$) was evident after ischemia. Epithelial repair started at 1 h of reperfusion ($P < 0.001$), followed by migration of neutrophils into the mucosa after 2 h of reperfusion (control: 72.3 ± 18.4 vs. reperfusion: 1149.9 ± 220.6 cells/mm² mucosa; $P < 0.01$). Mucosal eosinophils, mast cells and macrophages did not increase in numbers but were activated.

Epithelial injury and COX-2 expression caused by short-term hypoxia were followed by intense inflammation associated with epithelial repair during reperfusion.

Effect of Articular Design on Mediolateral Constraint and Stability of Two Unlinked Canine Total Elbow Prostheses. Reunan P. Guillou, Ryan M. Demianuk, Loïc M. Déjardin. Small Animal Clinical Sciences, Michigan State University, East Lansing, MI.

Short and long term stability of the unlinked, semi-constrained IOWA and TATE prostheses is influenced by their articular congruity. While a less congruent design spares bone/implant interfaces from deleterious stresses, it may impair prosthetic stability. To optimize osteointegration, a low congruity TATE-2 profile was recently released; however optimal prosthesis constraint is unknown. Our purpose was to compare IOWA and TATE behavior under mediolateral translation. We hypothesized that constraint and stability would be greatest in IOWA and lowest in TATE-2 profiles.

Four prostheses per group were tested in mediolateral translation. Loading conditions mimicked those of a trotting 40 kg dog in mid-stance. Stiffness (a reflection of prosthetic constraint) and maximum resistive force (an indication of prosthetic intrinsic stability) were statistically analyzed ($P < 0.05$).

Compared to IOWA and TATE-1, TATE-2 stiffness was at least 30 and 20 times smaller, respectively ($P < 0.001$). Regardless of direction, IOWA maximum resistive force was 30% and 100% greater than TATE-1 and TATE-2, respectively ($P < 0.001$). Similarly, TATE-1 resistive force was ~50% greater than TATE-2 in both directions ($P < 0.001$).

Despite IOWA greater intrinsic stability, the reported 10% postoperative luxation suggests that collateral desmotomy during implantation offsets the potential benefit of congruent designs. Conversely, the conservative TATE implantation may explain the lack of postoperative luxation with less congruent TATE profiles. Reducing TATE-2 congruity significantly decreased prosthetic constraint. Theoretically, this could spare bone/implant interfaces from deleterious shear stresses which may subsequently enhance bone ingrowth and long-term stability.

Three Dimensional Kinematics of the Normal Canine Elbow at the Walk and Trot. Reunan P. Guillou¹, Loïc M. Déjardin¹, Michael J. Bey², Collin P. McDonald². ¹Small Animal Clinical Sciences, Michigan State University, East Lansing, MI; ²Bone and Joint Center, Henry Ford Hospital, Detroit, MI.

While the kinematics of the hip and stifle joints have been extensively described, a comprehensive 3-D kinematics of the canine elbow has yet to be performed. Our purpose was to investigate normal elbow kinematics using dynamic radiostereometric analysis (RSA). We hypothesized that 1) elbow motion is smaller during stance phase and at the walk and 2) that radioulnar translation is minimal.

After implantation of bone markers in the right humerus, radius and ulna of 4 large-breed dogs, dynamic RSA was performed. Flexion/extension, ab-/adduction and internal/external rotation were expressed in a humeroulnar joint coordinate system (JCS) while pro-/supination and proximodistal translation were expressed in a radioulnar JCS. Kinematic data were compared using 2-factor repeated measure ANOVA ($P < 0.05$).

Joint excursions for flexion/extension and ab-/adduction were smaller during stance than swing phase ($P < 0.01$). Likewise, peak flexion, internal rotation and supination were smaller at the walk than trot ($P < 0.04$). Minimal radioulnar translation (<0.8 mm) occurred with no differences between gaits.

This first comprehensive description of normal elbow 3-D kinematics may provide the basis for a better understanding of disease processes and objective assessment of surgical outcomes. This study also represents a first step towards determination of joint pressure patterns using inverse dynamics and articular geometry. Our results demonstrate that while most humeroulnar motion occurs during swing phase, substantial radioulnar pro/supination occurs throughout the gait cycle, which in turn may significantly affect the functional outcome of total or hemi-elbow arthroplasty procedures. Such findings may eventually be used to refine prosthetic indications and designs.

Immobilization of Silver-Impregnated Polyelectrolyte Multilayers on a Biological Dressing (Biobrane™) Reduces Infection in a Murine Wound Infection Model. Kathleen M. Guthrie¹, Ankit Agarwal², Dana S. Tackes¹, Kevin W. Johnson¹, Nicholas L. Abbott², Christopher J. Murphy^{3,4}, Charles J. Czuprynski⁵, Michael J. Schurr⁶, Jonathan F. McNulty¹. ¹School of Veterinary Medicine, Department of Surgical Sciences, University of Wisconsin, Madison, WI; ²Department of Chemical and Biological Engineering, University of Wisconsin, Madison, WI; ³School of Medicine, Department of Ophthalmology and Vision Science, University of California, Davis, CA; ⁴School of Veterinary Medicine, Department of Surgical and Radiological Sciences, University of California, Davis, CA; ⁵School of Veterinary Medicine, Department of Pathobiological Sciences, University of Wisconsin, Madison, WI; ⁶School of Medicine, Department of Surgery, University of Wisconsin, Madison, WI.

Biological dressings are increasingly used for partial thickness wounds and burns. Biobrane™, a biosynthetic dressing, is commonly used in these wounds with the advantages of fewer bandage changes, decreased pain, faster healing, and decreased expense. However, up to 19% of Biobrane applications become infected and must be removed to provide traditional wound care. Our group is focused on engineering approaches to wound bed treatments and next-generation dressings. In this study, we examined augmentation of Biobrane with nanoparticulate silver to reduce infection (Biobrane-Ag). Silver is antimicrobial but current silver-containing wound dressings deliver loadings of silver at cytotoxic concentrations. Biological dressings do not contain silver since chemical processing to embed silver is too harsh for the dressing collagen matrix. We have developed a novel method of immobilizing silver nanoparticles into nanometer thick polyelectrolyte multilayers (PEMs) for stamping on soft surfaces such as wounds or biological dressings. This approach results in antibacterial activity in vitro at non-cytotoxic loadings of silver. In this study, we investigated an in vivo wound infection model in mice using topical inoculation of *Staphylococcus aureus* onto full thickness 6-mm diameter wounds. After 72 hours, bacterial quantification was performed. Wounds treated with Biobrane-Ag had significantly ($P < 0.001$) fewer colony-forming units than wounds treated with unmodified Biobrane (more than 4 log₁₀ difference). The results of our study indicate that immobilizing silver-impregnated PEMs on the collagen surface of Biobrane significantly reduces infection in full-thickness murine skin wounds. Ongoing research is aimed at developing this approach for clinical use.

Retrospective Analysis of the Impact of Abdominal Surgery on Return to Function in Racing Thoroughbreds. Samantha Hart, Louise L. Southwood. Clinical Studies, New Bolton Center, University of Pennsylvania, Kennett Square, PA.

There have been no studies comparing racing performance of Thoroughbred horses undergoing abdominal surgery for colic to horses of the same class that did not undergo surgery for colic. The hypothesis was that racing performance of horses that had abdominal surgery for colic would not be different to control horses by the third quarter following the date of surgery. Postoperative racing performance in Thoroughbred racehorses that underwent colic surgery (n = 45) was compared to randomly selected control horses (n = 90) from the race immediately prior to the date of surgery. Only horses which raced at least once prior to colic surgery were included in the study. Quarterly earnings and number of starts from quarter 1 (Q1) to quarter 12 (Q12) following the date of surgery were compared between cases and controls using an analysis of variance.

Overall, 70% of horses that raced prior to surgery raced after surgery. Case horses had significantly lower number of starts and earnings per quarter in Q1 and Q2, however by Q3 through to Q12 there was no significant difference in either number of starts or earnings per quarter between case and control horses. There were no significant differences between case and control horses in number of quarters raced, earnings per start, or total earnings after the date of surgery. The results of this study show that racing Thoroughbred horses that undergo abdominal surgery for colic are able to successfully return to racing, with no significant differences in performance variables compared to their cohorts.

Correlation of Meniscal Injury with Long-Term Osteoarthritis Formation and Ground Reaction Forces in Dogs After Surgical Treatment of Cruciate Insufficiency. Marc S. Hirshenson¹, Ursula Krotscheck¹, Margret Thompson¹, Jeremy Rawlinson¹, Hussni O. Mohammed². ¹Clinical Sciences, Cornell University, Ithaca, NY; ²Population Medicine and Diagnostic Sciences, Cornell University, Ithaca, NY.

One of the limiting factors to successful surgical correction of a ruptured cranial cruciate ligament (RCCL) is believed to be the degree of secondary osteoarthritis, both at presentation and its rate of progression. The objective of this study is to determine the influence that meniscal pathology and its treatment have on long term osteoarthritis formation and clinical function in dogs with previous RCCL.

Study participants undergoing surgery via extracapsular repair (ECR) or tibial plateau leveling osteotomy (TPLO) more than 1 year prior were entered prospectively. All animals had a complete orthopedic examination, radiographs, and force plate gait analysis. Dogs were divided into two groups: normal meniscus, no intervention (treatment 1); abnormal meniscus, partial meniscectomy +/- meniscal release (treatment 2) and compared against a standardized normal population. Radiographs of operated stifles were evaluated for presence of degenerative changes based on 29 specific imaging signs on preoperative and recheck images.

36 stifles have been enrolled with a mean follow-up of 1292 days. Breakdown of participants into groups included: control (n = 79); treatment 1 (n = 26); treatment 2 (n = 10). An ANOVA compared follow-up osteoarthritis score and identified no significant difference regardless of procedure or presence of meniscal damage. Significant differences in walk

contact time (CT) and trot CT, peak vertical force and vertical impulse was found between surgery groups (ECR vs. TPLO) but not among treatment groups. Therefore, surgery type appears to be more significant than meniscal treatment in long-term outcome of dogs undergoing repair for RCCL.

Evaluation of Single-Session Tibial Tuberosity Advancement Procedure for the Treatment of Bilateral Cranial Cruciate Ligament Rupture in Dogs: 24 Dogs. Marc S. Hirshenson¹, Ursula Krotscheck¹, Heather Knapp-Hoch¹, Ariane Jay¹, Stuart Bliss². ¹Clinical Sciences, Cornell University, Ithaca, NY; ²Port City Veterinary Referral Hospital, Portsmouth, NH.

The use of simultaneous bilateral tibial tuberosity advancement (TTA) as treatment for bilateral cranial cruciate repair (CCL) in the dog has not been well described. Our objective was to compare unilateral vs. bilateral single-session TTA and also to clinically evaluate the long-term results.

A total of 55 dogs and 79 stifles (24 bilateral, 31 unilateral) were evaluated retrospectively. Information gathered from the medical record included patient signalment, history, physical exam findings, anesthetic time, total surgical time, CCL damage (partial/complete rupture), meniscal damage and treatment, implants used and advancement distance and intra- and postoperative complications. Categorical data was compared using a chi-square test, and continuous data was evaluated using a 2-sample t-test. Significance was $P < 0.05$. Long term follow-up was evaluated by owner questionnaire.

No intra-operative complications were encountered in either group. Superficial skin infection was noted in three stifles postoperatively. No catastrophic failures occurred. Postliminary meniscal injury was suspected in one stifle. The only statistically significant differences between uni- and bilateral TTAs were days spent in hospital ($P = 0.01$), cost, anesthetic time, and total surgical time ($P < 0.0001$ for all). Ninety percent of owners reported excellent outcome postoperatively. All remaining owners reported good to excellent outcome. Complication rates were similar to both previously reported unilateral and bilateral TTA and TPLO procedures. This study suggests that the use of bilateral single-session TTA procedures can be an effective and safe technique.

A Biomechanical Comparison of Three Femoral Fixation Sites Using the Hamstring Graft in Canine Cranial Cruciate Ligament Reconstruction. Louisa K. Ho¹, Masahiro Seki¹, Lindsey M. Goodwin², Lin Xie¹, Michael T. Kearney³, Mandi Lopez¹. ¹Veterinary Clinical Sciences, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA; ²School of Medicine, Health Sciences Center, Louisiana State University, Baton Rouge, LA; ³Department of Pathological Sciences, Statistical Services Unit, Health Sciences Center, Louisiana State University, Baton Rouge, LA.

Surgical stabilization of canine cranial cruciate ligament (CrCL) deficient stifles is intended to prevent and delay degenerative joint changes and restore normal stifle kinematics. This study was designed to test the hypothesis that femoral graft attachment site influences stifle translation and rotation conferred by intra-articular hamstring (HG) graft CrCL reconstructions.

Craniocaudal (CrCa) tibial translation and medial-lateral stifle rotation were evaluated in 24 normal canine hind limbs with the CrCL intact, transected and after HG stabilization at three femoral fixation sites: 1) center of condyle (CC); 2) distal to lateral fabella (F), and 3) proximal aspect of lateral trochlear ridge (TR). Tibial translation was quantified with no force and during application of cranial and caudal forces of 66.7 N to the tibia. Stifle rotation angles were recorded via an active motion analysis system with the femur immobilized in a custom designed device that permitted tibial rotation during translation loading. Additionally, reconstructed graft strain was determined throughout stifle range of motion.

Comparison of reconstructed to intact stifles with CrCL fixation at site F showed significantly greater translational stability than fixation at site TR or CC ($P < 0.05$). Significant differences in tibial rotation were associated with fixation method ($P = 0.02$), with site F showing least rotational variances. Lack of significant differences in graft strain throughout stifle range of motion within or between treatment groups supports the potential for isometry when grafts extended from the native CrCL origin and insertion. Femoral fixation site influences the stifle stability conferred by HG CrCL reconstructions.

Prevalence and Risk Factors for Development of Malignant Neoplasia in Feline Renal Allograft Recipients Receiving Lifelong Cyclosporine Based Immunosuppression 1998–2010. Elaine S. Holmes, Lillian Aronson. University of Pennsylvania, Philadelphia, PA.

Malignant neoplasia has been documented at an increased rate in feline renal transplant recipients (FRTR). This study aims to report the prevalence and risk factors for post-transplant malignant neoplasia (PTMN) in a larger population that has been previously reported. The hypothesis is that

lymphoma predominates as the most common PTMN, and that mean cyclosporine level increases the risk of PTMN. Medical records from all feline renal transplant recipients (FRTR) from 1998–2010 ($n = 126$, $n = 109$ included) were reviewed. Data collected included patient signalment, survival data, neoplasia diagnosis data, exogenous erythropoietin administration, and measured trough cyclosporine data. Prevalence of PTMN was 22% ($n = 24/109$) with 27 occurrences of PTMN total. Lymphoma was diagnosed in 51.9% ($n = 14/27$). Other diagnoses included adeno-cortical carcinoma ($n = 1$), squamous cell carcinoma ($n = 1$), meningioma ($n = 1$), pulmonary carcinoma ($n = 1$), fibrosarcoma ($n = 1$), cutaneous mast cell tumor ($n = 1$), splenic mast cell tumor ($n = 1$), renal carcinoma ($n = 2$), malignant melanoma ($n = 1$), neuroendocrine tumor ($n = 1$), and nasal adenocarcinoma ($n = 1$). Cause of death was PTMN in 66.7% ($n = 16/24$). MST for cats with neoplasia was 646 days (interquartile range 409–1620 days) which was not significantly different from cats without PTMN. Median TTO of PTMN was 631 days (range 7–2803 days). Diagnosis of neoplasia was not associated with survival time. Cyclosporine and erythropoietin administration did not affect occurrence of PTMN or survival time. PTMN remains a problem in FRTR and cats with PTMN predominantly die from their disease. This is the first report of many malignancies in FRTR.

A Biomechanical Comparison of Three Linear-Circular Hybrid Fixator Constructs. Caleb C. Hudson¹, Daniel D. Lewis¹, MaryBeth Horodyski², Antonio Pozzi¹, Alan R. Cross⁴, Scott A. Banks³. ¹Small Animal Clinical Sciences, College of Veterinary Medicine, University of Florida, Gainesville, FL; ²Department of Orthopaedics and Rehabilitation, College of Medicine, University of Florida, Gainesville, FL; ³Department of Mechanical and Aerospace Engineering, College of Engineering, University of Florida, Gainesville, FL; ⁴Georgia Veterinary Specialists, Atlanta, GA.

Linear-circular hybrid fixation has been described for the correction of fractures and limb deformities in dogs and cats. Little information is available regarding the mechanical properties of these systems. The purpose of this study was to determine the stiffness properties of three hybrid fixator constructs loaded in axial compression, cranial-caudal bending, medial-lateral bending and torsion.

Three hybrid constructs (designated Ia, Ia_d, & Ib) were tested. All constructs utilized a single, 84 mm, incomplete (5/8) ring and two tensioned olive wires to stabilize one bone segment and a primary hybrid rod with three interface fixation pins to stabilize the other bone segment. Constructs Ia_d and Ib incorporated a secondary diagonally placed hybrid rod and construct Ib incorporated biplanar fixation pin insertion. Eight replicates of each construct were tested for 10 cycles in 4 modes of loading using an MTS. Ring deformation during testing was assessed by collecting serial ring measurements during loading. Stiffness and deformation data were analyzed using an ANOVA with a post hoc Bonferroni correction.

Axial compression: constructs Ia_d and Ib were significantly stiffer than Ia. Cranial-caudal bending: Construct Ib was significantly stiffer than construct Ia. Medial-lateral bending: no significant differences between constructs. Torsion: Construct Ib was significantly stiffer than both Ia and Ia_d. Permanent ring deformation did not occur.

Incorporation of biplanar linear fixation elements as well as the addition of a secondary hybrid rod improved construct stiffness in several modes of loading. This study provides a base for further studies evaluating hybrid linear-circular fixator biomechanics.

The Decompression and Fusion to Canine Caudal Cervical Spondylomyelopathy Using Custom-Made Titanium Implant. Atsuki Ijiri. Department of Small Animal Surgery, Atsuki Animal Medical Center, Kusatsu, Japan.

Canine caudal cervical spondylomyelopathy (CCSM) was treated by using custom-made bioactive titanium implant as distractable fusion spacer. The implant was used as a part of the technique in decompression surgery that includes ventral slot with removal of degenerated intervertebral disc protrusion from the spinal canal, and was placed into the slot space for distraction and stabilization.

Our new surgical technique using custom-made bioactive titanium implant combined with conventional ventral slot will provide sufficient initial distraction and stabilization to the affected spinal segment and lead to successful arthrodesis.

The cases included 5 large breed dogs with neurological abnormalities, which were diagnosed as CCSM by clinical symptoms, Computerized Tomography (CT), MRI, and radiographic examination at our clinic.

All dogs were evaluated radiologically by CT postoperatively at regular intervals over 1 year.

All 5 dogs showed satisfactory improvement postoperatively and became ambulatory within 3 months. The slight migration of the implant was detected by CT in each case within 10 days of the surgery, however, further

movement was not observed after 10 days. By 3 months, the intervertebral disc space appeared to be fused in all cases.

The original distractable fusion spacer performed sufficient durability against the pressure placed onto the stabilization throughout the dog's life. This new technique will be expected the further use and development in vertebral stabilization.

Risk Factors for Dehiscence Following Colonic Resection and Anastomosis. Courtney Ikuta, Janet Kovak McClaran. Department of Surgery, The Animal Medical Center, New York, NY.

Studies have been published regarding techniques for colonic resection and anastomosis, though none have been published regarding dehiscence rates and associated risk factors in colonic resection and anastomosis. Studies have also been published on rates and risk factors following gastrointestinal surgery, though none were specific to the colon. The objectives of this study were to identify the rate and risk factors for dehiscence of colonic anastomoses.

Medical records of patients receiving colonic resection and anastomosis from 2004 to 2010 were reviewed. Information on 53 different risk factors was recorded.

56 patients were included (15 dogs, 41 cats). Dehiscence was identified in 6/56 patients (3 dogs, 3 cats). Preoperative hypoproteinemia (<5.1 g/dL) and presence of a foreign body were significantly associated with dehiscence (both $P = 0.028$). Perioperative death was also significantly associated with dehiscence ($P = 0.021$). Preoperative administration of corticosteroids was nearly associated with dehiscence ($P = 0.084$). Dehiscence occurred a median of 5 days postoperatively (range 1–6 days). Univariate analysis was performed using the Fisher exact test. Significance was set at $P < 0.05$.

The rate of dehiscence was 11%, though dogs were more likely to dehiscence (20%) than cats (7%). While this difference was not statistically significant ($P = 0.149$), previous studies have documented differences in dehiscence rates between species. Reasons include species differences in colorectal blood supply (improved in cats) and indications for surgery (foreign body in dogs).

The time at which dehiscence occurred was 4–6 days postoperatively, which is a longer lag than expected for dehiscence of small intestinal anastomoses.

Treatment of Avascular Necrosis of the Femoral Head in Small Dogs with Cemented Micro Total Hip Replacement. Daniel Jankovits^{1,2}, Bill Liska², Russell H. Kalis³. ¹Surgery, Animal Specialty Group, Inc., Los Angeles, CA; ²Surgery, Gulf Coast Veterinary Specialists, Houston, TX; ³Surgery, Angell Animal Medical Center, Boston, MA.

Avascular necrosis (AVN) of the femoral head is a developmental condition that affects small breed dogs. AVN is reported to be an autosomal recessive trait. The pathophysiology is well described. The contemporary treatment for AVN is femoral head and neck excision with fair to good subjective results. Total hip replacement (THR) is used to manage hip diseases in dogs to eliminate pain and re-establish normal function. THR has been recommended as a treatment of AVN, but clinical outcome studies are lacking. The purpose of our study was to evaluate treatment of AVN with the Micro THR system. Our hypothesis is that Micro THR used for the treatment of AVN would result in return to normal function with normal weight bearing.

This was an unrandomized, retrospective study. The records of seven dogs (7 hips) treated with Micro THR were evaluated. All dogs were evaluated at least 6 months after Micro THR. Signalment, physical, orthopedic, neurologic and radiographic examination, owner questionnaire, thigh girth, and ground reaction forces were evaluated.

There was no correlation between age, sex, and breed for the development of AVN in this study. Thigh girth and ground reaction forces showed no statistical difference between operated Micro THR limb and contralateral normal limb.

Micro THR is a surgical treatment option for AVN in small dogs.

Inhibition of Prostaglandin E2 and Nitric Oxide Production in Canine Chondrocytes by Pentosan Polysulfate and N-Acetylglucosamine Combination Compared to Meloxicam. Lane Johnson¹, Mark Grzanna², Lowella Heinecke², Angela Au^{2,3}, Jennifer Wardlaw¹, Carmelita G. Frondoza^{1,2}. ¹Mississippi State University, Mississippi State, MS; ²Nutramax Laboratories, Inc., Edgewood, MD; ³Syracuse University, Syracuse, NY.

Osteoarthritis is associated with excess production of pro-inflammatory cytokines and prostaglandin E2 (PGE2). We determined whether the combination of pentosan polysulfate and N-acetylglucosamine (PPS+NG) will inhibit the inflammatory response in activated canine articular chondro-

cytes. The effect of PPS+NG was subsequently compared to the effect of the commonly used NSAID-meloxicam.

Canine chondrocyte microcarrier spinner cultures were activated with IL-1 β and treated with: (1) control media alone, (2) clinically relevant concentrations of PPS (AUPEN5000TM, 125 μ g/ml) + NG (200 μ g/ml), or (3) meloxicam (11.7 ng/ml), for 24 hours. PGE2 and NO production were determined by ELISA and by nitrite Griess assay, respectively. Data was analyzed using one-way ANOVA, Tukey post-hoc test, $P < 0.05$ significance level.

Chondrocytes activated with IL-1 β showed a four-fold increase in PGE2 production and a two-fold increase in NO production. Treatment with PPS+NG significantly reduced PGE2 and NO production levels ($P < 0.001$). Similarly, meloxicam elicited a significant decrease in PGE2 and NO production ($P < 0.001$). The anti-inflammatory effect of the PPS+NG mixture appears to be comparable to meloxicam as shown by its ability to inhibit cytokine-induced PGE2 and NO production ($P < 0.001$). These findings support earlier studies that found PPS and NG to exhibit both anti-inflammatory and anabolic activity (7–8). It may be possible to combine PPS+NG with meloxicam to allow dose reduction of NSAIDs, thus minimizing adverse side effects such as life-threatening gastrointestinal, renal, and hepatic complications. Our observation suggests that the PPS+NG combination may be a useful addition in the management of joint inflammation in dogs and other species.

Arthroscopic Anatomy of the Tarsal Collateral Ligaments in the Horse. Jan M. Kümmerle, Martin Kummer. Equine Hospital, Vetsuisse Faculty, University of Zurich, Switzerland.

The equine tarsal collateral ligaments (CLs) have a complex anatomy with a long and a short component present medially and laterally. Each short component can be subdivided into a superficial, middle and deep part. Tarsocrural joint arthroscopy can provide diagnostic information and serve therapeutic purposes in horses suffering from pathological changes of the tarsal CLs. However, a detailed description of the arthroscopic anatomy of the equine tarsal CLs is lacking.

In this study, cadaver hindlimbs from horses euthanized for reasons unrelated to tarsal disease were used to obtain silicon models or perform arthroscopic exploration and subsequent dissection of the tarsocrural joint. During arthroscopic exploration, a hook knife was used to apply markers to the various parts of the CLs. During dissection, the position of these markers was allocated to the specific parts of the CLs.

Ipsilateral arthroscope and instrument portals were used in each pouch. Via the plantaromedial pouch, the deep or middle short medial CL and the long medial CL were usually reached. Access via the plantarolateral pouch allowed manipulation of the deep short lateral CL and the long lateral CL. Dorsally, arthroscopy via the dorsomedial pouch gave access to the deep short medial CL, while the superficial or middle short lateral CL could be reached via the dorsolateral joint recess.

In conclusion, specific but limited parts of the tarsal CLs can be visualized or manipulated arthroscopically and this has clinical implications for diagnostic and therapeutic purposes.

Biomechanical Algorithm to Quantify Forces from Equine Motion at the Saddle Position. Laxmi R. Nandana Kaidapuram^{1,2}, Mandi Lopez², Lin Xie².

¹Electrical and Computer Engineering, Louisiana State University, Baton Rouge, LA; ²Veterinary Clinical Sciences, Louisiana State University, Baton Rouge, LA.

Therapeutic riding is a common component of physical therapy programs. Quantification of the forces on the horse back at the level of the saddle will provide vital information to match therapeutic riders with equine partners. To meet this unmet medical need, an algorithm to quantify forces at the saddle level from ground reaction forces was developed to test the hypothesis that the forces transferred to a static weight at the saddle level can be predicted by horse breed and weight. Simultaneous, real time kinetic, kinematic, and back force data on a static weight was collected from 7 adult horses, 3 Thoroughbreds, 3 Quarter Horses, and 1 Paso Fino, at a walk using an integrated system consisting of a force platform, active motion detection system, and wireless force transducers, respectively. Data was collected from a minimum of five trials from all horses at a walk (1.3–2.0 m/s). Inverse dynamic analysis was used to calculate the fore and hind limb joint forces to the level of the shoulder and hip. Virtual segments were created from the shoulder to the spine, and the segments were modeled as series of springs and dampers. The energy absorption coefficients were derived through a series of iterations to align the inverse dynamic solutions of the fore- and hind limb data with the forces measured at the back. The data from this investigation will contribute to mechanisms to predict forces experienced by the rider during horse motion to advance the science of therapeutic riding.

A Descriptive Study of the Equine Proximal Interphalangeal Joint Using Magnetic Resonance Imaging, Contrast Arthrography and Arthroscopy. J Lacy Kamm^{1,2}, Laurie Goodrich^{1,2}, Natasha Werpy², C Wayne McIlwraith². ¹Clinical Sciences, Colorado State University, Fort Collins, CO; ²Orthopaedic Research Center, Colorado State University, Fort Collins, CO.

Introduction: This study is a descriptive analysis of the fore and hind limb proximal interphalangeal (PIP) joints. The dorsal and palmar/plantar PIP joints are visualized using several imaging modalities. These are used to illustrate areas that are arthroscopically accessible, describe the soft tissue structures that must be avoided, and investigate the differences between the fore and hind PIP joint.

Methods: Healthy cadaver limbs were used to perform anatomic modeling, magnetic resonance imaging (MRI) with MRI-compatible needles, contrast arthrography using computed tomography (CT), and arthroscopy on the PIP joint. Two approaches to the dorsal joint, one more proximal than the other, were compared to reveal the optimal location of placement to see the greatest area of the joint.

Results: Anatomic modeling revealed large proximal recesses of the joint both on the dorsal and palmar/plantar sides. MRI showed that the axial plantar ligaments, abaxial palmar/plantar ligaments, straight sesamoidean ligament, and the branches of the superficial flexor tendon are axial or palmar/plantar to the vascular bundle. There was no significant difference in the amount of joint visualized when using the more proximal or distal approach to the dorsal joint ($P = 0.586$). The only significant difference in visualization between the fore and the hind was the arthroscope portal in the proximal dorsal approach could visualize more abaxial areas of the joint in the fore limb than in the hind ($P = 0.050$).

Discussion: the dorsal and palmar/plantar joint pouches allowed for good arthroscopic visibility of the axial portions of the articular surface of the first and second phalanx (P1 and P2). Dorsal arthroscope portals could be placed at the level of the PIP joint up to 1.5 cm proximal to it without affecting the amount of visibility of the joint. Placement of the arthroscope at the levels of 1.5 cm proximal to the joint allowed the most manipulation of the arthroscope. Palmar/plantar portals were placed dorsal to the vascular bundle to prevent laceration of tendons and ligaments.

Conclusion: with improved understanding of the PIP joint as well as knowledge attained regarding differences between the front and hind limb, joint injections and arthroscopic surgery can be more easily completed.

Flank Approach for Removing Enlarged, Diseased Ovaries in Standing Mares. Gal Kelmer, Dalia Berlin, Amir Steinman, Tal Raz, Amos Taz. Large Animal, Hebrew University of Jerusalem, Koret School of Veterinary Medicine, Beit Dagan, Israel.

The goal of the study is to describe a technique of removing a large, diseased ovary, using a flank approach, with the mare standing and to report the outcome of mares undergoing this technique.

Mares included in the study were those that underwent unilateral ovariectomy between the years: 2002–2010 through a flank approach, with the mare standing. The study included 14 mares, aged 3–17 years, weighing 350–500 kg.

Mares were examined because complaints of recent development of behavioral changes and/or cessation of reproductive cycling activity. Mares were restrained in a stock, the flank region was prepared for aseptic surgery and the abdominal cavity was exposed through a 10–12 cm long, vertical incision. The ovarian pedicle was ligated by sutures and staples. During closure of the abdominal incision, a suction drain was placed between the external and internal abdominal oblique muscles.

All the ovaries were successfully removed, and no major complications were observed. Two mares developed an incisional infection but all mares had a good final cosmetic outcome. A granulosa-theca cell tumor was identified during histological evaluation of the ovary of 6 mares. All mares showed improvement in objectionable behavior and regained normal oestrus cycling within 15 month after surgery. At the time of writing 2 mares foaled and 6 were pregnant.

Ovariectomy performed with the mare standing through a flank approach is a safe, efficient, and relatively inexpensive technique for removing a diseased ovary. The technique allowed easy ligation of the ovarian pedicle and avoided complications associated with general anesthesia.

Hip Toggle Stabilization Using the TightRope® System in 9 Dogs. Nina Kieves^{1,2}, Peter Lotsikas¹, Sherman O. Canapp¹. ¹Veterinary Orthopedic & Sports Medicine Group, Annapolis Junction, MD; ²Department of Veterinary Clinical Sciences, Iowa State University, Ames, IA.

Toggle rod stabilization for coxofemoral luxation (CFL) has been described using many variations of prosthetic ligament of the head of the femur (LHF) including absorbable and non-absorbable suture material. Our

objectives were to describe the technique and to report clinical outcome in 9 dogs that had toggle rod stabilization for CFL using the TightRope® system as the prosthetic LHF.

Medical records including radiographs (9 limbs) with CFL repaired using the TightRope system were retrospectively reviewed to assess outcome using this technique. Follow-up (mean, 16.5 months; range, 9–30 months) was available for 9 dogs (by phone). Re-evaluation and gait analysis was performed in 5 dogs (mean, 8 months; range, 3–24 months). A single case of re-luxation was reported. Eight of nine owners reported limb function as being excellent. For five dogs evaluated by a veterinarian >3 months following surgery, objective gait analysis revealed pelvic limb symmetry. Radiographs (3–24 months post-surgery) of the five dogs showed minimal to no progression of osteoarthritis compared to the contralateral hip.

Hip toggle with the TightRope® system produced a favorable clinical outcome with high owner acceptance. Repair of CFL with the TightRope® system is a clinically applicable technique and may offer advantages over other materials used for hip toggle repair in respect to postoperative complications.

The Effect of Position of the Tibial Plateau Leveling Osteotomy on Patella Tendon Strain: In Vitro Cadaveric Study. Sun Young Kim¹, Kei Hayashi^{2,3}, Jmaes Y. Kim¹, Tanya Garcia-Nolen³, Amy S. Kapatkin^{2,3}, Susan Stover³. ¹William R. Pritchard Veterinary Medical Teaching Hospital, University of California, Davis, CA; ²Surgical and Radiological Sciences, University of California, Davis, CA; ³JD Wheat Veterinary Orthopedic Research Laboratory, University of California, Davis, CA.

Patellar tendon thickening (PTT) and Patellar tendinopathy (PTP) is the most commonly reported complication after tibial plateau leveling osteotomy (TPLO). The purpose of this study was to investigate biomechanical factors that could contribute to patellar tendinopathy after TPLO. The specific aim was to determine the effect of location of the TPLO on patellar tendon strain in cadavers.

Eight pairs of normal cadaveric pelvic limbs were randomly assigned into two groups based on TPLO position; High cut and Low cut. Patellar tendon strain was measured using a differential variable reluctance transducer (DVRT) under an axial load of 30% body weight and standing joint angles; before, and after, TPLO. Joint angles were standardized by adjusting turnbuckles in series with respective load cells that simulated quadriceps and gastrocnemius muscle functions. Data from 2 specimens were excluded from analysis due to significant change of joint angles during the test. Patellar tendon strain was compared before and after TPLO, and amount of the strain change was compared between the High cut TPLO and Low cut TPLO.

Patellar tendon strain was lower after the TPLO than before TPLO. The Low cut, but not the High cut TPLO decreased patellar tendon strain.

Generally, a tendinopathy results from either repetitive excessive stress or stress shielding. The data indicate that PTT or PTP after TPLO may result from stress shielding rather than over-stress. The High cut TPLO is recommended over the Low cut TPLO because the change in patellar tendon strain after TPLO is smaller. To avoid PTT and PTP, physical therapy may be needed after TPLO to prevent stress shielding of the tendon.

Use of Plain Radiography in the Surgical Management of Obstructive Urolithiasis in Small Ruminants: 25 Cases (2002–2010). Marc Kinsley, Stacy Semevolos. Oregon State University, Corvallis, OR.

Obstructive urolithiasis remains the most common indication for surgery of the urinary system in small ruminants and continues to be a challenging problem to treat effectively. Diagnostic imaging may aid in the diagnosis of obstructive urolithiasis and determining the appropriate surgical technique for intervention. The objective of this retrospective study was to evaluate the use of plain radiography for diagnosis, surgical management, and prognosis of obstructive urolithiasis in small ruminants. We hypothesized that plain radiographs provided diagnostic and prognostic benefits in the surgical management of radio-opaque calculi in the urinary system of small ruminants. Goats and sheep ($n = 25$) admitted between January 2002 and December 2010 with obstructive urolithiasis and having plain radiographs taken of the urinary tract were included in the study. Urinary calculi were detected in 21/25 (84%) of plain radiographs taken, and radiographs were considered to be diagnostically useful in 23/25 (92%) cases. In radiographs containing radio-opaque uroliths, the calculi were localized to the urinary bladder in 10 animals, penile urethra in 8, just distal to the ischium in 6, and to the sigmoid flexure in 3. Radiographs were taken following surgical intervention in 9 animals and were perceived to be of diagnostic value in all animals. In 6 of these animals, the postoperative radiographs revealed residual calculi in the urethra and were essential for their targeted removal. In regions where radio-opaque calculi (calcium carbonate, calcium oxalate, silica) are common, survey radiographs are recommended to determine

the appropriate surgical approach(es) and to confirm resolution of the obstruction.

Isolation, Characterization and In Vitro Proliferation of Canine Bone Marrow, Adipose Tissue, Muscle, and Periosteum-Derived Mesenchymal Stem Cells. *Agatha Kisiel*¹, Laurie McDuffee², Elmabrok Masaoud^{3,4}, Trina Bailey¹, Blanca Esparza Gonzalez², Rodolfo Nino Fong². ¹Companion Animals, Atlantic Veterinary College, Charlottetown, PE, Canada; ²Health Management, Atlantic Veterinary College, Charlottetown, PE, Canada; ³Centre of Veterinary Epidemiological Research, Atlantic Veterinary College, Charlottetown, PE, Canada; ⁴Department of Statistics, University of Al-Jabal Al-Garbi, Zawia, Libyan Arab Jamahiriya.

Bone marrow and adipose tissue are the most commonly reported sources of canine mesenchymal stem cells (cMSCs). The objective of this study was to isolate and characterize muscle and periosteum-derived cMSCs (MMSCs and PMSCs) and compare their proliferation capacity to bone marrow and adipose tissue-derived cMSCs (BMSCs and AMSCs). We hypothesized that MMSCs and PMSCs could be successfully isolated, and their proliferation potential would be at least equivalent to BMSCs and AMSCs.

Mesenchymal stem cells (MSCs) were isolated from bone marrow, adipose tissue, muscle, and periosteum of seven canine cadavers. They were characterized by morphology, immunofluorescence of cell surface markers, and expression of pluripotency-associated transcription factors. Adipogenic, osteogenic, and chondrogenic differentiation was evaluated using morphological and histochemical methods. Passage one BMSCs, AMSCs, MMSCs, and PMSCs were counted daily for four days to determine proliferative capacity. The MSC yield/gram of tissue was also calculated.

Isolation of BMSCs, AMSCs, MMSCs, and PMSCs was based on positive expression of CD90, negative expression of CD34, CD45, and CD146, mRNA expression of SOX2, OCT4, and NANOG, and adipogenic and osteogenic differentiation. Proliferative capacity between BMSCs, AMSCs, MMSCs, and PMSCs was not significantly different over four days. Periosteum provided a significantly higher MSC yield/gram of tissue once confluent in passage one (mean \pm SD of 19,400,000 \pm 12,800,000 within a mean \pm SD of 13 \pm 1.64 days).

Muscle and periosteum are sources of cMSCs. Periosteum is a superior tissue source in providing the highest MSC yield/gram of tissue within a clinically relevant time period.

The Relationship Between Synovial Fluid and Cartilage Chondroitin Sulphate 846 Epitope in a Model of Experimentally Induced Osteoarthritis in Horses Treated Intravenously with Pentosan Polysulphate, N-Acetylglucosamine and Sodium Hyaluronan. *Toby J. Koenig*^{2,1}, Andrew Dart^{2,1}, Nigel Perkins⁵, Robin J. Bell^{2,1}, Neil U. Horadagoda^{2,1}, Mark Krockenberger¹, Leo Jeffcott^{2,1}, Christopher B. Little³, C Wayne McIlwraith³. ¹Faculty of Veterinary Science, University of Sydney, Camden, NSW, Australia; ²Biomedical Research & Clinical Trials Unit, the University of Sydney, Camden, NSW, Australia; ³Gail Holmes Equine Orthopaedic Research Centre, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO; ⁴Raymond Purves Bone and Joint Research Laboratories, Kolling Institute of Medical Research, Institute of Bone and Joint Research, University of Sydney, Sydney, NSW, Australia; ⁵AusVet Animal Health Services, Toowoomba, QLD, Australia.

Synovial fluid concentration of the chondroitin sulphate-846 epitope (CS-846) may increase in osteoarthritic joints associated with up-regulation of aggrecan synthesis. Synovial fluid concentrations may be a useful marker of aggrecan turnover in horses if there is a correlation between synovial fluid and cartilage concentrations. The objective of the current study was to compare the synovial fluid and cartilage concentrations of CS846 in horses with experimentally induced osteoarthritis. Our hypothesis was that the levels of CS846 in the synovial fluid would correlate with those of the articular cartilage.

A radiocarpal bone osteochondral fragment was induced arthroscopically in one middle carpal joint of 16 horses. Eight horses received 3 mg/kg PPS, 4.8 mg/kg NAG and 0.12 mg/kg HA (PGH) intravenously weekly until the completion of the study while 8 (control) received an equivalent volume of saline. Synovial fluid was aspirated fortnightly from both middle-carpal joints. A sample was also taken immediately prior to euthanasia. After euthanasia, cartilage was collected from the radiocarpal (RC), third (3C) and fourth carpal bones (4C). Samples were analyzed for CS-846.

CS-846 concentrations were higher in the synovial fluid of OA-induced joints ($P < 0.001$). There was no effect of treatment with PGH. There was no effect of surgery or treatment on CS-846 concentration in the car-

tilage from the radiocarpal or third carpal bone. CS-846 concentrations were higher in the cartilage of the fourth carpal bone from the unoperated limb in horses treated with PGH compared to saline treated controls. There was no correlation between synovial fluid and cartilage CS-846 concentrations.

Evaluation of a Combination of Pentosan Polysulphate, N-Acetylglucosamine and Sodium Hyaluronan Intravenously for Treatment of Horses with Experimentally Induced Osteoarthritis. *Toby J. Koenig*², Andrew Dart², Nigel Perkins⁵, Robin J. Bell², Neil U. Horadagoda², Mark Krockenberger¹, Leo Jeffcott², Christopher B. Little³, C Wayne McIlwraith³. ¹Faculty of Veterinary Science, the University of Sydney, Camden, NSW, Australia; ²Biomedical Research & Clinical Trials Unit, University of Sydney, Camden, NSW, Australia; ³Gail Holmes Equine Orthopaedic Research Centre, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO; ⁴Raymond Purves Bone and Joint Research Laboratories, Kolling Institute of Medical Research, Institute of Bone and Joint Research, the University of Sydney, Sydney, NSW, Australia; ⁵AusVet Animal Health Services, Toowoomba, QLD, Australia.

Lameness associated with osteoarthritis has a significant economic impact on the equine industry. The objective of the current study was to assess clinical and biochemical effects of an intravenous combination of pentosan polysulphate (PPS), N-acetylglucosamine (NAG) and sodium hyaluronan (HA) in treatment of horses with experimentally surgically induced osteoarthritis. We hypothesized that the drug combination (PGH) would have beneficial effects on the measured clinical and biochemical variables of osteoarthritis compared to placebo treated control horses.

An osteochondral fragment was created on the radiocarpal bone arthroscopically in 16 horses. Commencing on day 10, eight horses received 3 mg/kg PPS, 4.8 mg/kg NAG and 0.12 mg/kg HA intravenously weekly until the completion of the study. Eight control horses received an equivalent volume of saline on the same days. Clinical, synovial fluid and biochemical changes were evaluated throughout the study.

No adverse treatment-related events were detected. The presence of an osteochondral fragment caused a significant change in lameness, response to carpal flexion, joint effusion, synovial fluid total protein, synovial fluid CS846 and PGE2 and cartilage CS846. Treatment with PGH reduced the total protein concentration in the limb with the osteochondral fragment compared to horses treated with saline. The CS846 content of the cartilage of the fourth carpal bone in joints that did not have an osteochondral fragment was higher in PGH treated horses compared with horses treated with saline. There were no other significant changes.

Results suggest that PGH had beneficial disease-modifying or chondroprotective effects and may be a therapeutic option for osteoarthritis in horses.

Comparison of Long-Term Force Plate Gait Analysis for Extracapsular Reconstruction and Tibial Plateau Leveling Osteotomy in Dogs. *Ursula Krotscheck*, Samantha Nelson, Jeremy Rawlinson, Margret Thompson, Zhiwu Zhang, Rory Todhunter. Department of Clinical Sciences, Cornell University, Ithaca, NY.

Objectives: to determine the long-term ground reaction forces (GRF) in TPLOs vs. extracapsular reconstruction (ECR), and to compare these to a cohort of normal dogs.

Animals: Normal adult dogs (control, n = 79); dogs with unilateral CCL disease (treatment, n = 38).

Materials and Methods: Force-plate gait analysis (FGA) was performed in all groups. Symmetry indices (SI) were calculated for GRFs. Data collected and analyzed by individual GRFs using repeated measures ANOVA included: surgery type, time period after surgery (TP), sex, age, weight, BCS, side, lameness duration, tear type, and meniscectomy. Least squares estimate was used to evaluate GRFs based on time period after surgery and treatment group in comparison to the control group. TP was defined as period 1 (1–49 days), 2 (50–149 days), 3 (150–299 days), and 4 (≥ 300 days).

Results: There were no statistically significant differences among treatment groups for meniscal pathology, tear type, and lameness duration ($P = 0.74, 0.051, 0.33$, respectively). RM ANOVA showed significant differences for surgery type and TP. Further analysis showed a statistically significant difference between the ECR group and the control group at all TPs ($p \leq 0.036$ for all), whereas there was no statistically significant difference between the TPLO and control groups at time period 2 for trot contact time, and 3 and 4 for all GRFs except trot vertical impulse ($P = 0.026$).

Conclusions: Dogs receiving a TPLO for treatment of RCCL recovered near normal function by 150 days after surgery, whereas no dogs receiving ECR recovered to normal function at any time point.

Clinical and Histopathological Prognostic Factors for Canine Osteosarcoma of the Flat and Irregular Bones. Meghan A. Kruse¹, Elaine S. Holmes¹, Julie A. Balko², Steven Fernandez¹, Dorothy C. Brown¹, Michael H. Goldschmidt². ¹Department of Clinical Studies, Veterinary Hospital of the University of Pennsylvania, Philadelphia, PA; ²Department of Pathobiology, Veterinary Hospital of the University of Pennsylvania, Philadelphia, PA.

Osteosarcoma is the most common bone tumor in dogs. However, current literature focuses primarily on appendicular osteosarcoma. This study examined the prognostic value of histological and clinical factors in flat and irregular bone osteosarcomas and hypothesized that clinical factors would have a significant association with survival time while histological factors would not. All osteosarcoma biopsy samples of the vertebra, rib, sternum, scapula, or pelvis were reviewed while survival information and clinical data were obtained from medical records, veterinarians, and owners.

Forty-six dogs were included in the analysis of histopathological variables and 27 dogs with complete clinical data were included in the analysis of clinical variables. In the histopathologic cox regression model, there was no significant association between any histologic feature of the osteosarcoma, including grade, and survival time. In the clinical cox regression model, there was a significant association between the location of the tumor and survival time as well as between the percent elevation of alkaline phosphatase (AlkPhos) above normal and survival time. Controlling for AlkPhos elevation, dogs with osteosarcoma located in the scapula had a significantly greater hazard for death (2.8) compared to dogs with tumors in other locations. Controlling for tumor location, every 100% increase in AlkPhos from normal increased the hazard for death by 1.7.

For canine osteosarcomas of the flat and irregular bones, histopathological features, including grade do not appear to be rigorous predictors of survival. Clinical variables such as increased AlkPhos levels and tumor location in the scapula were associated with decreased survival times.

Pilot Hole Size and Tapping Affects Insertion Torque and Axial Pullout Strength of 4.0 mm Cancellous Bone Screws. Kevin A. Kunkel¹, Jonathan T. Suber¹, Michael P. Kowaleski². ¹Surgery, SC Veterinary Specialists, Columbia, SC; ²Surgery, Tufts Cummings School of Veterinary Medicine, North Grafton, MA.

Recommendation for placement of 4.0 mm screws is to use a 2.5 mm pilot hole and tap with a 4.0 mm tap. Our hypotheses were: (1) the axial pullout strength of 4.0 mm screws would be increased using a 2.0 mm pilot hole compared to a 2.5 mm pilot hole and (2) tapping the 2.0 mm hole would decrease the insertion torque, without decreasing pullout strength.

Synthetic cancellous bone blocks were assigned to one of five groups (screw size/pilot hole/tap size): 1 (3.5/2.5/3.5), 2 (4.0/2.5/4.0), 3 (4.0/2.5/none), 4 (4.0/2.0/4.0), 5 (4.0/2.0/none). 70 mm screws were inserted using a torque recording screwdriver. Screws were extracted at 5 mm/min until failure. Insertion torque (IT), axial pullout strength (APS), yield strength (YS), and stiffness were determined. Data were analyzed using a one-way ANOVA.

Maximum IT (Nm) was significantly different for all groups: Group 5 > Group 3 > Group 4 > Group 2 > Group 1. for APS (N): Group 3, Group 4 and Group 5 were similar and significantly greater than Group 2, all of which were significantly greater than Group 1. For YS (N): Group 5 and Group 4 were similar and significantly greater than Group 3, Group 2, and Group 1. for stiffness (N/mm): Group 3 was similar to Group 4 and Group 2 but was significantly greater than Group 5, all of which were significantly greater than Group 1.

In a synthetic cancellous bone model, tapping a 2.0 mm pilot hole when placing a 4.0 mm screw is the optimal insertion technique.

Reliability of Photogrammetry to Perform Three-Dimensional (3D) Wound Assessments Compared to Standard 2D Photographic Techniques. Raphael Labens, Anthony Blikslager. Department of Clinical Sciences, North Carolina State University, Raleigh, NC.

Reliable wound monitoring is essential for assessment of healing in clinical and research situations. Two-dimensional (2D) surface measurements are commonly used but they do not consider 3D topography. We hypothesize that principles of photogrammetry can be applied for 3D analysis of equine wounds and that the technique is more reliable than 2D image analysis.

Using PhotoModeler Scanner™ and three Canon PowerShot™ SD780 IS cameras simultaneous images were repeatedly (three times) obtained of four conservatively healing wounds at each follow-up.

Images were processed to compute 3D computer models and 3D wound surface measurements were obtained. Standard 2D measurements were ob-

tained using an open source software program (Image J™). The maximum difference between repeated measurements was recorded. Differences were translated in %changes of the mean wound area that they occurred in. a repeated measures ANOVA was performed on absolute measurements (Data1) and %changes (Data2).

Analysis of Data1 showed that "time of follow-up" and "method of analysis" were significant ($P = 0.0002$; $P = 0.0013$). Analysis of Data2 showed that "method of analysis" ($P < 0.0001$) and "wound location" were significant ($P = 0.0286$). The mean difference in %change of the wound surface was 17.3% for repeated 2D and 5.75% for 3D measurements.

Photogrammetric methods can be successfully applied for equine wound monitoring. 3D area measurements were shown to be significantly more reliable than 2D measurements allowing a reliable assessment of the wound bed. The poor performance of repeated 2D measurements is in part attributable to differences in photographic perspective, which the 3D method is not subject to.

Use of Neurostimulation to Localize and Anesthetize the Brachial Plexus of Calves Undergoing Metacarpal Surgery. Hélène Lardé, Sylvain Nichols, Geneviève Bussières, Marketa Kopal, André Desrochers, Susan R. Vogel. Faculté de Médecine Vétérinaire, Université de Montréal, St-Hyacinthe, QC, Canada.

In cattle, surgery distal to the metacarpophalangeal joint is usually performed under loco-regional anesthesia. However, for proximal interventions, general anesthesia is often required. The aim of this study was to evaluate the use of brachial plexus anesthesia for orthopedic surgery in calves. We hypothesized that this loco-regional block, combined with sedation, would be sufficient for interventions on the metacarpal of calves.

Ten Holstein calves were sedated with xylazine and butorphanol and placed in dorsal recumbency. The limb was held in extension and the brachial plexus was located by neurostimulation. The plexus was anesthetized with lidocaine. Orthopedic surgery was then performed on the metacarpal and the vital parameters of the calves were monitored. If the vital parameters changed during painful stimulation or if the calves moved excessively, general anesthesia was induced and maintained with a drip of GGE and ketamine. Daily monitoring was performed for 7 days after surgery.

All ten brachial plexi were detected with neurostimulation. For three calves, surgery was performed without induction of general anesthesia. For the other seven calves, five were induced because of movement not associated with painful stimulation. All calves recovered sensitivity and mobility of their forelimb within 3 hours after surgery and no long-term complications related to the block were observed.

Brachial plexus anesthesia is an effective technique for performing surgery on metacarpal bones of calves. However, general anesthesia should be available in cases of incomplete anesthesia or if complete immobilization of the calf is needed.

Minimally Invasive Approach to the Spinal Canal for Treatment of Intervertebral Disc Herniation in Dogs. Abigail Lockwood¹, Dominique J. Griffo², Wanda Gordon-Evans³, Jodi A. Matheson¹, David J. Schaeffer¹. ¹Department of Veterinary Clinical Medicine, University of Illinois, Urbana, IL; ²Department of Veterinary Research, Western University of Health Sciences, Pomona, CA; ³Wisconsin Veterinary Referral Center, Waukesha, WI.

The objective of this study was to develop two minimally invasive approaches to the spinal canal for treatment of intervertebral disc disease and compare their efficacy to that of standard hemilaminectomy. 10 canine cadavers (5 < 13 kg, 5 > 13 kg) received injections of agarose gel into the spinal canal at three intervertebral spaces to simulate disk extrusion. Each site within each dog was randomly assigned one of the following three techniques: standard hemilaminectomy (SH), endoscopic foraminotomy (EF), or foraminotomy via an illuminated port (FP). Surgical time and length of the incisions were recorded. Computed tomography was performed before and after the procedures to document and compare removal of the agarose gel. Specimens were then dissected to explore size and position of the window and iatrogenic trauma to the spinal cord or nerve root.

In all dogs, surgery time was greater for EF than SH and FP, and mean skin incision was longer for SH than with EF or FP. The size of the window was greater for SH in large dogs, while in small dogs, window size was not different across techniques. EF provided unparalleled visualization of the spine and nerve root while FP allowed the use of traditional burr to create the window. The amount of agarose gel removed did not differ between techniques, or size of dogs.

Minimally invasive techniques for treatment of intervertebral disc herniation were as effective as standard hemilaminectomy while decreasing soft tissue morbidity in a cadaveric model.

In Vivo Application of Novel and Commercially Available Bioabsorbable Implants for Tibial Fixation of Cranial Cruciate Ligament Reconstruction Grafts. Mandi Lopez¹, Prakash Bommala¹, Laura Kelly¹, Nan Zhang¹, W. Todd Monroe². ¹Veterinary Clinical Sciences, Louisiana State University, Baton Rouge, LA; ²Biological and Agricultural Engineering, Louisiana State University, Baton Rouge, LA.

Bioabsorbable devices for fixation of canine cranial cruciate ligament (CrCL) graft reconstructions are an alternative to standard implants. This study was designed to test the hypothesis that tibial translation, graft incorporation, and mechanical properties of hamstring graft reconstructions stabilized with a novel bioabsorbable implant (GG) or a commercially available bioabsorbable screw and washer (BP) are indistinguishable. Hamstring graft reconstructions in 14 normal canine stifles were affixed to the tibia with a GG or a BP ($n = 7/\text{implant}$). Stifle stability was quantified, and kinetic gait analysis, stifle radiographs and computed tomography (CT) performed prior to, 4 and 8 weeks after surgery. Microstructural graft incorporation and graft-tibia construct tensile properties were evaluated 8 weeks postoperatively. Outcomes were not statistically different between implants at any time point. Grafts were robust and intact in 13 dogs. Caudal tibial translation in the BP group was greater 8 weeks after surgery compared to pre-surgical values. Ground reaction forces in treated limbs were lower than preoperative values and control limbs 4 and 8 weeks after surgery, and values in treated limbs lower 4 versus 8 weeks after surgery. All grafts failed mid-substance or at the tibial articular surface during mechanical testing. Graft and bone tunnel volume and area in 3-D CT reconstructions were comparable between treatment groups and time points. Grafts had a combination of fibrous, direct and indirect attachments to the tibia. Based on these results, canine hamstring graft CrCL reconstruction fixation with either bioabsorbable implant is an option for treatment of CrCL deficient stifles.

Efficacy of a Plant Extract (*Brachytemma Calycinum* D. Don) on the Pain-Related Disability in Dogs with Naturally Occurring Osteoarthritis. Maxim Moreau^{1,2}, Bertrand Lussier^{2,3}, Jean-Pierre Pelletier², Dominique Gauvin^{1,2}, Johanne Martel-Pelletier², Eric Troncy^{1,2}. ¹Faculty of Veterinary Medicine, Department of Veterinary Biomedicine, University of Montreal, St-Hyacinthe, QC, Canada; ²Osteoarthritis Research Unit, University of Montreal Hospital Research Centre (CRCHUM), Notre-Dame Hospital, Montreal, QC, Canada; ³Faculty of Veterinary Medicine, Department of Clinical Sciences, University of Montreal, St-Hyacinthe, QC, Canada.

As an alternative to treatment of canine osteoarthritis (OA) with non-steroidal anti-inflammatory drugs, we evaluated, in a randomized, double-blinded, placebo-controlled (CTR) clinical trial, the efficacy of *Brachytemma calycinum* D. don (BCD) over 6 weeks of treatment. Thirty-three dogs with hind limb lameness were included in the study. After baseline, dogs were randomly divided into 2 groups (16 CTR; 17 BCD). Assessment by a validated client-specific outcome measures (CSOM) questionnaire was performed twice weekly, and peak vertical force (PVF) kinetic measurement was repeated after 3 and 6 weeks of treatment. Collar-mounted activity monitors were worn throughout the study by 6 CTR and 7 BCD dogs. Statistical inferences were done under a probability value less than 5% and mean (SD) values are presented.

At week 3 [BCD: +2.8 (3.5)%; CTR: -0.9 (4.3)%; $P = 0.03$] and week 6 [BCD: +5.1 (5.1)%; CTR: -0.3 (5.6)%; $P = 0.03$], both averaged change to baseline and number of dogs positive to treatment (Fig 1) were statistically significant for PVF. Both intensity (DATI) and duration (DDAP) of daily activity were maintained in the BCD group, whereas both parameters decreased within-time in the CTR group. The intergroup comparison was significant ($P < 0.001$). Both groups presented a significant decrease in CSOM score within-time. CSOM scores were significantly lower in the BCD group compared to CTR ($P = 0.02$), at the end of the study.

Treatment of naturally-occurring OA dogs for 6 weeks using BCD improved functional outcome and performance in daily life activities and represents an interesting avenue for future treatment of canine OA.

Incidence and Distribution of Stress Fractures in Thoroughbred Flat Racehorses Training on Different Surfaces. Melissa C. MacKinnon¹, Darryl Bonder², Raymond Boston¹, Michael W. Ross¹. ¹Department of Clinical Studies, New Bolton Center, University of Pennsylvania, Kennett Square, PA; ²Toronto Equine Hospital, Mississauga, ON, Canada.

Stress fractures are common in Thoroughbred (TB). Training track surface is one factor that can contribute to musculoskeletal injury. Retrospectively, two populations of TB flat racehorses were evaluated using scintigraphy. Group 1, Toronto Equine Hospital (TEH 2003–2010) and group 2, New Bolton Center (NBC 1994–2006). Horses admitted to TEH trained at a single track at which the racing surface changed from dirt to synthetic on

8/27/2006. All scintigraphic images were evaluated by a blinded reviewer. Fisher's exact test and logistic regression were used when appropriate and significance was set at $P < 0.05$. There were 531 horses from TEH (257 dirt and 274 predominantly on synthetic, numerous trainers). There were significantly more stress fractures in horses trained on synthetic surface (32.1%) compared to those trained on dirt (21.8%) ($P = 0.037$). Age and sex distribution did not differ between groups. At NBC, there were 547 horses (349 dirt trained by numerous trainers and 198 primarily turf trained by one trainer). There were significantly fewer stress fractures in horses trained on turf (2.0%) compared to those trained on dirt (14.6%) ($P = 0.0001$). The mean age was 3 in both groups, however there were less 2 and 3 year old horses trained on turf ($P = 0.012$) and less females ($P = 0.004$) than in those trained on dirt. This study provides evidence that training surface can impact the incidence of stress fractures but other factors such as age, sex and training philosophy appear important and warrant further investigation.

Clinical Evaluation of a Vanilloid Receptor Type 1 (TRPV1) Antagonist for Treatment of Osteoarthritis in Dogs. Sarah Malek¹, Susannah J. Sample¹, Zeev Schwartz¹, Susan L. Schaefer¹, Jason A. Bleedorn¹, Peer B. Jacobson², Elizabeth Cozzi², Peter Muir¹. ¹Surgical Sciences, School of Veterinary Medicine, University of Wisconsin, Madison, WI; ²Abbott Laboratories, Abbott Park, IL.

Challenges in managing pain have prompted research into new classes of analgesics. A receptor expressed on sensory neurons, the vanilloid receptor type 1 (TRPV1), is a key component of nociception. We hypothesized that an oral TRPV1-antagonist would induce improvement during treatment of osteoarthritis-associated pain.

In this study, 36 client-owned dogs with osteoarthritis were enrolled in a double-blind randomized prospective trial with rescue therapy. Dogs were evaluated on days 1, 8, and 22. After a week of no treatment, dogs were assigned to one of four treatments (TRPV1-antagonist, carprofen, tramadol, placebo) from day 8 for 2 weeks. A key outcome measure was owner questionnaire scoring. Changes in pain and pain interference scores were assessed by a single-sample Student's t test. With Dunn-Sidak correction, results at $P < 0.0127$ were considered significant.

One dog was withdrawn from the trial because of an unrelated illness. Dogs were generally improved after treatment. Reduction in pain score was influenced by weight ($P < 0.05$), with heavier dogs showing greater improvement. Dogs treated with tramadol had a significant reduction in pain interference score ($P = 0.0005$), but not pain score ($P = 0.02$). In the TRPV1 and carprofen groups, scores were lower after treatment, but not significantly. Scoring was also lower after placebo treatment.

We conclude that all 4 groups showed improvement in CBPI score. Significant clinical improvement was only identified with tramadol treatment. A care-giver placebo effect was also evident; a unique feature of use of client-owned dogs as a model for analgesic trial studies

Effect of Post-Arthroscopic Triamcinolone Acetonide Administration on Synovial Fluid and Serum Biomarkers in an Equine Metacarpophalangeal Osteochondral Injury Model. Jane M. Manfredi¹, Troy N. Trumble¹, Mary Boyce¹, Donna Groschen¹, Kelly Merritt², Murray Brown². ¹Veterinary Population Medicine, College of Veterinary Medicine, University of Minnesota, St Paul, MN; ²Large Animal Clinical Sciences, College of Veterinary Medicine, University of Florida, Gainesville, FL.

Information about synovial fluid and serum biomarkers after arthroscopic removal of osteochondral fragments is lacking. Often, corticosteroids or hyaluronan are intra-articularly administered postoperatively. The purpose of this study was to investigate the effects of arthroscopic surgery and post-surgical administration of triamcinolone acetonide (TA). Seven adult Quarter Horses had an experimentally induced osteochondral fragment created on the first phalanx of one metacarpophalangeal joint (MCPJ). Lameness exams, force plate data, and serum and synovial fluid from both MCPJs were collected on weeks 0 (fragment creation), 16 (fragment removal), 17 and 18. After week 17 fluid collection, horses were divided into 2 treatment groups: 10 mg TA ($n = 4$) and 1 ml saline ($n = 3$). Serum and injured MCPJ synovial fluid BAP, CPII, C12C, and C2C concentrations were evaluated using ELISAs. Unpaired t-tests were used to evaluate all data ($P < 0.05$). Horses became more lame at week 17, and by week 18, the TA group demonstrated a trend toward improvement compared to saline controls. In saline control horses at week 18 there was a trend towards increasing synovial fluid concentrations of C2C ($P = 0.11$), C12C ($P = 0.06$), and CPII ($P = 0.051$). In synovial fluid at week 18, horses injected with TA demonstrated significantly increased BAP ($P < 0.001$), C2C ($P < 0.001$), C12C ($P < 0.05$), and CPII ($P < 0.001$) concentrations compared to saline controls. There were no significant differences in serum concentrations. Intra-articular TA administration after arthroscopic surgery for removal of osteochondral fragments increases metabolism of type II collagen and bone that was balanced between synthesis and degradation.

Characterization of Stromal Cells from Equine Laminae In Vitro. Vanessa Marigo¹, Frank Andrews¹, Jeffrey Gimble², Mandi Lopez¹. ¹Veterinary Clinical Sciences, Louisiana State University, Baton Rouge, LA; ²Stem Cell Biology, Pennington Biomedical Research Center, Baton Rouge, LA.

Laminitis is a multifactorial disease for which an effective treatment has yet to be identified. Costs associated with this condition exceed \$10 million per year. Normal laminae do not regenerate after damage from laminitis, and progenitor cell alterations may be the reason. Progenitor cells in the equine laminae are largely unexplored. The hypothesis tested in this study was that there are adult multipotent stromal cells (MSCs) in the equine laminae that can be expanded and differentiated into tissue lineages from different embryonic layers in vitro. Nucleated cells were isolated from the laminae of 5 adult horses immediately post mortem. Cell doublings (CD) and doubling times (DT) were determined for passages 1 to 6. Colony forming unit assays (CFU-F) were performed with cell passages 1, 3 and 6. Flow cytometry was used to quantify cell surface markers CD90 and CD44. The overall CD and DT were 1.81 ± 0.11 cell doublings/day and 2.54 ± 0.26 days, respectively. There were no significant differences among passages in the parameters evaluated. Overall MSC colony forming unit frequency was 1:58,677 nucleated cells. Passage 2 cells were 72.28% positive for CD90 and 66.63% for CD44. Passage 3 cells formed calcified colonies after 14 days of culture in osteogenic medium. These results indicate that multipotent cells from adult equine lamina can be harvested and expanded in vitro. This new information may provide a novel therapy for equine laminitis as well as an in vitro model to study the condition

Effect of NSAIDs in Combination on the In Vitro Inhibition of Equine Cyclooxygenase Enzymes. John Marshall¹, Caitlyn Redding², Anthony Bliklager².

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Flunixin meglumine and phenylbutazone are non-selective cyclooxygenase inhibitors associated with renal failure and right dorsal colitis. Under current competition guidelines the combined administration of flunixin meglumine and phenylbutazone is banned but firocoxib may be combined with other NSAIDs. Currently no data exists regarding the effect of combining firocoxib with other NSAIDs. We hypothesized that combining firocoxib with flunixin meglumine or phenylbutazone significantly inhibits both COX-1 and COX-2. An in vitro whole blood model ($n = 6$ horses) was performed. Blood samples were treated with flunixin (10 $\mu\text{g/ml}$), phenylbutazone (10 $\mu\text{g/ml}$) or firocoxib (170 ng/ml) alone at previously described concentrations, or in combination (flunixin/firocoxib, phenylbutazone/firocoxib, flunixin/phenylbutazone). Effect of treatment on COX-1 and COX-2 was determined by measuring coagulation-induced thromboxane B2 (TXB2) and lipopolysaccharide (LPS) stimulated prostaglandin E2 (PGE2) respectively. Data was described as mean \pm SD and groups compared using one-way ANOVA and Dunn's test. Baseline mean \pm SD serum TXB2 (231 ± 38 pg/ml) increased significantly following coagulation (6563 ± 398 pg/ml). Coagulation induced TXB2 was significantly inhibited in all treatment groups except firocoxib alone (Fig 1, $P < 0.05$). Flunixin alone or flunixin/firocoxib or flunixin/phenylbutazone resulted in significantly less TXB2 production than either phenylbutazone alone or phenylbutazone/firocoxib ($P < 0.05$). Baseline mean \pm SD plasma PGE2 (1301 ± 20 pg/ml) increased significantly with LPS stimulation (2589 ± 516 pg/ml). PGE2 was significantly lower in all treatment groups than control (Fig 2, $P < 0.05$). There was no significant difference in PGE2 concentration between treatment groups. This study demonstrates the COX-2 selective effect of firocoxib alone. However, firocoxib in combination with other NSAIDs results in significant COX-1 inhibition and cannot be recommended clinically.

Optimization of White Blood Cell Concentration in Platelet Rich Plasma (PRP) for the Treatment of Tendonitis. Taralyn McCarrel¹, Tom Minas², Lisa Fortier³.

¹Rood and Riddle Equine Hospital, Lexington, KY; ²Orthopedic Surgery, Brigham and Women's Hospital, Boston, MA; ³Clinical Sciences, Cornell University, Ithaca, NY.

Numerous methods are available for PRP generation, but evidence defining the optimal composition is lacking. We hypothesize that leukocyte reduced PRP (lrPRP) will result in lower inflammatory cytokine expression compared to PRP containing a lot of WBC (wbcPRP) and that maintaining the platelet:WBC ratio will compensate for increased WBC concentration. Equine blood and SDFT were collected. The following PRP groups were generated as media for SDFT explants cultured for 72 hours; standard PRP (sPRP), lrPRP, wbcPRP, and high concentration PRP (hcPRP), with 10% plasma in DMEM as control. PDGF-BB concentration was quantitated by ELISA. Tendon gene expression for COL1A1, COL3A1, COMP, MMP-13, IL-1b, and TNF- α were performed. Platelet concentration in hcPRP

was higher than all other PRP groups ($P < 0.0001$). The concentration of WBC was highest in wbcPRP and hcPRP, and lowest in lrPRP ($P < 0.0001$). Platelet:WBC ratio was not different between sPRP and hcPRP with lrPRP having the highest ratio, and wbcPRP the lowest ($P < 0.0001$). Platelet and PDGF-BB concentrations were correlated strongly ($r^2 = 0.74$, $P < 0.0001$). Expression of COMP, COL1A1:COL3A1, and MMP-13 was not different between PRP groups, but COMP and COL1A1:COL3A1 were increased compared to control ($P = 0.0027$ and $P < 0.0001$) and MMP-13 was decreased compared to control ($P = 0.0001$). Expression of IL-1b was lowest in lrPRP and highest in wbcPRP ($P = 0.0001$). Control and lrPRP had the lowest TNF- α while hcPRP and wbcPRP had the highest expression ($P = 0.0224$). These results indicate that WBC concentration should be minimized in PRP. Further investigation to confirm this effect results in improved quality of tendon repair in vivo is required.

Plantarolateral Plate Fixation for Management of Distal Tarsal Instability in 5 Horses. Justin McCormick, Jeffrey Watkins. Large Animal Clinical Sciences, Texas A&M, College Station, TX.

To report a novel technique of plate fixation for management of traumatic injury and subsequent instability of the distal tarsus. We hypothesize that plantarolateral plate for disruptive injuries of the distal tarsus provides adequate stability and improves prognosis for healing, and in some horses, return to work.

Medical records of 5 horses undergoing internal fixation of the distal tarsus were reviewed. Stabilization was performed using a broad dynamic compression plate (DCP) or a locking compression plate (LCP) placed plantarolateral extending from the proximal calcaneus to the mid metatarsus. Subject details, clinical presentation, radiographic findings, time to surgery, type of implant, and postoperative management and complications were recorded. Long-term (>1 year) follow-up was obtained for 4 horses.

Four horses were treated using a DCP and 1 with a LCP. Sub-luxation of the proximal intertarsal joint was the most common injury treated (60%). Perioperative complications included peroneus tertius rupture (3 horses) and septic osteoarthritis (1 horse). Four (80%) horses survived to time of discharge, 2 were sound at pasture, 1 was sound and training, and 1 was sound for breeding purposes.

Use of a plantarolateral plate for disruptive injuries of the distal tarsal joints provides adequate stability and improves prognosis for healing, with some horses able to return to work.

Comparison of Inertial Sensor Based System and Traditional Lameness Exam. Megan J. McCracken, Marco Lopes, Joanne Kramer, Shannon K. Reed, David A. Wilson. University of Missouri, College of Veterinary Medicine, Columbia, MO.

Wireless inertial sensor systems objectively detect lameness in horses trotted over natural footing. The purpose of this study was to compare one such inertial sensor based system (Lameness LocatorTM, Equinosis LLC, Saint Louis, Missouri) to subjective evaluation performed by experienced equine practitioners of horses with lameness induced by sole pressure. We hypothesized that the inertial sensor system would identify lameness before a consensus of three experienced equine veterinarians

Fifteen horses were fitted with special shoes, which allowed for lameness induction via sole pressure. Before each trial the horses were instrumented with three wireless inertial sensors. Horses were subjected to multiple trials: 1) before inserting the screw, 2) after inserting the screw to just touch the sole, and 3) after tightening the screw in half turn increments. The number of screw turns required for determination of correct limb by the inertial sensors and by consensus of three equine veterinarians was compared using the Wilcoxon test.

The inertial sensors selected the limb with the induced lameness after fewer screw turns than the veterinarians ($P < 0.0001$). Subjective consensus selected the correct limb before the inertial sensors in 5 trials (8.33%), inertial sensors selected the correct limb before subjective consensus in 35 trials (58.33%), and simultaneous selection occurred in 20 trials (33.33%).

The inertial sensor based system was able to identify induced lameness at a lower level of sole pressure than the consensus of three equine veterinarians. The inertial sensor system would be an effective aid to lameness localization in clinical cases.

The Role of Cellular Senescence in the Pathogenesis of Canine Osteoarthritis. Kristina McGuinness, David Bennett. Division of Small Animal Clinical Sciences, School of Veterinary Medicine, College of Medical, Veterinary and Life Sciences, University of Glasgow, United Kingdom.

Osteoarthritis (OA) is characterized by degeneration of articular cartilage, inflammation of the synovial membrane and deterioration of synovial fluid leading to pain and loss of function. It is the commonest of all diseases

affecting the dog. Our hypothesis was that the premature and/or accelerated ageing (senescence) of cartilage cells is a major factor in the progression of OA. Once chondrocytes become senescent, there is a decrease in cartilage matrix production, protein synthesis and potential for repair.

In order to investigate if senescence plays a role in the pathogenesis of osteoarthritis quantifiable biomarkers of senescence were measured in osteoarthritic and normal chondrocytes collected from the articular cartilage of femoral heads of canines. Specifically we looked at growth curves of normal and OA cells in monolayer cell culture, staining for senescence associated beta-galactosidase in cultured cells, p16 protein quantitation and p38 kinase expression. The growth curves obtained in this study demonstrated that OA cells senesce more quickly and after less population doublings than non-OA cells. OA cells had higher levels of senescence-associated beta-galactosidase staining than non-OA cells. In OA cartilage samples there were a higher percentage of p16 stained chondrocytes compared to normal cartilage samples. Both normal and osteoarthritic senescent chondrocytes contained phosphorylated p38 kinase. These results support the hypothesis that senescence of chondrocytes is a feature of canine osteoarthritis and that senescence is an important component of the pathogenesis of OA. Understanding the factors involved in senescence will help in developing disease modifying therapies for articular disease.

The Prevalence of Radiographic Abnormalities of Thoroughbred Horses in 2-Year-Old-in-Training Sales and Associations with Race Performance. Daniel Meagher¹, Dennis Meagher², Susan Stover³, Ian Gardner⁴. ¹Valley Equine Associates, Valley Equine Associates, Ranson, WV; ²Department of Radiological and Surgical Sciences, School of Veterinary Medicine, University of California, Davis, CA; ³J.D. Wheat Veterinary Orthopedic Research Laboratory, School of Veterinary Medicine, University of California, Davis, CA; ⁴Department of Medicine and Epidemiology, School of Veterinary Medicine, University of California, Davis, CA.

Veterinarians evaluate radiographs of prospective Thoroughbred racehorses for potential buyers. Although the association of yearling radiographic abnormalities on race performance has been studied (Kane, et al), radiographic abnormalities of 2-year-old horses in training have not been studied. Our goals were to identify radiographic abnormalities of 2-year-old Thoroughbred racehorses in training and determine if abnormalities affect future race performance.

Repository carpal, fetlock, stifle, and hock radiographs of horses assigned to 2-year-old-in-training sales (Barretts Equine Sales Limited, Pomona, CA) from 1997–2001 were examined. Horses with abnormal findings were classified by lesion type and location. Race performance variables (Jockey Club Information Systems) were compared between horses with radiographic abnormalities (cases) and horses without radiographic abnormalities (controls) using nonparametric techniques.

Radiographs were reviewed for 953 horses; 69% controls, 31% cases. Lesions were most prevalent in the fetlock. In general, cases were less likely to start a race or earn >\$25,000 than controls. Specifically, horses with proximal phalangeal articular margin fracture fragments, forelimb proximal sesamoid bone fracture (particularly medial), sesamoiditis, or tarsal bone wedging were less likely to start a race and/or earn >\$25,000. All 7 horses with patellar osteophytes won a race and earned >\$25,000.

Specific radiographic abnormalities were associated with lower race performance. However, none of the individual lesions prevented all affected horses from racing.

Osteochondral Injection of Human Adenoviral BMP-2 or BMP-6 for Bone and Cartilage Regeneration. Maria I. Menendez^{1,2}, Daniel Clark¹, Guang Jia¹, Michelle Carlton¹, David Flanigan³, Steven Weisbrode⁴, Michael Knopp^{1,2}, Alicia Bertone^{2,4}. ¹Radiology, College of Medicine, The Ohio State University, Columbus, OH; ²Veterinary Clinical Sciences, College of Veterinary Medicine, The Ohio State University, Columbus, OH; ³Orthopaedics, College of Medicine, The Ohio State University, Columbus, OH; ⁴Veterinary Biosciences, College of Medicine, The Ohio State University, Columbus, OH.

Healing evaluation of osteochondral defects in femoral condyles in response to direct injection of adenoviral (Ad) vectors coding for either human bone morphogenetic proteins 2 (BMP-2) or 6. Four 13 mm diameter and 7 mm depth circular defects, 1 per femoral condyle. At 2 weeks after surgery, AdBMP-2, AdBMP-6, Ad green fluorescent protein, or saline was injected. Quantitative magnetic resonance imaging and computed tomography were performed at 12, 24, and 52 weeks. At 12 or 52 weeks, histomorphometry and microtomographic analyses were performed to assess subchondral bone and cartilage repair tissue quality. Direct delivery of AdBMP-6 into healing large femoral condyle lesions demonstrated delayed gadolinium enhanced MRI of cartilage and histologic evidence of

greater GAG content in repair tissue at 12 weeks, while AdBMP-2 had greater, nonmineral cartilage at the surface at 52 weeks. AdBMP-2 demonstrated greater CT subchondral bone mineral density by 12 weeks and both AdBMP-2 and -6 had greater subchondral BMD at 52 weeks. Despite earlier and more persistent chondral tissue and greater subchondral bone density, the tissue within the large weight bearing defects at 52 weeks was suboptimal in all groups due to poor quality repair cartilage, central fibrocartilage retention, and central bone cavitation. Delivery of either BMP by this method had greater frequencies of subchondral bone cystic formation. Delivery of AdBMP-2 or AdBMP-6 to osteochondral defects via direct injection provided evidence of support to cartilage and subchondral bone regeneration but was insufficient to provide long term quality osteochondral repair in this femoral condyle pony model.

Evaluation of Canine Plasma Cortisol and C-Reactive Protein as Measures of Post-Surgical Stress and Tissue Trauma. Jacob Michelsen, Jane Heller. School of Animal and Veterinary Science, Charles Sturt University, Wagga Wagga, NSW, Australia.

Post-surgical stress and tissue trauma have increasingly been evaluated through blood cortisol and C-reactive protein (CRP) assays. Cortisol release has numerous triggers compared with CRP and no comparison has previously been made between the discriminating ability of the assays.

Forty five bitches were ovariectomized by either an experienced surgeon (8) or veterinary student (37) under standardized conditions. Blood samples collected pre, 2, 4 and 6 hours post operatively were analyzed for cortisol and CRP.

Surgery times were four times longer, anesthesia times double, postoperative temperatures lower, and estimated blood loss was three times greater for student sterilized dogs. CRP and cortisol was found to increase significantly over time for all animals. Bitches sterilized by inexperienced surgeons had a significantly greater rise in CRP at 4 and 6 hours post surgically ($P = 0.046$).

Serum cortisol was not significantly affected by surgeon experience ($P = 0.242$), or any other outcome variables assessed.

Inexperienced surgeons caused more tissue trauma due to long surgical times, larger wounds, more bleeding and less precise tissue handling than experienced surgeons. This difference was only discernable in serum CRP concentrations. It was concluded that serum CRP is a more discriminating marker than serum cortisol when assessing post-surgical trauma. Blood cortisol concentration may still be a useful, if less precise, measure of assessing patient perceived post-surgical stress in dogs, but it was clearly inferior to CRP in terms of identifying differences between surgical procedures in this study.

In Vitro Comparison of Proximal Ulnar Osteotomy and Distal Ulnar Osteotomy with Release of the Interosseous Ligament. Kelly R. Might¹, Kimberly A. Hanzlik², Joseph B. Case³, Colleen G. Duncan⁴, Erick L. Egger³, Matthew B. Rooney⁵, Felix M. Duerr⁵. ¹Veterinary Clinical Sciences, Washington State University, Pullman, WA; ²Animal Urgent Care and Specialty Group, Escondido, CA; ³Veterinary Clinical Sciences, Colorado State University, Fort Collins, CO; ⁴Microbiology, Immunology and Pathology, Colorado State University, Fort Collins, CO; ⁵Aspen Meadow Veterinary Specialists, Longmont, CO.

Proximal ulnar osteotomy is a common procedure utilized to treat elbow dysplasia. The purpose of this study was to determine if distal ulnar osteotomy with release of the interosseous ligament provides equivalent proximal displacement of the proximal ulna when compared to proximal ulnar osteotomy.

Twenty two cadaveric Beagle antebrachii were disarticulated at the elbow joint and randomly assigned to one of two groups. A distraction force of approximately 12.5 Newton's per kilogram of bodyweight was applied to the proximal ulna with the distal limb secured in a testing system and displacement of the proximal ulnar segment at the radioulnar joint and at the osteotomy site was recorded following each treatment. Group A was tested without treatment (NOTX), followed by an oblique proximal ulnar osteotomy (PUO). Group B limbs were tested with a distal ulnar osteotomy (DUO) followed by a release of the interosseous ligament (DOLR).

Mean displacement at the radioulnar joint was 0.36 mm for the NOTX group, 0.95 mm for the DUO group, 4.68 mm for the PUO group, and 4.36 mm for the DOLR group.

In the study population there was no significant difference in the displacement of the proximal ulnar segment following distal ulnar osteotomy with interosseous ligament release compared to conventional ulnar osteotomy. Given the morbidity associated with proximal ulnar osteotomy, distal osteotomy with release of the interosseous ligament may be an alternative method of addressing joint incongruity in adult dogs.

The Contribution of the Palmar Carpal Ligaments to Antebrachioacarpal Joint Stability. Joshua Milgram, Koret School of Veterinary Medicine, Rehovot, Israel.

The objective of this study was to evaluate the role of the palmar ligaments in the stabilization of the canine antebrachioacarpal (AC) joint. Right carpal joints free of musculoskeletal pathology were obtained from 4 dogs of medium build and prepared for biomechanical testing. The carpal joints with all ligaments intact served as the control group and the carpal joints all the palmar structures sectioned served as the experimental group. Each specimen was aligned in a custom-built jig prior to testing. The specimen was then placed into a custom-built joint testing machine and a single motion tracking sensor (Nest of Birds) was fixed to the metacarpal bones. All carpi were tested twice in 15 degrees of flexion, zero degrees and 15 degrees of extension. Loads ranging between 0.4 kg and 2.0 kg were applied to the MC in 3 directions (axial, mediolateral and craniocaudal) and 2 moments (varus/valgus and supination/pronation). The radius and ulna were held fixed throughout the experiment. There was no difference between the groups in the translations of the AC joint in the, lateral/medial and proximal/distal directions, or in the rotations, varus/valgus and supination/pronation. A significant difference was found in cranial translation under cranial load with the carpus in flexion. The results of this study demonstrate that the palmar structures play a role in stabilization of the AC joint. With increasing flexion there is a decrease in AC joint stability and the palmar structures prevent cranial translation of the first row of carpal bones relative to the distal radius and ulna.

Isometric Points in the Canine Stifle. Joshua Milgram¹, Yaron Meiner², Amir Shapiro². ¹Koret School of Veterinary Medicine, Rehovot, Israel; ²Department of Mechanical Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel.

The aim of this study was to determine the presence and location of isometric points in the canine stifle joint using a three dimensional kinetic model. A single hind limb was used in this study. A CT scan with a slice thickness of 0.5 mm of the entire specimen was then performed. The specimen was then placed into a joint testing machine without any change in the relative position of the tibia and the femur. Four joint motion sensors were mounted on the tibia via wooden dowels placed prior to the CT scan. The knee was then released and flexed through 80 degrees with measurements taken every 5 degrees. The search for isometric points was limited to periarticular areas on both the femur and the tibia and included the origin and insertion sites of the collateral ligaments. Isometric points were defined as any two points, one on the femur and one on the tibia, where the largest distance between the two points did not exceed the smallest distance between the two points by 0.2 mm throughout the range of motion. Four isometric areas were identified. The area on the lateral femur corresponded to an area on the tibia located at the sulcus extensorius. The area on the medial aspect of the lateral femoral condyle corresponded to an area in the cranial intercondylar area of the tibia. This study confirms the isometric position of the cranial cruciate ligament. We were also able to demonstrate that isometric points exist on the lateral aspect of the stifle.

The Role of the Antebrachioacarpal Ligaments in the Prevention of Hyperextension of the Antebrachioacarpal Joint. Joshua Milgram, Tomer Milshtein, Yaron Meiner, Koret School of Veterinary Medicine, Rehovot, Israel.

The aim of this study was to evaluate the role of the medial collateral ligament, lateral collateral ligament and the palmar carpal ligaments in the prevention of carpal hyperextension. Twenty four forelimbs were collected from 12 healthy mixed breed dogs. Each specimen was radiographed to ensure the carpal joint was free of pathology and assigned to 1 of 6 groups. The groups were defined by the order in which the ligaments were cut. The antebrachium, carpus and proximal metacarpal bones were stripped of all muscle tissue, preserving the carpal joint capsule. The specimens were prepared for biomechanical testing and placed into a custom made joint testing machine. The manus was loaded using a system of weights and pulleys resulting in the extension of the carpus. The extension was measured using a single motion tracking sensor fixed to the metacarpal bones. All specimens were tested with all the ligaments intact, and after cutting each of the ligaments. Cutting each of the ligaments resulted in a significant change in the angle of extension of the carpus when compared to the extension of the carpus with the ligaments intact. Cutting the palmar AC ligaments resulted in the largest change in the extension angle and this difference was significantly larger than that seen after cutting the medial and lateral collateral ligaments. Each of the AC ligaments tested contribute to the prevention of hyperextension of the AC joint. Improved understanding of the function of the AC ligaments may result in improved treatment of hyperextension injury.

Fractures of the Radius and Ulna in the Dog: 73 Cases (2003–2010). Farrah A. Monibi, Sean M. Murphy, John C. Chandler, Jeff D. Brouman, WestVet Emergency and Specialty Center, Garden City, ID.

The objective of this study was to report on 73 dogs undergoing surgical stabilization of radius and ulna (RU) fractures between the years 2003–2010.

Medical records were evaluated retrospectively for patients undergoing surgical repair of RU fractures during the study period. Data collected on each case included signalment, cause of injury, concurrent injuries, fracture site, fracture type, fixation method, time to fixation, time to union, complications, and functional outcome.

Seventy-three dogs underwent surgical repair of 75 antebrachial fractures. Toy and small breed dogs were the most commonly affected (64%). Median age was 2 years (range 2 months – 12 years). Sixty-seven fractures (89%) were combined radius and ulna. Five fractures (7%) had been previously managed with external coaptation and were referred for surgical correction. Sixty-six fractures (88%) were repaired within 7 days of diagnosis. Bone plating was the most common fixation method and was used to stabilize 68 fractures (91%).

Complete follow-up was available for 49 fractures (65%). Median time to radiographic union was 8 weeks (range 3–21 weeks). Complications warranting additional surgical treatment occurred in 10 fractures (20%); these included implant removal (n = 7), subsequent fractures (n = 2), and malunion revision (n = 1). Functional outcome was reported by 29 owners to be excellent to good in 24 cases, fair in 3 cases, and poor in 2 cases.

Based on these results, surgical stabilization of RU fractures is recommended and may lead to a reduced risk of nonunion and other significant complications compared to historic data using coaptation.

Scapulectomy for Primary Bone Tumors in 42 Dogs: A Veterinary Society of Surgical Oncology (VSSO) Retrospective Study. Vincenzo Montinaro¹, Sarah E. Boston¹, Paolo Buracco³, William T. Culp², Giorgio Romanelli⁴, Rod Straw⁵, Stewart Ryan⁶. ¹Department of Clinical Studies, Ontario Veterinary College-University of Guelph, ON, Canada; ²Department of Surgical and Radiological Sciences, School of Veterinary Medicine, University of California, Davis, CA; ³Department of Animal Pathology, School of Veterinary Medicine, University of Turin, Italy; ⁴Clinica Veterinaria Nerviano, Nerviano, Italy; ⁵Brisbane Veterinary Specialist Centre, Brisbane, QLD, Australia; ⁶Animal Cancer Center, Colorado State University, Fort Collins, CO.

Scapulectomy is an alternative to amputation for tumors arising from the scapula that is not commonly performed. The purpose of this retrospective study was to identify dogs with primary scapular tumors treated with scapulectomy. Inclusion criteria were dogs that had a scapulectomy to treat a primary tumor of the scapula. Cases were submitted by VSSO members. Forty-two dogs met the inclusion criteria. The median age was 8.3 years and median weight was 34.8 kg. In eighteen dogs (42.9%) a subtotal scapulectomy (removal of $\geq 75\%$ of the scapula) was performed. Osteosarcoma was diagnosed in 27 dogs (64.3%). Limb use was evaluated immediately post-surgery in 41/42 dog and it was poor (15), fair (17), good (7) and excellent (2). Information on limb use at other time post (1, 2, 3 and >3 months) postoperatively was also available in some cases and was good to excellent overall. For the parameters assessed for their effect on survival time (ST) and disease free interval (DFI), only the use of adjunctive chemotherapy had a significant effect on ST ($P = .0003$) and DFI ($P = .00011$). Scapulectomy can be performed to remove primary tumors of the scapula and preserve limb function. The most common primary scapular tumor in this study was osteosarcoma. Primarily older, large breed dogs were affected. Although long-term follow-up of limb use was not available in all dogs, limb use was fair to excellent for the majority of dogs in this study. The addition of adjunctive chemotherapy prolonged the DFI and MST.

Cardiovascular Effects of N-Butylscopolammonium Bromide and Xylazine in Horses. Alison J. Morton, Courtney R. Varney, Abel B. Ekiri, Astrid Grosche, Large Animal Clinical Sciences, College of Veterinary Medicine, University of Florida, Gainesville, FL.

The objective of this study was to evaluate the effects of intravenous (IV) administration of N-butylscopolammonium bromide (NBB), xylazine, and the combination of NBB and xylazine on heart rate and other commonly measured vital parameters, cardiac rhythm, and blood pressure. Six adult horses of mixed breed and gender were used. In a random cross-over design, each horse was given 0.3 mg/kg btw of NBB IV, 0.25 mg/kg btw xylazine IV, and a combination of 0.3 mg/kg btw NBB and 0.25 mg/kg btw xylazine. Heart rate and other vital parameters, cardiac rhythm, and indirect blood pressure were recorded at timed intervals before and 60 minutes following administration. Heart rate and blood pressure were significantly elevated immediately following administering NBB and NBB with xylazine.

Administration of NBB with xylazine resulted in significantly greater initial and peak blood pressure values than with NBB alone. Administration of xylazine resulted in a decrease in heart rate, with an initial increase in blood pressure followed by a decrease in blood pressure. Sinus tachycardia was seen with NBB, and NBB and xylazine administration. First and second degree atrioventricular block was identified with xylazine administration. Ventricular tachycardia was identified in one horse following NBB and xylazine administration. Results of this study suggest that the effects of administration of NBB alone or in combination with xylazine to horses with colic, especially to those with systemic cardiovascular compromise, should be considered carefully to accurately assess condition and predict prognosis, and avoid potential adverse effects.

Development of a Virtual Reality Simulator for Teaching Canine Arthroscopy. Tatiana Motta¹, Michael Shaw², Don Stredney², Jennifer Au¹, Matthew Allen¹. ¹Clinical Sciences, The Ohio State University, Columbus, OH; ²Interface Laboratory, Ohio Supercomputer Center, Columbus, OH.

Veterinary schools have been under pressure from the public and the students regarding animal use in teaching. Our overall objective is to limit the use of animals or cadavers and prepare students using simulation tools that provide for on-demand practice. Our specific goal is to develop a virtual simulator for performing a canine arthroscopy of the stifle joint. We present our current developments, and describe our future goals to obtain this objective.

We have acquired high-resolution images from a canine stifle joint using computed tomography scans to accurately model the bone. In addition, we have acquired magnetic resonance imaging data to display the soft tissue structures. Currently our simulator provides visualization of the stifle joint and allows for interactive manipulation using a haptic device that simulates surgical tools with force reflection. We are able to view anatomical structures on the bone and highlight the important structures vital for proper orientation to successfully execute this procedure. The simulator allows the surgeon in training to section through the hard and soft tissues providing an additional method for learning the spatial configurations of the regional anatomy.

Our ongoing development includes additional tools to physically investigate the stifle joint; during this stage experts will assist in validating the simulator for its realism and help provide metrics for which trainees can be evaluated. Through these steps, we will move towards our objective of employing simulation technologies to replace cadaver use in the formative development of surgical technique for canine arthroscopy.

Femoral Fracture Repair Using an Intramedullary Locking Nail in Newborn Calves: 25 Cases. Jacques Bellon², Pierre-Yves Mulon¹. ¹Hopital Veterinaire Lachute, Lachute, QC, Canada; ²Clinique Veterinaire, Decize, France.

Femoral fractures are one of the common fractures seen in bovine neonates. They represent a great challenge in terms of treatment based on the mechanical properties of the bovine neonate bone and the presence of thin cortices. This retrospective study describes the etiology, clinical signs, fracture configuration, orthopedic fixation by use of an intramedullary interlocking nail, and outcome associated with femoral fracture in newborn calves. Medical records from calves referred for femoral fracture repair for 2008 and 2009 were included. Signalment, clinical findings, and results of lameness examination and complete radiographic examination were recorded. Surgical technique, orthopedic fixation, associated complications, and outcome were detailed. Twenty-five Charolais calves were included in the study. All fractures were closed and located in the diaphysis; 18 extended to the distal metaphysis, 1 extended proximally. Left femurs (N = 17) were twice as much represented than right femur (N = 8). The interlocking nail was used alone in 14 calves, and internal fixation was reinforced in 9 calves. Two calves were euthanized for reasons related to the surgery, and 4 died for unrelated reasons. Long-term prognosis was considered excellent for 15 calves and fair for 4 calves. Age, body weight, overall musculoskeletal strength at evaluation, affected femur, type and location of the fracture, or need for reinforcement of the repair had no significant relationship with positive outcome of the surgery. The novel implant used in this study was associated with a good prognosis for surgical repair of femoral fractures in newborn calves regardless of the location of the fracture.

Comparison of Different Concurrent Imaging Modalities in Staging of Dogs with Appendicular Osteosarcoma. Michelle Oblak, Sarah E. Boston, Stephanie Nykamp, Galina Hayes. Clinical Studies, Ontario Veterinary College, Guelph, ON, Canada.

Osteosarcoma (OSA) is the most common canine primary bone tumor. Staging includes assessment for thoracic and bone metastasis. The study objectives were to compare different imaging modalities for the detection of

thoracic and bone metastasis in dogs with appendicular OSA. Study design was a prospective cross-sectional observational study (n = 15). Thoracic radiographs negative for metastatic lesions were compared against thoracic CT. Test modalities (survey radiographs, whole body CT scan, nuclear scintigraphy) were assessed against a gold standard for detection of bone metastasis. Discriminatory capacity of the test modalities was assessed using receiver operator characteristic (ROC) analysis. Twenty percent (3/15) of dogs had pulmonary lesions on CT. Three bone lesions (3/15) were identified on scintigraphy and no lesions were identified on survey radiographs or CT during blinded assessment. Evaluation for bone metastasis showed that the AUROC characteristics of the different test modalities ranged between 0.76 and 0.86. The AUROC values of radiographs and CT scan was 0.76 and of scintigraphy was 0.86. Differences between the discriminating capacity of the test modalities failed to reach significance. Based on this study, CT identified more lesions than radiographs for thoracic staging. While not statistically significant, this study supports previous findings that scintigraphy is an important part of staging for dogs with OSA. Whole body survey radiographs and CT have not been previously reported as modalities for general staging of dogs with OSA and although these tests do not appear to be useful as alternatives to scintigraphy, they may have some utility as adjunctive diagnostic modalities

Surgical Excision of the Equine Ceratohyoid Bone in Conscious Sedated Horses. Thomas O'Brien¹, Dwayne Rodgerson², Michael Livesey¹. ¹Department of Surgical Sciences, University of Wisconsin, Madison, WI; ²Davidson Surgery Center, Hagyard Equine Medical Institute, Lexington, KY.

Excision of the ceratohyoid bone (CB) may be indicated in the treatment of temporohyoid osteoarthropathy (THO) in horses. Affected animals typically have variable degrees of vestibular and facial nerve damage and as such are high-risk anesthetic candidates. The aim of this study was to investigate the feasibility of excising the ceratohyoid in standing sedated horses free from THO.

With the horse sedated and its head and neck supported in extension the surgical site was clipped and aseptically prepared. Local anesthetic solution was then infiltrated along a 10 cm line extending rostrally from 2 cm caudal to the basihyoid bone (BB) and half way between midline and the mandible. The skin and subcutaneous tissues were incised along that line, exposing the sternohyoideus, omohyoideus and geniohyoid muscles, the fibers of which were bluntly separated, to allow identification of the CB and its articulations with the BB and stylohyoid bone (SB). The CB/BB joint was sharply disarticulated and the ceratohyoideus muscle was bluntly separated from its caudal aspect. The CB/CB joint was then sharply disarticulated and the CB removed. Incisions were left open to heal by second intention.

Six mature horses free from clinical signs of THO were used. The procedure was well tolerated by and successfully performed on all horses. Intraoperative complications were minimal. Three horses were euthanized immediately postoperatively and three horses were euthanized 7 days postoperatively. Postoperative complications were not observed.

The results of this study indicate that excision of the CB in standing sedated horses free from THO is feasible. It remains unclear whether this procedure will be tolerated in clinically affected animals.

Standing Surgical Repair of Non-Displaced Metacarpal and Metatarsal Condylar Fractures in Thoroughbred Racehorses. Thomas O'Brien¹, Robert J. Hunt², Dwayne Rodgerson², Michael Spirito², Jorge Gomez^{3,2}, Michael Livesey¹, Jacob T. Goodin¹. ¹Department of Surgical Sciences, University of Wisconsin, Madison, WI; ²Davidson Surgery Center, Hagyard Equine Medical Institute, Lexington, KY; ³Jorge Gomez Equine Veterinary Svcs LLC, Wellington, FL.

Surgical repair of condylar fractures of the metacarpus/metatarsus is most commonly performed under general anesthesia. Recently, standing surgical repair of propagating condylar fractures has been reported. The aim of this study was to report the surgical technique and outcome following standing surgical repair of non-displaced condylar fractures. Thirty seven Thoroughbred racehorses (19 females, 15 geldings and 2 intact males) met criteria for inclusion. In total 37 fractures were repaired, 28 were fractures of the lateral condyle and 9 were fractures of the medial condyle. Eight fractures of the medial condyle and 2 fractures of the lateral condyle spiraled proximally. Surgical repair was successfully performed in all cases.

Twenty seven horses (73%) raced post-injury. The mean number of days from surgical repair of the fracture until first race was 307 days. Of the horses that raced postoperatively 16 horses maintained the same race class post-injury as pre-injury, 7 horses improved race class and 4 horses decreased race class. For all horses, mean number of starts and race earnings preoperatively was 7.4 and \$31,604 respectively. For all horses the mean number of starts and earnings postoperatively was 7 and \$20,002.

This study confirms that standing surgical repair of non-displaced condylar fractures is a suitable surgical technique. The percentage of horses to start a race postoperatively, duration from surgery to return to racing, as well as number of postoperative starts and earnings, is similar to that previously reported for horses undergoing surgical repair under general anesthesia.

Cervical Abscessation in the Dog: A Retrospective Study. Adam Ogilvie¹, Sarah E. Boston². ¹Small Animal Clinic, Ontario Veterinary College, Guelph, ON, Canada; ²Clinical Studies, Ontario Veterinary College, Guelph, ON, Canada.

Cervical abscessation (CA) is commonly caused by oropharyngeal penetrating injuries. The purpose of this study was to describe the signalment, cause, work-up, associated bacteria, treatment, and outcome of consecutive cases of CA in dogs.

Medical records were searched for dogs presenting with CA, and pertinent data recorded.

Sixteen cases met the inclusion criteria. Ultrasonographic and CT evaluation was performed in ten and two cases, respectively. Aspirates were taken in twelve patients, and cytology was consistent with a CA in ten. Fifteen cases were surgically explored, with a foreign body retrieved in two. A closed suction drain was placed in twelve cases. Fourteen cases were cultured, and three were positive for aerobic and anaerobic bacteria (See Table 2). Postoperative complications were noted in four cases. One patient had long-term impairment of respiratory and swallowing function, and one patient was euthanized due to sepsis.

Diagnosis of CA is based on history, clinical signs, physical examination, and fine needle aspiration. This study supported previous reports that clinical signs noted were associated with the duration of disease. We found a low incidence of surgical complications. Fine needle aspiration of cervical abscess is a practical technique for diagnosis. Aerobic and anaerobic culture and susceptibility of material aspirated from cervical abscess is recommended. This study did not support previous findings in which foreign bodies were commonly retrieved from abscesses. Active drainage after surgical exploration is recommended.

Comparison of Transvaginal Natural Orifice Transluminal Endoscopic Surgery (NOTES) and Laparoscopy for Elective Bilateral Ovariectomy in Standing Mares. Karine Pader¹, Lynetta Freeman¹, Peter D. Constable¹, Ching C. Wu², Paul W. Snyder², Timothy B. Lescun¹. ¹Veterinary Clinical Sciences, School of Veterinary Medicine, Purdue University, West Lafayette, IN; ²Comparative Pathobiology, School of Veterinary Medicine, Purdue University, West Lafayette, IN.

Natural Orifice Transluminal Endoscopic surgery (NOTES) is a new surgical technique reported for standing ovariectomy in mares; however, its potential advantages over laparoscopy are unknown. We hypothesized that transvaginal NOTES would improve the clinical outcome after bilateral ovariectomy in mares by minimizing soft tissue trauma and reducing pain and inflammation when compared to a laparoscopic approach.

Ovariectomy was performed with a vessel-sealing device via transvaginal NOTES (n = 6) using a flexible endoscope and specialized instruments or via laparoscopy (n = 6). Preoperative and postoperative complete blood cell count (CBC), plasma fibrinogen and serum amyloid A (SAA) concentrations, peritoneal nucleated cell count and total protein concentration were compared using repeated measures ANOVA. Surgical times were compared using an unpaired t-test. Mares were monitored for 2 weeks postoperatively and necropsy was performed at 3 weeks (n = 6) or 3 months (n = 6) to assess short and medium-term effects of each procedure. Complication rate, necropsy and bacteriology findings were compared using a Fishers exact test. Significance was set at $P < 0.05$.

All surgical procedures were performed successfully and mares remained healthy until euthanasia. Surgical time was similar between groups (NOTES: 100 ± 40 minutes; laparoscopy: 107 ± 47 minutes). No significant differences in vital parameters, CBC, plasma fibrinogen and SAA concentrations, peritoneal nucleated cell count and total protein concentration were found between groups across time.

Bilateral ovariectomy via transvaginal NOTES or laparoscopy resulted in minimal inflammation and surgical trauma. Using specialized instrumentation, transvaginal NOTES can be performed safely as an alternative to conventional laparoscopy for standing bilateral ovariectomy in healthy mares.

Comparison of Three Surgical Approaches for Fixation of Abomasal Displacements in Lactating Dairy Cattle (1999–2009). Rebecca L. Pentecost¹, Andrew J. Niehaus¹, David Anderson². ¹Veterinary Clinical Sciences, The Ohio

State University, Columbus, OH; ²Department of Clinical Sciences, Kansas State University, Manhattan, KS.

A retrospective evaluation of medical records of lactating dairy cows presenting to a referral institution for repair of left displaced abomasum, right displaced abomasum, or right abomasal volvulus using one of three surgical techniques (right flank omentopexy, right flank omentoabomasopexy, or left flank abomasopexy) was performed to determine the effect of surgical technique on return to milking productivity. Medical records covering a ten year period were reviewed. Data including signalment, history, diagnosis, method of surgical correction, surgery date, surgeon, and stage of lactation were recorded. Questionnaires, telephone interviews, and DHI records were used to obtain available follow up information regarding milk production including production prior to the displacement, after surgical correction, and during previous and subsequent lactations, and the herd average milk production. Initial results suggest no significant difference in return to milk production due to surgical technique. Information regarding future displacements or other complications was collected as well. For all diagnoses (LDA, RDA, and RAV), the majority of cattle returned to normal milk production when treated with right flank omentopexy with 58%, 57%, and 90%, respectively. Right flank omentoabomasopexy resulted in normal milk production in 47% (n = 8) of cattle presenting with LDA and 66% (n = 4) of those presenting with RAV. All cattle with RDA (n = 3) returned to normal milk production after right flank omento-abomasopexy. Left displaced abomasum was the only diagnosis repaired via left flank abomasopexy and 50% (n = 5) returned to normal production. One cow of the 91 for which follow up information was available was reported to redisplace.

Arthroscopic Approach and Intra-Articular Anatomy of the Stifle in South American Camelids. Rebecca L. Pentecost, Andrew J. Niehaus, Elizabeth Santschi. Veterinary Clinical Sciences, Ohio State University, Columbus, OH.

The objective of this study is to describe an arthroscopic approach and the intra-articular anatomy of the stifle joint of South American camelids. This experimental study utilized 16 cadaveric alpaca hindlimbs which were evaluated arthroscopically to determine appropriate arthroscope portal location, describe the anatomic structures visible during arthroscopic examination, and report potential complications associated with arthroscopy. Joint dissection followed examination. A polymethylmethacrylate joint model was created to document joint dimensions, surface landmarks, and topographic anatomy. In addition, two clinical cases were evaluated and described.

Positioning for arthroscopic portals was located approximately 2 cm abaxial to the patellar ligament to either the medial or lateral side of the joint and halfway between the tibial crest and the base of the patella. Joint structures visualized included the suprapatellar pouch, the articular surface of the patella, the trochlear ridges and groove, the femoral condyles, the intercondylar notch, the cruciate ligaments, and the menisci and associated ligaments. Stifle arthroscopy allowed for joint evaluation and therapeutic intervention in one alpaca and one llama with spontaneously occurring stifle disease. Complications were recorded for each procedure.

Arthroscopy allows for a safe and minimally invasive approach for diagnosis and treatment of stifle lesions in South American camelids. Diagnostic and therapeutic arthroscopic evaluation of the stifle joint is feasible in llamas and alpacas with orthopedic disease localized to the stifle joint including removal of free osseous fragments, debris, patellar fractures, and cranial or caudal cruciate injury or rupture.

In Vitro Studies of Clindamycin and Enrofloxacin Elution from Calcium Sulfate Hemihydrate Beads. Heidi Phillips¹, Dawn M. Boothe³, Dorothy C. Brown¹, R. Avery Bennett². ¹Clinical Studies: Small Animal Surgery, University of Pennsylvania, Philadelphia, PA; ²Clinical Studies: Small Animal Surgery, University of Illinois, Urbana, IL; ³Clinical Pharmacology, Auburn University, Auburn, AL.

This study evaluated the in vitro elution of clindamycin and enrofloxacin from calcium sulfate hemihydrate (CSH) beads.

CSH beads were manufactured commercially with the following additives per bead: no antibiotic; 16 mg clindamycin; 16 mg enrofloxacin; or 16 mg of clindamycin with 16 mg of enrofloxacin. Ten beads of each antibiotic/CSH combination were placed in 5 milliliters (mL) of phosphate buffered saline (PBS) at pH 7.4. Additional beads were manufactured to evaluate elution when beads of individual antibiotics were placed into the same eluent vessel. Five beads containing 32 mg clindamycin/bead and five beads containing 32 mg enrofloxacin/bead were placed in the same eluent vessel with 5 mL PBS at pH 7.4. All beads were made and evaluated in triplicate and maintained at room temperature with constant agitation. Eluent fluid was collected at 14 time points over 30 days and stored at -80°C until assays were performed.

For all bead configurations, clindamycin elution decreased over time while elution of enrofloxacin remained stable or increased over time. For all bead configurations, clindamycin eluted significantly greater amounts of antibiotic at 24 hours and over the entire study period than did enrofloxacin.

Clindamycin elution from calcium sulfate followed the familiar bimodal pattern of release kinetics seen with antibiotic-impregnated polymethylmethacrylate. However, enrofloxacin showed a surprisingly more stable pattern of release, and enrofloxacin concentrations in the eluent fluid remained stable or increased over time in all of the bead configurations. Elution of both antibiotics was effective as defined by the study.

In Vivo Effects of a Single Intra-Articular Injection of 2% Lidocaine or 0.5% Bupivacaine on Articular Cartilage of Normal Horses. Perrine Piat, Hélène Richard, Guy Beauchamp, Sheila Laverty. Département des Sciences Cliniques, Faculté de Médecine Vétérinaire, Université de Montréal, Saint-Hyacinthe, QC, Canada.

Results of recent clinical and experimental investigations reveal a dose- and time-dependent toxicity of both lidocaine and bupivacaine on articular cartilage. The goal of our study was to assess the effects of an intra-articular (IA) lidocaine or bupivacaine injection on the concentrations of biomarkers of cartilage metabolism in the synovial fluid (SF) to detect evidence of cartilage insult following injection.

The study was a 4-period, 4-treatment, randomized, placebo-controlled double cross-over trial. Two groups of horses ($n = 3$ each) were randomly assigned to receive either 5 mL of bupivacaine (0.5%) or placebo (0.9% NaCl) IA in their intercarpal joints. Following a 2 week wash-out period, treatments were then reversed. After an additional 2 week period, the same trial design was repeated, but this time in the tarsocrural joints and with 15 mL of lidocaine (2%) and placebo IA. SF samples were collected at 0, 6, 12, 24, 48 hours, 7 and 14 days for measurement of biomarkers of cartilage metabolism (CPII, CS846, C2C, C1, 2C).

Bupivacaine IA induced a significant surprising increase in both markers of cartilage matrix synthesis (CS846- aggrecan synthesis and CPII- type II collagen synthesis) suggesting an anabolic effect at the dose we tested. Lidocaine had similar effects, but to a lesser degree. Bupivacaine IA also resulted in an unanticipated significant decrease in both SF collagen degradation markers (C2C and C1, 2C). These results provide some evidence for an overall anabolic, rather than catabolic effect, of IA local anesthetics on cartilage metabolism at the doses tested.

Evaluation of SURGIFLO® Hemostatic Matrix to Control Hemorrhage in an Acute Porcine Laparoscopic Liver Bleeding Model. Thomas Poandl¹, Clarence A. Rawlings², David Stoloff¹, Bababhai Patel¹, Richard Hutchinson¹, Wayne Holloway¹. ¹Ethicon, Inc, Somerville, NJ; ²University of Georgia, Athens, GA.

Efficacy of laparoscopic applied hemostatic matrix, with and without topical thrombin, was tested. A novel porcine liver bleeding model was developed.

Four domestic pigs were anesthetized for laparoscopy. Three defects (6 mm in diameter and 7 mm deep) were made in each of 3 lobes (a total of 9 sites per animal). A visual analogue score characterized bleeding as mild (oozing), moderate (flowing), or severe (pulsatile arterial or brisk venous bleeding).

The 3 defects in each lobe were treated in random sequence of (SURGIFLO® plus saline or SURGIFLO® Hemostatic Matrix plus Evithrom® Thrombi) or a control (saline soaked gauze). After application, tamponade was maintained for 3 minutes before examining. If free flow bleeding was not observed during a 60 second period, hemostasis was deemed complete. If blood flowed, tamponade was applied for another minute. This cycle was repeated until clot formation. Bleeding for 10 minutes was failure.

Treatments were compared to control using a Dunnett's test. Each of the 3 treatments had 12 bleeding sites and a 90% confidence interval was computed on the proportion of successes observed. Bleeding was classified as mild in one defect, moderate in 33, and severe in two of the 36 total defect sites. The time to hemostasis was significantly shorter in the sites treated with SURGIFLO® + saline (4.4 ± 1.5 minutes) and SURGIFLO® + EVITHROM® (3.4 ± 0.8 minutes) when compared to the sites treated with gauze + saline (> 10 minutes).

We conclude that both treatments effectively control liver hemorrhage.

Comparing Accelerometer Placement and Validity of Accelerometer Use in Dogs Under Controlled Conditions. Timothy Preston¹, Wendy Baltzer¹, Stewart Trost². ¹College of Veterinary Medicine, Oregon State University, Corvallis, OR; ²Department of Nutrition and Exercise Sciences, Oregon State University, Corvallis, OR.

Accelerometer-based motion sensors may be useful tools for assessing physical activity in dogs. This study's purpose was to identify which location and method of attachment was the most accurate and reproducible, and to validate their ability to differentiate rest and increases in speed in healthy dogs.

Two accelerometers were placed on a harness between the scapulae adjacent to one another, one pouched and the other not. Two additional accelerometers were placed in a similar fashion (pouched and not pouched) ventrally on the dog's collar, equidistant from each other. Accelerometers were programmed for 1 second epochs. Data were recorded with dogs in 3 minute stages. Stage 1 - dogs were required to lie in right lateral recumbency. Stage 2- dogs were placed onto a treadmill at 0% slope and walked at 3 km/hr. Stage 3 - dogs were trotted on the treadmill at 0% slope at 5 km/hr. Stage 4 - dogs were run on the treadmill at 0% slope at 7 km/hr. Stage 5 - dogs were trotted on the treadmill at 5% slope at 5 km/hr. Stage 6 - dogs were run on the treadmill at 5% slope at 7 km/hr.

Only the harness/pouch yielded statistically significant increases ($P < 0.05$) in vector magnitude as level walking speed increased (5 to 7 km/h). Placement of an accelerometer in a pouch attached to a harness along the dorsal midline was the best position for detection of differences between resting, walking, and trotting. Accelerometers are a valid and objective tool able to discriminate between and monitor different levels of activity in dogs.

Comparative Study of Three Imaging Methods for Diagnosing Thoracolumbar Disc Disease in Dogs. Ana C. Mortari¹, Sandra R. Torelli¹, Sheila C. Rahal¹, Seizo Yamashita², Luis C. Vulcano³, Rodrigo Maruccio¹, Carlos R. Padovani⁴. ¹Department of Veterinary Surgery and Anesthesiology, School of Veterinary Medicine and Animal Science, UNESP (Univ Estadual Paulista), Botucatu, Brazil; ²Department of Tropical Diseases and Imaging Diagnosis, School of Medicine, UNESP, Botucatu, Brazil; ³Department of Animal Reproduction and Radiology, School of Veterinary Medicine and Animal Science, UNESP Botucatu, Brazil; ⁴Department of Biostatistical, Institute of Biosciences, UNESP, Botucatu, Brazil.

The aim of this study was to compare imaging methods for diagnosing thoracolumbar disc disease in dogs. Fifteen dogs (13 dachshunds, 1 poodle, and 1 crossbreed), eight males and seven females, weighing 5 to 20 kg, and aged from 3.5 to 8 years were used. All dogs had clinical history and neurological evaluation of spine compression in the thoracolumbar region. For diagnosis, they were submitted to magnetic resonance imaging (MRI), survey radiography, and myelography. MRI was performed with the dogs positioned in dorsal recumbency. Sagittal T1, T2, and proton density (PD) weighted images and axial T1 and T2* weighted images were used. Survey radiography of the spinal column was performed, followed by myelography after administration of iodized contrast, injected into the cisterna magna. Lateral and ventrodorsal views were obtained. Degenerated, protruding, or extruded discs were seen in MRI sagittal sequences. Calcified discs and narrowed intervertebral spaces were frequently seen by survey radiography. Myelography showed a contrast column failure in the lateral view of all, except for two dogs that showed blocked ventral contrast column and attenuated dorsal contrast column. Coincidence between lateral and ventrodorsal views was found in 80% in relation to blocked contrast column site. Indices of coincidence were 91% to 100% between myelography and MRI data. In conclusion, myelography is a reliable exam for identifying spine compression sites, but MRI is the most accurate method for diagnosis.

Gait Analysis in Clinically Healthy Sheep at Two Different Age Groups. Felipe S. Agostinho, Sheila C. Rahal, Fábio A. Araújo, Renato T. Conceição, Carlos A. Hussni. Surgery and Anesthesiology, School of Veterinary Medicine and Animal Science, UNESP, Botucatu, Brazil.

The aim of this study was to evaluate kinetic and temporospatial patterns in clinically healthy sheep at two different age groups by using a pressure sensing walkway. Fourteen clinically healthy female Santa Ines sheep were divided into two groups: Group 1 - seven animals weighing 20-33 kg (mean 25.7 kg) and aged from 8 to 12 months. Group 2 - seven animals weighing 32-45 kg (mean 41 kg) and aged from 3 to 5 years. Before data collection, sheep were trained to be lead by halter for a period mean of three weeks. Kinetic data were collected by use of a 1.951 mm x 447 mm pressure-sensitive walkway. The data from the first 6 valid trials were taken for each sheep and analyzed using proprietary software. A trial was considered valid if the sheep walked within the correct velocity (1.1-1.3 m/s) and acceleration (from -0.15 to 0.15 m/s²) parameters. Peak vertical force (PVF), vertical impulse (VI), stance time, gait cycle time, and percentage of body distribution among the four limbs were determined. Within each group, the differences between the right and left limbs in all variables were not significant. No significant differences were observed between G1 and G2 for VI (%BW*s), and percentage of body distribution. However, PVF (%BW)

was greater in G1 than G2, in both forelimbs and hind limbs, and stance time (s) and gait cycle time (s) were lesser in G1 than G2. In conclusion, younger healthy sheep have differences in some kinetic and temporospatial patterns than older ones walking on a pressure sensing walkway at the same velocity.

Evaluation of Castor Oil-Based Polyurethane Membranes in Rat-Bone Marrow Cell Culture. Sofia A. Cerejo¹, Sheila C. Rahal¹, João F. Lima Neto¹, Fabiana A. Voorwald², Fernanda C. Landim Alvarenga¹. ¹Surgery and Anesthesiology, School of Veterinary Medicine and Animal Science, Univ Estadual Paulista (UNESP), Botucatu, Brazil; ²Department of Clinical and Veterinary Surgery, Faculty of Agrarian and Veterinary Sciences, Jaboticabal, Brazil.

The polyurethane derived from the castor oil plant is a polymer with commercial presentations especially as moldable biomass and pre-molded blocks. Since the chemical composition, consistency and format of the polymer may influence cell growth and adhesion to biomaterial, the aim of this study was to evaluate the potential of castor oil polyurethane in membrane format as scaffold to mesenchymal stem cells (MSCs). Four male Wistar rats, aged 20–30 days were used. Bone marrow aspirates from femur and tibia were harvested using DMEM high glucose and heparin, and the cells were cultured. After 15 days, the 1st passage was made and cell viability was analyzed with Hoerscht 33342 and propidium iodide markers. The MSCs were characterized by surface markers with the aid of flow cytometry. After this, three types of castor oil polyurethane membranes associated with the MSCs were kept on the 6-well plate for 5 days and were analyzed by optical microscopy to confirm cell aggregation and growth. The membranes were composed of isocyanate and a different percentage of castor oil (type 1 = 18%, type 2 = 39.2%, type 3 = 51.3%). The membranes with a higher percentage of castor oil showed the greatest growth of MSCs, being 80% type 3, 20% type 2, and 10% type 1. In addition, these membranes had more surface pores than membrane type 1 as observed by scanning electron microscopy. It was concluded that castor oil-based membrane especially type 3 may be used as a scaffold for MSCs.

Safety and Efficacy of the Artificial Urethral Sphincter in 21 Dogs with Acquired or Congenital Urinary Incontinence. Lauren Reeves, Christopher Adin, Mary McLoughlin, Dennis Chew. Veterinary Clinical Sciences, Ohio State University, Columbus, OH.

Urinary incontinence occurs in dogs as an acquired condition or secondary to congenital anomalies. Dogs that are refractory to medical therapy can benefit from surgical intervention. Our group has developed an artificial urethral sphincter (AUS) that has shown promising results in maintaining long term continence in 4 female dogs with urethral sphincter mechanism incompetence (USMI). We have now expanded our entry criteria to include both male and female dogs with congenital or acquired urinary incontinence. The purpose of the current study was to report efficacy and safety in a larger series of dogs. All dogs receiving AUS implantation at a single institution between 1/1/09 and 1/31/11 were included. A total of 21 dogs were identified. 12 dogs (10 females and 2 males) had USMI, 3 females had pelvic bladders, and 6 females had failed ectopic ureter repairs. AUS implantation was performed as previously described. Clients scored their dog's continence before surgery and at follow up using an analogue scale with 1 representing constant leakage and 10 representing perfect continence. Final scores were obtained in 19 of 21 dogs with a median follow up period of 13 (7.5–18.5) months. Median (IQR) continence scores were significantly improved ($P = 0.0002$) between the preoperative period [2 (1–4)] and last follow up period [9 (7–10)]. Late complications with urinary obstruction developed in two dogs at 5 and 9 months after surgery. Application of the AUS appears to offer an effective method of improving urinary continence in a variety of naturally occurring disease conditions.

The Effect of Blood Contamination on Equine Synovial Fluid Parameters. Imma Roquet, James Carmalt. Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, SK, Canada.

Synovial fluid (SF) examination is a routine procedure in equine practice. Normal equine SF is transparent and straw-colored with a total protein (TP) less than 2.5 g/dL and a white blood cell (WBC) count of less than 500 cells/ μ L. Blood contamination of the sample can complicate assessment and has the potential to alter both the TP and WBC. The degree to which blood contamination affects these parameters has not been determined. Peripheral venous blood and SF samples were obtained from five horses. The pooled SF sample was separated into 2 mL aliquots, each of which was subsequently contaminated with a known percentage of autogenous blood (0 to 50%), a complete blood cell count (CBC), packed cell volume, TP, and differential cytological examination were performed

in all the samples. Regression analysis was used to generate a model to calculate non-contaminated synovial WBC count ($r^2 = 91\%$), TP concentration ($r^2 = 77\%$), and synovial neutrophil percentage. Using a further 5 horses these models were applied in blinded fashion to contaminated SF samples. Calculated values were compared to non-contaminated measured values. Model results for WBC count were not significantly different from measured values. Calculated synovial TP was significantly different from measured values; however, as the difference was a mean of 0.08 g/dL the clinical significance is questionable. Neutrophil percentage could not be calculated but mirrored that of the contaminating blood. Results suggest that an approximate non-contaminated synovial TP and WBC count can be calculated from contaminated samples but that current models do not allow an accurate determination of absolute numbers.

Viscosupplementation with Carbomer in the Middle Carpal Joint of Four Horses. Julie Rosser, Alberto Serena, Mark Markel, Peter Muir. School of Veterinary Medicine Department of Surgical Sciences, University of Wisconsin, Madison, WI.

Joint viscosupplementation is widely used in the sport horse industry, commonly utilizing hyaluronan. Similar to hyaluronan, the carbomer molecule has bioadhesive and viscoelastic properties, and has been studied for use in human medicine. Carbomers are generally inert biologically, non-irritating, and have been used in humans as injectable depots for time-release medications. Our objective was to describe the outcome of intra-articular viscosupplementation with carbomer in four horses.

Four healthy adult mares participated in this study. Baseline lameness examinations, aseptic arthrocenteses and synovial fluid analyses were performed. Three mL of 3% carbomer was then injected into each left middle carpal joint. Lameness evaluations were repeated daily for each horse for ten days post-injection or until the time of euthanasia. At euthanasia, synovial fluid analyses were repeated on the left middle carpal joint. Samples of synovium from the left middle carpal joints were submitted for histopathology. Articular cartilage of the third carpal bone including subchondral bone was submitted for histology and confocal microscopy.

Carbomer viscosupplementation of the middle carpal joint caused severe lameness in 3/4 mares. The fourth mare developed moderate lameness after injection. Confocal microscopy was negative for cartilaginous defects. Histology of all treated samples revealed varying degrees of small cell inflammatory infiltrate into the subsynovium.

With no abnormal findings in samples of cartilage or subchondral bone, lameness is attributable to severe synovitis, which is consistent with histologic findings of synovium in all cases. The current formulation of carbomer is therefore not suitable for intra-articular viscosupplementation in horses.

Comparison of Closure Technique for Equine Pelvic Flexure Enterotomies with a TA-90 Stapling Device vs. Hand-Sewn Closure: An Ex-Vivo Study. Julie Rosser, Sabrina Brounts, Michael Livesey, Kerri Wiedmeyer. School of Veterinary Medicine Department of Surgical Sciences, University of Wisconsin, Madison, WI.

Pelvic flexure enterotomies of the ascending colon are commonly performed in the horse during surgery of gastrointestinal conditions. Closure of pelvic flexure enterotomies using the thoracoabdominal stapling device (TA-90) was recently described as technically simple and time saving, with a low complication rate.

Our objective was to compare the TA-90 stapled enterotomy closure to the double layer hand-sewn closure, using time to perform the technique, luminal diameter and bursting pressure in ex vivo specimens.

The pelvic flexures of thirteen horses euthanized for reasons unrelated to gastrointestinal disease were harvested. All pelvic flexures had one 6 cm antimesenteric enterotomy performed; six were closed using the TA-90 stapling device, the remaining seven were closed with a conventional hand-sewn technique. The luminal diameter of the bowel at the enterotomy site was assessed via contrast radiography. Bursting pressure of the closure was assessed by continuous manometry during infusion with colored solution while the colon was submerged in warm water.

Time to perform stapled closure was significantly shorter than hand-sewn closure ($P < 0.0001$). Post-enterotomy luminal diameters were significantly increased in stapled specimens as compared to hand-sewn ($P = 0.028$). Percent change in luminal diameter between pre and post-enterotomy was significantly less in stapled specimens ($P = 0.034$). There was no significant difference in bursting strength between the 2 methods of closure ($P = 0.196$).

The morbidity associated with equine gastrointestinal surgery is closely correlated to the duration of the procedure. Stapled closure of enterotomy incisions offers significant time savings without compromising biomechanical strength while improving post-enterotomy luminal diameter.

Influence of Plate-Bone Contact on Cyclically Loaded Locking Plate Failure. Randi Rotne¹, Nicky Bertollo², William Walsh², Katja Voss¹, Kenneth Johnson¹, Navneet Dhand¹. ¹Faculty of Veterinary Science, Surgery Department, University of Sydney, Sydney, NSW, Australia; ²Surgical and Orthopaedic Research Laboratories, Prince of Wales Hospital Clinical School, University of New South Wales, Sydney, NSW, Australia.

Locking plates with threaded locking head screws were developed for biological fracture fixation. The plate can be placed directly against the bone or slightly elevated from the underlying periosteum, preserving blood supply. A potential disadvantage of leaving a large gap under the plate though, is a reduction in fixation stability.

We hypothesized that the in vitro mechanical stability of a locking plate system that relies on a plate-screw conical coupling may be compromised when the plate is elevated 2 mm from the bone and placed under conditions of cyclic loading.

Paired femora (n = 6 pair) were harvested from cadavers and 3.5 series 3 mm thick 3-hole FIXIN plate constructs were applied to the bone either with direct plate to bone contact or with a 2 mm plate to bone gap. The constructs were cyclically loaded on a material testing machine in 10 percent incremental increases every 1000 cycles at 2 Hz with a range of 250 newtons to >350 Newtons, fatiguing the constructs to failure.

The mean sustained loads in the contact group (420.8 newtons, 7612 cycles) were significantly greater than in the 2 mm gap group (337.5 newtons, 4252 cycles) (P -value < 0.001). Failure mode of all constructs was via screw pullout (contact n = 6, 2 mm gap n = 6).

Results suggest that elevating locking plates with a conical coupling system 2 mm from the bone did not result in coupling failure but reduced overall construct fatigue life. However, further evaluation is required to determine if this is of clinical significance.

Osseous Sequestration in Llamas and Alpacas: 36 Cases (1999–2010). Marjolaine Rousseau¹, David Anderson¹, Andrew J. Niehaus², Matt D. Miesner¹, Sylvain Nichols^{2,3}. ¹Department of Clinical Sciences, Kansas State University, Manhattan, KS; ²Department of Veterinary Clinical, The Ohio State University, Columbus, OH; ³Département de Sciences Cliniques, Université de Montréal, Saint-Hyacinthe, QC, Canada.

Osseous sequestration is a recognized but rarely reported cause of lameness in alpacas. We hypothesized that osseous sequestration occurs more often in juvenile camelids and that the condition is most often of unknown origin.

Medical records of alpacas and llamas having osseous sequestration between January 1999 and December 2010 were reviewed. History, signalment, physical examination, radiographic abnormalities, treatment, complications, and outcome were obtained from these records. Descriptive statistics were generated from this data. Student's t-test and Chi-Square were performed when appropriate with $P < 0.05$ considered significant.

Records of 36 camelids (27 alpacas, 9 llamas) were included of which there were 22 intact males, 11 females, and 2 castrated males having a median age of 7.5 months. Most animals were presented for lameness (n = 21) and/or presence of a draining tract (n = 10) with a mean duration of 71 days. The sequestra were of unknown etiology in 29 camelids whereas trauma had occurred in 7 animals. Camelids having idiopathic bone sequestra were significantly younger than camelids with a traumatic injury ($P = 0.03$). Bones of the proximal extremities were more commonly affected by idiopathic sequestrum than traumatic sequestrum ($P = 0.0001$). Sequestrectomy was performed in 34 patients and all camelids survived to be discharged a median of 6.5 days after admission.

Osseous sequestration occurs more frequently in juvenile camelids as compared to adults and the condition is most often of unknown cause. Bone sequestra should be suspected in camelids with lameness associated with firm and painful swelling or draining tract of any bone.

Laparoscopic-Assisted Ovariectomy Using a Bipolar Vessel Sealing Device. Sherisse Sakals, Clarence A. Rawlings, Jamie Laity, Erik Hofmeister, MaryAnn Radlinsky. Small Animal Medicine & Surgery, University of Georgia, Athens, GA.

The technique and results of a laparoscopic-assisted approach to ovariectomy in cats using a bipolar vessel sealing device are reported. Our hypotheses were 1) laparoscopic-assisted ovariectomy can be achieved using a bipolar vessel sealing device and 2) laparoscopic-assisted ovariectomy can be performed with equivalent postoperative comfort when compared to traditional ovariohysterectomy.

Thirty healthy female cats were randomly assigned to one of three groups: laparoscopic-assisted ovariectomy using a bipolar vessel sealing device (Group A), laparoscopic-assisted ovariectomy using ligation (Group B), or ovariohysterectomy (Group C). Data collected included surgery time, interactive visual analogue scale (IVAS) pain scores, and blood glucose and cortisol levels.

For Group A, an abdominal port was established for the 2.7 degree endoscope and each ovary located. Hemostats were advanced through the lateral body wall to grasp and exteriorize each ovary for removal using the bipolar vessel sealing device. For Group B, the procedure was the same with the exception that ovarian pedicle hemostasis was achieved using ligation. Ovariohysterectomy was performed using a standard open technique.

Successful ovariectomy was performed using the techniques described. There was no significant difference in the IVAS data or the blood parameters between any of the three groups. Surgical time was shortest for Group C and there was no difference in time between Groups A and B.

Laparoscopic-assisted ovariectomy using either a bipolar vessel sealing device or suture ligation can be used to sterilize female cats with the same level of postoperative comfort for the patient as traditional ovariohysterectomy.

Effect of Previous Splenectomy on Incidence of Canine Gastric Dilatation Volvulus. Angela J. Sartor¹, Adrienne M. Bentley², Dorothy C. Brown³. ¹Surgery, Veterinary Surgical Associates, Concord, CA; ²Surgery, Veterinary Medical and Surgical Group, Ventura, CA; ³Clinical Studies, College of Veterinary Medicine, University of Pennsylvania, Philadelphia, PA.

The objective of this multi-institutional retrospective case-control study was to evaluate the effect of previous splenectomy on the incidence of gastric dilatation volvulus (GDV). The null hypothesis was that dogs with GDV would not be more likely to have a history of previous splenectomy compared to a control population.

Computerized records were searched and 151 dogs were identified with a history of GDV where the presence or absence of a spleen was verified by exploratory laparotomy. Data was collected on signalment, presence of a spleen, procedures performed, and outcome. Computerized records were searched for two control cases that were matched with respect to age, weight, sex, neuter status, and breed to each GDV case for a total of 302 control cases. Identical data was collected for the control cases.

Six dogs in the GDV group (4%) and 3 dogs in the control group (1%) had a history of previous splenectomy. Conditional logistic regression revealed that controlling for body weight and breed, the odds of GDV in dogs with previous splenectomy were 5.9 times that of dogs without previous splenectomy ($P = 0.036$). The odds of GDV were significantly greater for Labrador Retrievers, Rottweilers, and mixed breed dogs compared to other breeds ($P < 0.05$). Odds of developing GDV for the heavier dogs were significantly less than lighter dogs ($P = 0.013$).

Dogs with GDV were significantly more likely to have a history of previous splenectomy compared to control cases. Prophylactic gastropexy should be considered in dogs undergoing splenectomy, especially in cases with predisposing factors for GDV.

Surgical Correction of Angular and Torsional Metatarsal Deformity with Cylindrical Osteotomy and Locking Compression Plates in an Angus Calf. Jennifer A. Schleinig^{1,2}, Mary S. Bergh². ¹Veterinary Diagnostic and Production Animal Medicine, Iowa State University, Ames, IA; ²Veterinary Clinical Sciences, Iowa State University, Ames, IA.

A ten-week-old, 76 kg, male Angus calf presented with metatarsal varus and external torsion of the right pelvic limb precluding use of the limb. Dorsoplantar and mediolateral digital radiographs of the limb revealed a 28° varus deformity and the degree of torsion was estimated to be 23°. Based on the desire to maintain limb length, have maximal cortical contact of the bone, and the need for early full weight bearing on the limb, a cylindrical osteotomy was performed to correct both the angular and torsional deformity during a single surgery. A 24 mm cylindrical TPLO-style saw was used to perform an osteotomy centered at the center of rotation of angulation (CORA) with 52° of inclination, angled 11.5° lateral from the central axis of the fused second and third metatarsal bone. The distal bone segment was then rotated 37° clockwise. The osteotomy was stabilized with two 3.5 mm broad locking compression plates and locking screws placed on the dorsal and medial surfaces of the metatarsus. The patient had external coaptation for three weeks postoperatively. Radiographs obtained 5 months postoperatively revealed complete osteotomy healing and remodeling with stable implants. Full limb function was present and client satisfaction was very high. This report describes a novel approach to the management of angular and torsional deformity in the calf. A single osteotomy and locking bone plate technology were used to successfully treat concurrent angular and torsional limb deformity in the bovine species.

The Effect of Abaxial Retraction on Pelvic Geometry Following Pelvic Symphysiomy. Michael D. Schlicksup, David E. Holt, Elaine S. Holmes, Kimberly A. Agnello. University of Pennsylvania, Philadelphia, PA.

Access to the pelvic canal is necessary to treat traumatic or neoplastic lesions of the distal urogenital tract, rectum, and iliosacral lymphocenter.

This can be accomplished via pelvic symphysiotomy, pubic osteotomy, or bilateral pubis and ischial osteotomies. It has been the authors' experience that during abaxial retraction following pelvic symphysiotomy sacroiliac joint luxation can occur prior to adequate visualization. Our hypothesis is that pelvic symphysiotomy with abaxial retraction causes sacroiliac (SI) joint luxation in dogs. Eight dog cadavers free of additional pelvic disease underwent pelvic symphysiotomy and retraction to 25%, 50% and 100% of sacral width. Prior to symphysiotomy, after each abaxial retraction and following reduction of the symphysis each pelvis underwent a computed tomographic study to evaluate the effect on the SI joints. All SI joints subluxated bilaterally following symphysiotomy and 25% abaxial retraction. Additionally all 8 cadavers luxated on one side (6 left and 2 right) to an average of 41% (range 31–53%) of sacral width at 100% abaxial retraction. The ideal approach to the pelvic canal remains unknown. Pelvic symphysiotomy provides adequate visualization of the entire pelvic canal contents; however surgeons should be aware the abaxial retraction of 25% of sacral width leads to subluxation of the SI joints and retraction to 100% of sacral width leads to substantial luxation. Sacroiliac joint subluxation and luxation may not likely require ancillary stabilization but may be a cause for additional postoperative pain, reluctance to ambulate, and prolonged recovery.

Toxoplasma Gondii Infection in the Renal Transplant Recipient. Michael D. Schlicksup, Lillian Aronson. University of Pennsylvania, Philadelphia, PA.

Renal transplantation remains the only potential cure for cats that suffer from chronic renal disease. Following transplantation of an allograft organ, animals undergo lifelong immunosuppression to prevent allograft rejection. Chronic immunosuppression in the recipient has been shown to have numerous deleterious consequences, including predisposing these animals to infections. The effect of *Toxoplasma gondii* (*T. gondii*) infection in the feline renal transplant recipient and efficacy of lifelong prophylactic chemotherapeutics for the parasite remains unknown. Medical records were reviewed for two populations of cases. The first group of cats (group A) that underwent transplantation were *T. gondii* seronegative or had an unknown status and developed clinical *T. gondii* infections following transplantation. The second group of cats (group B) that underwent transplantation were seropositive for *T. gondii* and were maintained on lifelong clindamycin. Four status unknown and two seronegative cats underwent transplantation and did not receive prophylactic chemotherapeutics. All six cats developed clinical *T. gondii* infections, five of which were fatal. Median survival was 188 days (range 24–390 d). Twelve *T. gondii* seropositive cats underwent transplantation while being administered clindamycin with only one developing a non-fatal *T. gondii* infection following transplantation. Median survival was 396 days (range 11–1014 d) for eight cats with four cats being alive at submission. Of the six cats that developed clinical infections, once respiratory signs developed, treatment provided no effect and all progressed to respiratory arrest and death. No animal managed with prophylactic clindamycin developed a fatal infection. *T. gondii* seropositive cats remain acceptable candidates for renal transplantation however should receive lifelong prophylactic chemotherapeutics to prevent fatal infections.

Long-Term Retrospective Study of 12 Heifers and 1 Bull with Sinonasal Cysts. Tanja Schmid¹, Ueli Braun¹, Regine Hagen², Paula Grest³, Sophie Hug⁴, Karl Nuss¹. ¹Department of Farm Animal, Vetsuisse Faculty, University of Zürich, Switzerland; ²Section for Diagnostic Imaging, Vetsuisse Faculty, University of Zürich, Switzerland; ³Institute of Veterinary Pathology, Vetsuisse Faculty, University of Zürich, Switzerland; ⁴Equine Hospital, Vetsuisse Faculty, University of Zürich, Switzerland.

Sinonasal cysts in cattle are rarely described in the literature. Thirteen case records (2004–2010) were evaluated for reason of presentation, clinical signs, diagnostic techniques, surgical treatment, complications and outcome. Follow-up was carried out by contacting the owners 6–36 months after surgery.

The main presenting signs were abnormal respiratory noise, nasal discharge and dyspnea. The mean age of the animals was 1.87 (1–3.5) years. In 8 of 13 animals the cysts could be detected on endoscopic examination. Radiographs (11/13) and computed tomography (8/13) of the head were obtained. Radiographic signs included a mostly soft tissue mass in the paranasal sinuses or conchae (all). In most cases nasal septum deviation (12/13), fluid lines (9/13) and bone atrophy (5/13) were found.

Eight animals were treated surgically with osteoplastic techniques (4), nasal extraction of the cyst under endoscopic surveillance (3) or a combination of both techniques (1). One heifer presented several months after nasal extraction with recurrence of cysts. The other seven cattle showed no recurrence during the follow up time (mean 24 months).

From this study can be concluded that sinonasal cysts occur mainly in young cattle. Single cysts that do not occupy more than one cavity/ sinus can be diagnosed and location determined on good quality radiographs,

but multiple projections are necessary. CT as a cross-sectional imaging modality is superior to radiographs especially in cases with multiple or very large cysts. Depending on the localization of the cysts animals can be successfully treated with either nasal extraction or osteoplastic techniques.

Progress Toward the Generation and Validation of Equine Induced Pluripotent Stem (iPS) Cells. Lauren V. Schnabel¹, Christian M. Abratte², John C. Schimenti², Lisa A. Fortier¹. ¹Clinical Sciences, Cornell University, Ithaca, NY; ²Biomedical Sciences, Cornell University, Ithaca, NY.

Induced pluripotent stem (iPS) cells derived from reprogrammed fibroblasts are a recent and intense focus of regenerative medicine because they are the only type of stem cell that is pluripotent and autologous. The purpose of this abstract is to describe the methods we have used to generate and validate equine iPS cells. Our laboratory has consistently generated murine iPS cells using the doxycycline-inducible lentiviral reprogramming system with murine Oct4, Sox2, Klf4, and c-Myc expression vectors. These cells have been validated for pluripotency via staining for alkaline phosphatase (AP) expression, embryoid body formation/differentiation assays, teratoma assays, and chimera generation. Because initial attempts at reprogramming equine fetal fibroblasts using murine vectors were unsuccessful, reprogramming using human vectors was attempted and resulted in putative equine iPS cells. Putative equine iPS cell colonies are morphologically similar to murine iPS cell colonies and positive for AP staining. The resultant cell lines are highly proliferative, able to be maintained in passage for extended periods of time, and are currently being assessed for pluripotency via teratoma assay. This assay is stringent and avoids any confusion or misinterpretation caused by trying to characterize equine cells using antibodies which have not been validated for the horse. Equine iPS cells have the potential to be valuable therapeutics for equine musculoskeletal diseases including tendon, ligament, and cartilage injuries. Because iPS cells are pluripotent, they should have a greater regenerative capacity than multipotent mesenchymal stem cells.

The Effect of Intralesional Bone Marrow Derived Mesenchymal Stem Cells and Bone Marrow Supernatant on Collagen Fibril Size in a Surgical Model of Equine Superficial Digital Tendonitis. Michael C. Schramme¹, Christopher J. Caniglia¹, Roger K. Smith². ¹College of Veterinary Medicine, North Carolina State University, Raleigh, NC; ²Veterinary Clinical Sciences, Royal Veterinary College, North Mymms, United Kingdom.

The purpose of the study was to evaluate the effect of bone marrow (BM) derived mesenchymal stem cells (MSCs) on collagen fibril size characteristics in surgically induced core lesions in the SDFT. Core lesions were created in both forelimbs and injected with either autologous BM derived MSCs or BM supernatant alone, at 4 weeks after injury. Twelve weeks later, tendon samples from the injured and adjacent normal areas at the maximum injury zone were evaluated with electron microscopy. The mean mass-Average diameter (MAD) was 174.4 ± 30.2 nm and 172.8 ± 30.9 nm respectively for treated and control normal regions and 76.9 ± 14.9 nm and 89.7 ± 26.9 nm respectively for treated and control injured regions. There were no significant differences between the mean MAD for treated and control samples. There was no difference between collagen fibrillar index (CFI) values for treated and control regions in either normal (0.49 ± 0.07 and 0.51 ± 0.09) or injured tissues (0.30 ± 0.07 and 0.33 ± 0.04). The fibril size distribution in injured samples was significantly different from that in normal tissues for % of fibrils and for area % covered by fibrils of a given size. The matrix of normal, uninjured SDFT tendon consists of populations of small and large diameter collagen fibrils and injured tendon healed with a predominance of small diameter fibrils, regardless of whether lesions were treated with BM derived MSCs at 4 weeks.

Suppression of Interleukins 6 and 8 and Macrophage Chemotactic Protein-1 Production By Avocado/Soybean Unsaponifiables, Glucosamine and Chondroitin Sulfate Combination and NSAIDs in Activated Canine Chondrocytes. Erica Secor¹, Mark Grzanna², Lowella Heinecke², Angela Au^{2,3}, Carmelita G. Fronzoza^{2,4}. ¹Cornell University, Ithaca, NY; ²Nutramax Laboratories, Inc., Edgewood, MD; ³Syracuse University, Syracuse, NY; ⁴Mississippi State University, Mississippi State, MS.

Osteoarthritis (OA) is characterized by articular cartilage breakdown, immobility, and pain associated with excess production of cytokines and chemokines. Non-steroidal anti-inflammatory drugs (NSAIDs) block production of these mediators. However, NSAIDs induce deleterious side effects. Avocado/soybean unsaponifiables (ASU), glucosamine (GLU), and chondroitin sulfate (CS) have safely been used to reduce inflammation in OA joints. We examined the effect of meloxicam or carprofen on IL-6, IL-8 and MCP-1 production alone, or in combination with ASU+GLU+CS.

Canine articular chondrocytes were propagated in a microcarrier spinner culture system ($n \geq 6$). Culture (10 mL) aliquots were activated with IL-1 β (50 ng/mL) and treated with meloxicam (11.7 ng/mL) or carprofen (40 ng/mL), with or without [ASU+GLU+CS] for another 24 hours. IL-6, IL-8, and MCP-1 production was determined by ELISA.

IL-1 β robustly increased production of IL-6, IL-8, and MCP-1 in all chondrocyte cultures examined ($P < 0.001$). IL-6 levels increased by 62,000-fold, IL-8 levels increased by 16,000-fold, and MCP-1 by 2,200 fold. Induced production of these mediators were significantly reduced by ASU+GLU+CS as much as 80%, $P < 0.001$. The low doses of meloxicam and carprofen, which represent sub-therapeutic concentrations of these compounds, had variable and only marginal effects in suppressing IL-1 β -induced IL-6, IL-8, and MCP-1 production. The most pronounced suppression of IL-6, IL-8, and MCP-1 production was observed when the mixture of ASU+GLU+CS was combined with meloxicam or carprofen. These results show a possible use for sub-therapeutic doses of NSAIDS with [ASU+GLU+CS] for the treatment of OA, which would minimize NSAID side effects.

Evaluation of Perioperative Gastroesophageal Reflux in Dogs with Brachycephalic Syndrome. Stephanie L. Shaver, David A. Jimenez, Benjamin M. Brainard, Karen Cornell, MaryAnn Radlinsky, Chad Schmiedt. Small Animal Medicine and Surgery, University of Georgia, Athens, GA.

Functional upper airway obstruction is a common complaint in brachycephalic dogs and many have concomitant gastrointestinal (GI) abnormalities. While brachycephalic dogs are predisposed to gastroesophageal reflux (GER) when awake, objective data regarding perioperative GER is not available. The objective of this study was to identify the prevalence of and risk factors for perioperative GER in brachycephalic dogs undergoing surgery for correction of upper airway obstruction. Twenty three dogs were prospectively enrolled in the study in which owners completed a historical questionnaire, and the dogs underwent a standardized anesthetic protocol. Perioperative reflux was documented by continuous monitoring of esophageal pH throughout anesthesia with a single channel pH probe proximal to the lower esophageal sphincter. Data (historical GI complaints, signalment, bloodwork, body weight, body condition, radiographic signs, anesthetic and surgical time, and specific procedures) were compared between dogs that did and did not experience acid (pH < 4), basic (pH < 7.5), or any GER. Perioperative GER was present in 60.9% of dogs, with 34.8% experiencing acid reflux, 21.7% having basic reflux, and 4.3% having both acidic and basic perioperative GER. When all dogs with GER were compared to dogs without GER, dogs in the GER group were significantly more likely to have esophageal gas on radiographs compared to dogs without GER ($P = 0.0367$). No other significant differences were identified in any group. Based on these findings, a majority of brachycephalic subjects experienced perioperative GER and only esophageal air on preoperative radiographs may predict GER.

Epidural Idiopathic Sterile Pyogranulomatous Inflammation Causing Spinal Cord Compressive Injury in Four Dogs. Mitsuhiro Shibata¹, Takeshi Aikawa^{1,2}, Moe Asano¹. ¹Aikawa Veterinary Medical Center, Tokyo, Japan; ²Veterinary Surgical Service Japan, Tokyo, Japan.

Idiopathic sterile pyogranuloma (ISP) is known as a dermatologic disease occasionally seen in miniature dachshund (MDs) and other breed dogs. We reported epidural ISP causing spinal cord compression in five MDs. We encountered additional epidural ISP cases (2 MDs and 2 other breeds). We report the clinical findings, outcome of epidural ISP and update the follow up of 5 previous cases inclusive.

Four dogs with T3-L3 myelopathy were referred. In one MD, osteolytic lesion of vertebrae was detected by survey radiograph. On myelogram, T-L spinal cord compression was detected in all cases. Hemilaminectomy was performed and epidural lesion was resected. In one case, additional vertebral stabilization was performed. The histopathological diagnosis suggested pyogranulomatous panniculitis and bacterial culture was negative in all cases. Three dogs were neurologically normal at 11 to 17 months postoperatively. In one MD which had osteolytic lesion, the neurological deterioration occurred and died at 3 months postoperatively. The postoperative immunosuppressants were used in three dogs.

The epidural ISP was diagnosed by the histopathological examination and negative bacterial culture results. Present report suggests that epidural ISP is not a specific disease for MD. Surgical intervention was needed as the primary therapy for severe spinal cord injury and definitive diagnosis for ISP. The osteolytic lesion detected by survey radiograph in a case suggested the ISP may be considered as one of the differential diagnosis for the cause of vertebral bone lytic lesions. Further investigation is needed for the definitive diagnostic method, effects of surgical and immunosuppressive treatment for epidural ISP.

Hemi-Dorsal Laminectomy and Vertebral Stabilization for Treatment of Solitary Vertebral Plasmacytoma in a Dog. Mitsuhiro Shibata¹, Takeshi Aikawa^{1,2}, Moe Asano¹. ¹Aikawa Veterinary Medical Center, Tokyo, Japan; ²Veterinary Surgical Service Japan, Tokyo, Japan.

Vertebral plasma cell tumor is a rare tumor that account for less than 4% of all canine vertebral tumors. The dissemination of the solitary plasmacytoma to the multiple myeloma has been reported in humans. There has been limited information of the canine solitary plasmacytoma after surgical treatment. We present a dog that the solitary plasmacytoma disseminated to the multiple myeloma 9 months after the neurological improvement by the surgical decompression and stabilization.

An 8-year-old Yorkshire terrier was referred because of ambulatory paraparesis. The pathological fracture of T7 vertebrae was detected by radiography. The MRI and CT study showed mass lesion at T7 vertebral body.

Surgical decompression by hemi-dorsal laminectomy and partial vertebrectomy followed by vertebral stabilization were performed. The histopathological diagnosis was suggestive of sarcoma. The dog improved its neurologic status postoperatively and had remained ambulatory until sudden neurological deterioration on 295 days postoperatively. The pathological fracture and loss of bone density were detected. The elevated gamma fraction and abnormal immunoglobulin was detected. The dog died on 297 days postoperatively. The proliferation of multiple myeloma was diagnosed by bone marrow aspiration.

Present case documented the surgical decompression with stabilization without additional chemotherapy or radiotherapy maintained improved neurological status until the solitary plasmacytoma of the vertebra disseminated to the multiple myeloma 9 months after the initial diagnosis. The surgical decompression by hemi-dorsal laminectomy and partial vertebrectomy followed by vertebral stabilization may be a reasonable treatment for the acute spinal cord injury caused by the pathological fracture secondary to the solitary plasmacytoma.

In Vitro Load to Failure Biomechanical Comparison of a Novel Canine Non-Constrained Medial Compartmental Elbow Arthroplasty System vs. Normal Canine Thoracic Limbs. Kirk Wendelburg¹, Zachery F. Smith¹, Kei Hayashi², Susan Stover², Tanya Garcia-Nolen², Slobodan Tepic³. ¹Animal Specialty Group, Los Angeles, CA; ²JD Wheat Veterinary Orthopedic Research Laboratory, University of California, Davis, CA; ³Kyon Pharma, Boston, MA.

Elbow dysplasia is one of the most common orthopedic causes of lameness in the thoracic limb. The medial compartment is most commonly affected. The purpose of this study is to determine the effect of implantation of a novel medial compartment elbow arthroplasty system on the biomechanical load to failure in normal canine thoracic limbs. We hypothesized that the implanted limbs would fail beyond normal biologic loading but at lower loads than control limbs. Axial load to failure was measured using a novel testing construct. 6 paired medium mixed breed canine cadaveric thoracic limbs were prepared for comparison of failure loading of control vs. implanted limbs. Load and displacement values were measured. The mean bodyweight/failure load ratios for the implanted limbs and control limbs were 2.47 (range: 1.62–3.38) and 2.68 (range: 2.25–3.25) respectively. The implanted to control ratio was performed for paired limbs. The mean ratio was 0.93 (sd: 0.19). No difference was noted between paired control vs. implanted limbs ($P = 0.38$). Failures occurred in 4 testing constructs, 3 at the implant at the proximal ulna, 2 at the distal humeral implants, and 4 at the distal radius/ulna and carpus. We concluded that in vivo implantation of this prosthesis is feasible as these failure loads are above biologic loading.

Evaluation of Intra-Arterial and Intra-Venous Regional Limb Perfusion of Mesenchymal Stem Cells in the Normal Equine Distal Limb Using Scintigraphy. Albert Sole¹, Mathieu Spriet², Larry D. Galuppo², Kerstien A. Padgett², Dori L. Borjesson³, Erik Wisner², Robert J. Brosnan², Martin A. Vidal². ¹Veterinary Medical Teaching Hospital, School of Veterinary Medicine, University of California, Davis, CA; ²Department of Surgical and Radiological Sciences, School of Veterinary Medicine, University of California, Davis, CA; ³Department of Pathology, Microbiology and Immunology, School of Veterinary Medicine, University of California, Davis, CA.

Mesenchymal stem cells (MSCs) are commonly injected directly into the lesions for treatment of soft tissue injuries in the horse. Alternative routes of administration would be beneficial for lesions that cannot be accessed directly or in order to limit needle-induced iatrogenic damage to the surrounding tissue.

The purpose of our study was to evaluate intra-arterial (IA) and intra-venous (IV) distal regional limb perfusions (RLP) of MSCs using scintigraphy.

Six sound horses were used in the study. Allogeneic MSCs were labeled with hexamethylpropylene amine oxime (HMPAO) and technetium-99m. RLP was performed under general anesthesia through the median artery of one limb and through the cephalic vein of the opposite limb. Scintigraphic images were obtained at 0 min, 45 min, 75 min, 6 hours and 24 hours post-injection.

Distribution of labeled MSCs through the entire distal limb was achieved with all 6 IA-RLP, while 3 out of 6 IV-RLP showed poor or absent uptake distal to the metacarpus. A persistence of 100% of the MSCs was achieved for both techniques in presence of the tourniquets. Persistence decreased to a median of 39% and 28% at 6 hours after injection for IA- and IV- RLP, respectively.

In conclusion this study demonstrates that both IA- and IV-RLP result in good persistence of MSCs in perfused tissues. The IA-RLP appeared to result in more reliable cell distribution to the pastern and foot area.

Morphological Comparison of the Middle Ear Between French Bulldogs and Non-Brachycephalic Dogs. Lawrence Souchu¹, Thomas Chuzel², Claude Carozzo³. ¹Clinique vétérinaire des Perrières, Saint Gervais La Foret, France; ²Voxcan, Marcy l'Etoile, France; ³Surgery, VetAgroSup, Marcy l'Etoile, France.

The objective of this study was to compare normal and pathological morphology of the middle ear of French Bulldogs (FB) with normal morphology of non-brachycephalic dogs (NBD) using computed tomography (CT).

CT scans of FB (n = 34) with or without middle ear disease and NBD (n = 36) without middle ear disease were reviewed. Ratios between inter-jugal processes distance and height of the epi-+ mesotympanum (rHem) and external acoustic meatus (rHeam), height (rHh), width (rWh) and length (rLh) of the hypotympanum, percentage of tympanic bulla (TB) protrusion from the skull (%Hin and%Hout) were calculated from 2D view. Relative position of TB and temporo-mandibular joint (TMJ) were determined with surface rendering 3D reconstruction. Data were compared using paired-sample (independent) t-test with $P < .05$ considered significant.

Mean rHem, rHh, rWh and%Hout of the FB group are significantly smaller than the NBD group (respectively $P = .02$, $P = .02$, $P < .001$ and $P < .001$) whereas mean rHeam and%Hin are higher (respectively $P < .001$ and $P = .005$). rLh is not significantly different between groups ($P = 0.07$). TB is more medially located in FB ($P < .001$); it is also slightly more cranial than TMJ whereas it is more caudal in NBD ($P < .001$). There is no significant difference for all the parameters between FB with or without middle ear disease.

Middle ear is smaller (except for the length) in FB compared with NBD but with a greater external acoustic meatus. It is also more dorsally located in comparison with the skull and protrudes less in FB. It must be palpated slightly cranially and medially compared with TMJ. Preoperative CT scan with 3D reconstruction for surgical planning is really amendable in this breed. Tympanic bulla lavage under video-otoscopy could be an alternative of great interest in brachycephalic dogs.

Pads Pressure Distribution in Pit Bulls with Cranial Cruciate Ligament Rupture. Alexandre N. Souza¹, Angélica C. Tartarunas¹, Valdecir Marvulle², Julia M. Matera¹. ¹Veterinary Surgery, University of Sao Paulo, São Paulo, Brazil; ²Center of Mathematical, Computation and Cognition, University of ABC, São Paulo, Brazil.

Our objective was to evaluate pads pressure distribution in forelimbs (FL) and hind limbs (HL) to describe kinetics details in pit bulls with cranial cruciate ligament rupture.

10 healthy pit bulls (Group A) and 10 pit bulls with cranial cruciate ligament rupture (Group B) were used. A pressure-sensitive walkway was used to collect vertical force data for each pad of the limbs of dogs used for kinetic gait analysis. The load for each pad was evaluated as a percentage of body weight. Velocity and acceleration were within a range of 1.0 and 1.3 ± 0.1 m/s². The data was compared by unpaired t-test and the symmetry by student t-test and both with $P < 0.05$.

The results showed that a decrease of vertical forces (VF) in the affected limb mainly occurs by support decrease in metatarsal pad. Compensation of this decrease is reflected in a redistribution of the VFs in the pads of contralateral HL and both FLs.

We found a pads pressure distribution pattern in pit bulls with cranial cruciate ligament rupture. These data could contribute to the assessment of lameness in dogs with cranial cruciate ligament rupture and assist in follow up of operated dogs.

We acknowledged to FAPESP and CAPES by support.

Correlation Between Hip Joint Radiographic Classification and Kinetic Analysis in German Shepherd Dogs. Alexandre N. Souza¹, Ana Carolina B. Pinto¹, Valdecir Marvulle², Julia M. Matera¹. ¹Veterinary Surgery, Faculty of Veterinary Medicine and Animal Science, São Paulo, Brazil; ²Center of Mathematical, Computation and Cognition, University of ABC, São Paulo, Brazil.

Our objective was to establish the correlation between hip joint radiographic classification and kinetic analysis in German shepherd dogs.

Five groups were performed according to HD classification in the categories A, B, C, D and E in German shepherd dogs with total of 8 dogs in each group.

The dogs were examined and kinetic analysis was performed with 5 valid passages on the pressure platform. The peak vertical force (PVF), vertical impulse (VI), and stance phase (SP) was assessed with a constant speed between 1.3 to 1.6 m/s. The pads pressure distribution was evaluated also. The data was compared by ANOVA test and the symmetry by student t-test and both with $P < 0.05$.

Was founded a tendency to decrease progressively the PVF in the hind limbs (HL) from group C (mild dysplasia) to E (severe dysplasia) and VI was decreased in dysplastic dogs without any correlation with HD degree. Relevant compensation was not found in the forelimbs (FL) and even in dysplastic dogs there were no difference between the SP. The pads pressure distribution is not affected on a regular basis in the HD.

We conclude that according to the HD degree the dogs have tendencies to support less at the HL. However it should be considered the individual response because there are dysplastic dogs that have the same pattern of support that dogs free of HD. The kinetic analyses provide a great approach to evaluate the dysplastic patient condition.

We acknowledged to FAPESP and CAPES by support.

Correlation of Foot Balance and Deep Digital Flexor Tendon Lesion Location on MRI. Brianne R. Gindlesperger, Allison A. Stewart. University of Illinois, Urbana, IL.

Introduction: The purpose of this study was to determine if the location of DDFT lesion identified on MRI corresponded with a medial to lateral and dorsal to palmar imbalance of the distal limb. We hypothesize that the DDFT lesion will be located on the long side of imbalanced limbs and that dorsal to palmar imbalance will be present in limbs with DDFT lesions.

Materials and Methods: Medical records, radiographs, and MRI for horses between July 2007 and September 2009 that blocked out to the digit were reviewed. Radiographs and MRI were reviewed to see if there was a correlation between imbalance and DDFT injury. Statistics were performed using a Fisher Exact Test with a $P < 0.05$ considered significant.

Results: There is a significant correlation between the long side of an imbalanced limb and location of DDFT lesion. A negative palmar angle was present in all limbs with DDFT lesion, supporting both hypotheses of the study.

Discussion: These results suggest that horses with a long toe, low heel, and medial to lateral foot imbalance are predisposed to DDF tendon injury on the long side of medial to lateral imbalance. Further studies with larger case numbers are warranted to verify these findings.

Polycationic Coating on Orthopedic Implants Inhibits Biofilm Formation in an Infected Ovine Tibial Osteotomy Model. Suzanne Stewart, Raymond Boston, Tom P. Schaer. Department of Clinical Studies, New Bolton Center, School of Veterinary Medicine, University of Pennsylvania School of Veterinary Medicine, Kennett Square, PA.

Implant associated infections contribute to increased patient morbidity and healthcare cost. Klibanov et al. have previously shown that surfaces coated ("painted") with a hydrophobic polycationic coating (HPC) killed bacteria by rupturing their cellular membranes. We hypothesized that surface coating of orthopedic hardware using HPC would result in formation of a bactericidal surface that prevents implant colonization in a large animal infection model in vivo. Twelve mature Dorset cross ewes were enrolled in a prospective study. A unilateral transverse mid diaphyseal tibial osteotomy was performed and repaired with a stainless steel LCP. The osteotomy was inoculated with 2.5 mL of 10^6 CFUs of *S. aureus*. Six animals received a HPC implant and the remaining six were uncoated. Implants were coated aseptically at the time of surgery. Radiographs were assessed immediately post operatively and at one month post operatively. Animals were sacrificed at one month and an aseptic necropsy and harvest of the implant performed. The implants were sectioned and the surface analyzed for bacterial colonization using scanning electron microscopy (SEM). The callus was fixed for histological and μ -CT analysis. Radiographic, microbiology, histological and explant scores were significantly lower for treatment animals compared to controls. There was significantly greater healing and callus formation in treatment animals ($P < 0.05$). Control animals had

evidence of a delayed union of the osteotomy with significant abscessation and bacterial colonization. SEM analysis of control implants revealed abundant biofilm formation compared to relatively no bacterial colonization of HPC implants.

Effects of Sterilization and Friction on Polycationic Coated Orthopedic Implants In Vitro. Suzanne Stewart, Raymond Boston, Tom P. Schaer. Department of Clinical Studies, New Bolton Center, School of Veterinary Medicine, University of Pennsylvania, Kennett Square, PA.

Previous work has demonstrated that hydrophobic polycationic coated orthopedic implants (HPC) reduce the risk of implant associated infection. We hypothesized that sterilization methods would not impact the bactericidal nature of the HPC and that friction created by screw insertion would not strip the coating. Three HPC were exposed to steam sterilization (HPC-autoclave), 3 HPC were exposed to cold ethylene oxide sterilization (HPC-EO), 3 HPC were not sterilized (HPC-positive control) and 3 implants were left uncoated (negative control). All implants were challenged with *Staphylococcus aureus*. Colony counts were performed on incubated media. Implant surfaces were imaged using scanning electron microscopy (SEM). Twelve additional screws were placed into 4 experimental groups as described above and aseptically inserted into equine cortical bone. All samples were challenged with *Staphylococcus aureus* and evaluated as previously described. All HPC had significantly less bacterial colonization compared to negative controls ($P = 0.001$). HPC-autoclave group had less bacterial growth than HPC-EO and HPC-positive control groups ($P = 0.027$). There was no significant difference in bacterial growth between HPC-EO and HPC-positive control groups. SEM analysis revealed biofilm formation on negative controls. The HPC-EO and HPC-positive control groups had increased bacterial colonization compared with the HPC-autoclave group. SEM analysis of HPC inserted into bone revealed the coating to be stripped from the cutting threads at the bone-screw interface. Bacterial colonization of HPC was restricted to the screw threads. Sterilization methods did not inhibit the bactericidal effects of HPC. SEM imaging demonstrated that sufficient HPC remained to reduce implant colonization when compared with negative controls.

Determine the Pelvic Canal Diameter Ratio at Which Signs Related to a Stenotic Pelvic Canal Develop in Dogs and Cats. A Retrospective Review of 62 Cases (1998–2010). Pei-Yi Sung, Po-Yen Chou, Lih-Seng Yeh. NTUVH, Taipei, Taiwan.

Pelvic fractures of dogs and cats are nearly always the results of major trauma and comprise at least 25% of all fractures. The method determining pelvic canal diameter was established by Averill S.M. et al. Based on the previous research, the smallest pelvic canal diameter ratio (PCDr) at which clinical signs related to pelvic canal stenosis develop could not be determined because the lack of severe injured cases treated with conservative methods in that study. Objective of this study was to determine the pelvic canal diameter ratio related to clinical signs of constipation.

Radiographs of pelvic fracture cases in dogs and cats presented to National Taiwan University Veterinary Hospital from 1998 to 2010 were examined retrospectively. Comparing PCDr and clinical signs of constipation of each case was performed. Data were statistically analyzed using logistic regression procedures.

A total of 62 pelvic fracture cases including dogs and cats were included in this study. 7 cases have the clinical signs related to constipation and need stool softeners or changes in diet to alleviate the frequency of constipation. 87.5% cases (7/8 cases) with PCDr less than 0.64 have the clinical signs of constipation. Of the cases with PCDr greater than 0.71, none has the clinical signs of constipation. Under logistic regression analysis, PCDr less than 0.64 is a significant risk factor associated with constipation ($P < 0.05$).

Based on the presented study result, animals with PCDr less than 0.64 have increased risk of constipation. More clinical cases may be needed to obtain the exact PCDr causing constipation.

Modified High Perineal Urethrostomy Technique for Treatment of Urethral Stricture in Goats. Karen Tobias¹, Sarel van Amstel². ¹Small Animal Clinical Sciences, University of Tennessee, Knoxville, TN; ²Large Animal Clinical Sciences, University of Tennessee, Knoxville, TN.

Perineal urethrostomy is considered a salvage technique for treatment of urolithiasis-associated obstruction of the penile urethra in male goats because of high rate of stricture formation. We hypothesized that transection of penile attachments to the pelvis would improve mobilization of the penis, reduce tension on the perineal urethrostomy, and decrease the risk of postoperative stricture.

Three adult male goats with urethral obstruction were presented for surgical correction. Two goats had previously undergone perineal urethrostomies for urethral obstruction and rupture; stomas in both had strictured

and both goats underwent subsequent placement of a tube cystostomy. The third goat received a tube cystostomy after bladder rupture from urethral obstruction. During modified perineal urethrostomy, the urethra was approached through a skin incision ventral to the anus. The penile body was completely freed from its ischial attachments with blunt and sharp dissection and transected distal to the urethrostomy site. Urethral mucosa at the proximal end of the penile body was spatulated and sutured to the skin. All goats were able to urinate without difficulty after surgery. At follow-up (>1 year), all goats had normal diameter urine streams and no clinical signs of urinary tract dysfunction. Short term follow-up (<2 weeks) was available for four additional goats that underwent modified perineal urethrostomy. Urination was normal at the time of discharge in all 4 goats; one goat had significant hemorrhage that was eventually controlled with a perineal pressure bandage.

Transection of ischial attachments decreases tension on urethrostomy sites, reducing the risk of postoperative stricture.

Predictive Value of Radiographs, Dual Energy X-ray Absorptiometry, Computed Tomography and Microcomputed Tomography to Determine Local Cancellous Bone Quality of the Proximal Femur. Katy Townsend¹, Tatiana Motta¹, Valerie Samii¹, Jonathan Dyce¹, Richard Hart², Matthew Allen¹. ¹Veterinary Clinical Sciences, The Ohio State University, Columbus, OH; ²Biomedical Engineering, The Ohio State University, Columbus, OH.

Proximal femoral bone quality and quantity are two important variables to provide long-term stability in cementless total hip arthroplasty (THA). The goal of this study is to determine the feasibility of using non-invasive imaging data to predict the quality and quantity of cancellous bone in the canine proximal femur and directly compare this with bone microstructure and mechanical analysis. Twelve cadaveric canine femora were used. Radiographs were taken, along with DEXA scans and quantitative CT. Bone Mineral Content (BMC) and Bone Mineral Density (BMD) were measured from DEXA scans and CT, and radiographs were scored. Cores of cancellous bone were harvested from the proximal femur. High-resolution micro computed tomography (uCT) was performed to assess bone microstructure (fractional bone volume BV/TV, polar moment of inertia). Direct mechanical testing of the bone core was performed to assess bone strength (break load, stiffness, energy at break). Pearson correlation was used to compare the biomechanical parameters with the imaging modalities. uCT values (BV/TV and AMI) had the best predictor of mechanical properties of cancellous bone in the proximal femur, while clinical imaging modalities such as radiographs, DEXA BMD and BMC and qCT had only mild correlation with predicting bone strength. uCT has the best predictor of bone strength, suggesting that bone architecture plays a significant role in determining bone strength. CT, DEXA and radiographs all showed only mild correlation of bone strength, indicating that clinical parameters are not useful in predicting proximal femoral bone strength.

In Vivo Osteoinductivity of Gelatin β -Tri-Calcium Phosphate Sponge Containing Bone Morphogenetic Protein-2 on an Equine Third Metacarpal Bone Defect. Nao Tsuzuki¹, Kenji Otsuka¹, Kazutaka Yamada¹, Shingo Hameda¹, Hidefumi Furuoka¹, Yasuhiko Tabata², Naoki Sasaki¹. ¹Obihiro University of Agriculture and Veterinary Medicine, Obihiro, Japan; ²Kyoto University, Kyoto, Japan.

Limb fractures occur frequently in horse. In racehorses, fractures can cause large economic losses because they require long-term rest and thus, the affected horse is prevented from entering races. Therefore, new treatment method that enhances bone regeneration is required. Recently, bone regeneration methods that make use of various biogenic cytokines combined with surgical procedures have been proposed to enhance the process of fracture healing. Bone morphogenetic protein-2 (BMP-2) has reported to induce bone regeneration. Gelatin β -tri-calcium phosphate sponge (sponge) can act as a scaffold necessary for cell differentiation and proliferation. This study evaluated the therapeutic effects of a sponge incorporating BMP-2 (BMP-2/sponge) on bone regeneration in equines.

Six bone defects were created in third metacarpals of five thoroughbred horses, and a total of six treatments were applied. The treatments were BMP-2/sponge, gelatin hydrogel sheets (sheets) incorporating BMP-2 (BMP-2/sheets), free BMP-2, sheets incorporating basic fibroblast growth factor (bFGF) (bFGF/sheets), plain sponges and plain sheets. The defects were monitored for 16 weeks by radiography and then examined by Multi Detector-row Computed Tomography (MDCT) and histological analysis.

Radiographic evaluation scores of bone regeneration revealed significantly greater bone regeneration of defects treated with BMP-2/sponge than defects treated with plain sponge ($P < 0.05$). MDCT revealed significantly greater regeneration of the defects treated with BMP-2/sponge compared to both plain sponge and free BMP-2 ($P < 0.05$). In histological

analysis, compact bone was observed over a wide area in the BMP-2/sponge treatment.

From these results, we concluded that the treatment with BMP-2/sponge accelerated bone regeneration in the equine.

The Effect of Locking Compression Plate Position on Mechanical Stabilization of the Canine Radius with a Gap. Justin Uhl¹, Amy S. Kapatkin³, Tanya Garcia-Nolen², Susan Stover². ¹Veterinary Clinical Sciences, University of Minnesota, St. Paul, MN; ²Anatomy Physiology and Cell Biology, University of California, Davis, CA; ³Surgical and Radiological Sciences, University of California, Davis, CA.

Distal radial fractures are the most common fracture of the canine thoracic limb and large breed dogs are more likely to have a comminuted fracture requiring bone plate fixation in buttress across a fracture gap. We hypothesized that a smaller locking compression plate (LCP) placed medially across a fracture gap will have similar biomechanical properties to a larger LCP placed cranially due to increased screw purchase across an elliptical shaped radius and having an additional screw in the distal fragment.

The in vitro biomechanical properties of paired canine radii, stripped of the ulna and all soft tissues, with an LCP stabilized, simulated distal radial comminuted fracture were compared between cranial and medial plate positions (each treatment in contralateral limbs). The limb constructs were taken through 4 conditions of medial to lateral and cranial to caudal bending at walk and trot loads before being tested to failure. The results were statistically analyzed using paired t-tests.

Cranial plate constructs had significantly higher monotonic stiffnesses, and yield and failure loads; and higher cyclic stiffnesses; when compared to medial plate constructs.

The larger, cranially applied LCP was biomechanically superior to the smaller, medially applied LCP in our distal radial fracture model. Surgeons should consider using a larger cranially applied locking plate when repairing distal radial fractures requiring buttress across comminution or a gap in large breed dogs.

In Vivo Tracking of Injected Mesenchymal Stem Cells Using Technetium-99m. Patricia Becerra¹, Miguel A. Valdés¹, Francisco Neves¹, Jay Dudhia², Neil G. Hartman³, Andrew Fiske-Jackson², Roger K. Smith². ¹Hospital de Referencia La Equina, Manilva, Spain; ²Department of Veterinary Clinical Sciences, the Royal Veterinary College, North Mymms, Hatfield, United Kingdom; ³Department of Nuclear Medicine, Barts & the London NHS Trust, West Smithfield, United Kingdom.

Mesenchymal stem cells (MSCs) are being used with increasing frequency in soft tissue injuries but immediate cell survival and alternative administration routes have not been investigated. We hypothesized that MSCs are retained within the tendon after intra-lesional injection but can also "home" to injury sites after intravenous injection or regional perfusion.

Labeling efficiency of MSCs with technetium-99m (Tc-99m) and hexamethylpropylene amine oxime (HMPAO) was initially determined in vitro. 10 million labeled MSCs were then implanted into 12 horses with naturally-occurring tendon or ligament injuries intra-lesionally, intravenously, and by regional perfusion on consecutive weeks. Labeled MSCs were traced over 36 hours using gamma scintigraphy.

Maximum in vitro cell labeling was 55% with >90% cell viability. In contrast, labeling efficiencies varied between 2.7% and 22.5% (mean 9.2%) in clinical cases. Cells were retained in the damaged area after intra-lesional administration but only ~10% of cells were still present within the tendon after 24 hours. After intravenous injection, cells largely distributed to the lung fields, with no detectable cells in the tendon lesions. In contrast, significant labeling of the tendon lesions was observed in 11/12 horses following regional perfusion.

Optimal number of cells is not known but the highest cell numbers were retained after intra-lesional injection, although with considerable cell loss. Regional perfusion appeared to be a viable alternative if no core lesion was present. The absence of cells seen after intravenous administration may be a consequence of low labeling efficiencies, but cells still did not "home" to the lesion in large numbers.

CT Scan Base Determination of Optimal Atlantoaxial Ventral Screw in Miniature Breed. Núria Vizcaino Revés¹, Christina Stahl², Markus Stoffel³, Franck Forterre¹. ¹Surgery, University of Bern, Switzerland; ²Radiology, University of Bern, Switzerland; ³Anatomy, University of Bern, Switzerland.

Transarticular screw fixation is a technique described to stabilize the atlantoaxial joint. Because of the small target area, the procedure can be rather challenging. The purpose of this study was to define the screw

length and placement angle in order to achieve an optimal atlantoaxial transarticular screw stabilisation

This was a retrospective CT-imaging study including sixteen toy-breed dogs, weighing less than 5 kg. Nine showed no atlantoaxial abnormalities (group 1), whereas the other seven presented with atlantoaxial instability (group 2). The optimal angle, which resulted in maximum bone purchase, was measured on a dorsal plane and sagittal plane. The length of the area of maximum bone purchase was correlated to the maximum screw length. Both right and left sides were measured. Each scan was measured 3 times, and the average was used for statistical analysis.

In 100% of the cases, the optimum transarticular atlantoaxial angle to ensure maximal bone purchase was determined to be 40° from the patient midline on a dorsal plane and 20° from the neural canal on a sagittal plane. No significant differences were found between groups 1 and 2.

The angle determined in this study should be chosen for the stabilisation of the atlantoaxial joint with transarticular screws. The screw length should not exceed 10 mm.

Evaluation of the Stabilizing Function of the Canine Atlantoaxial Ligaments: A Biomechanical Study. Núria Vizcaino Revés¹, Katrine Reber¹, Alexander Buerki², Markus Stoffel³, Stephen Fergusson², Franck Forterre¹. ¹Surgery, University of Bern, Switzerland, Bern, Switzerland; ²ISTB, MEM Research Institute, Bern, Switzerland; ³Anatomy, University of Bern, Switzerland.

Atlantoaxial instability is a well known disease affecting most commonly immature toy breed dogs. Although several surgical techniques to stabilize the joint have been described and used in the past, the biomechanics of the atlantoaxial joint have never been studied.

The purpose of this study was to evaluate the stabilizing function of the single atlantoaxial ligaments.

The craniocervical region was harvested from the cadavers of 10 Beagles. The occipito-atlantoaxial region was prepared and freed from the surrounding musculature. Care was taken to preserve integrity of the atlantoaxial ligaments and of the atlantoaxial joint capsule. The atlanto-occipital joints were blocked with 2 transarticular diverging 1.8 mm positive threaded K-wires. The end of the specimens were embedded in PMMA and mounted on a simulator testing flexion and extension of the atlantoaxial joint. Range of motion (ROM) and neutral zone (NZ) were determined with all ligaments intact, after cutting the apical ligament, after cutting the both alar ligaments, after cutting the transverse ligaments and finally after cutting the dorsal atlantoaxial ligament.

Range of motion in flexion/extension increased stepwise during the testing in a similar fashion in all tested specimen. However the most significant increase was observed after transection of the alar ligaments.

The alar ligaments seem to be the most important ligamentous structures for the stabilization of the atlantoaxial joint.

The results of this study impart biomechanical knowledge of the canine atlantoaxial joint and may be of importance for the therapy- decision making process in canine atlantoaxial instability

Evaluation of a Novel Pin-Sleeve and Ring System for Transfixation Casting in a Neonatal Calf Model. Susan R. Vogel¹, André Desrochers¹, Stefano Brianza², Sylvain Nichols¹, Christiane Girard¹, Christian Bolliger¹, Kate Alexander¹, Ludovic Bouré². ¹Faculté de Médecine Vétérinaire, University of Montreal, St-Hyacinthe, QC, Canada; ²AO Research Institute, Davos, Switzerland.

Pin loosening is a common complication of transfixation pincasts (TP) in large animals, often necessitating premature removal before fracture healing. The excessive loads centered on the proximo-external and disto-internal cortices of the bone-pin interface cause osteolysis. Using a neonatal calf model, this project evaluated a novel pin-sleeve and ring cast system (PS) optimized to decrease peri-implant strain and evenly share stress at the bone-implant interface. It was hypothesized that PS would result in less peri-implant osteolysis compared to TP.

Ten, 3-week-old, healthy calves were implanted with either TP or PS in the right metacarpus, 2 implants per calf. Calves were scored daily for lameness and were euthanized at day 28. Collected data included radiographs at surgery and euthanasia and histomorphometric measures of bone-implant contact on non-decalcified specimens with the implants in situ. Data was analyzed using Cochran-Mantel-Haenszel test; a *P*-value < .05 was considered significant.

The cortical thickness was larger for distal implants than proximal implants for both groups at surgery (*P* = .03), but were similar between groups (*P* > .31). TP calves developed lameness sooner, at day 21, than PS calves (*P* = .04). Histologically, there was more direct cortical bone-implant contact for PS distal implants than TP distal implants (*P* = .04).

The metaphyseal-diaphyseal junction where the proximal implants were situated is unsuitable bone for either system; each had minimal

bone-implant contact and extensive osteolysis. The PS system did not cause significant osteolysis when instrumented in diaphyseal bone and could be used in transfixation casting for comminuted distal limb fractures.

Congenital Laryngeal Paralysis in the Alaskan Husky. Dirsko J. von Pfeil¹, Eric Zellner², Michele C. Fritz², Joe G. Hauptman², Caroline Griffiths³, Tim Hunt⁴, Ingeborg M. Langohr², Bryden J. Stanley². ¹Veterinary Specialists of Alaska, P.C., Anchorage, AK; ²Michigan State University, East Lansing, MI; ³The Traveling Vet LC, Loveland, CO; ⁴Dr. Tim's, Marquette, MI.

Congenital laryngeal paralysis (CLP) in Alaskan huskies (AKH) has been anecdotally reported. These dogs are frequently called "wheezers". Signalment, history, examination, bloodwork, radiographs, esophagram and videolaryngoscopy were documented. 54 AKH were enrolled, 12 were affected. Affected dogs had blue eyes and white facial markings, except one, which only had blue eyes. Less than half unaffected dogs had blue eyes (15/42), or white facial markings (17/42). Oral mucosal tags were present in 50% of affected dogs, but only in 27% of unaffected dogs. There was a significant association (Fisher's exact test; significance if $P \leq 0.05$) between CLP and blue eyes ($P = 0.0001$), CLP and white facial markings ($P = 0.002$), but not CLP and mucosal tags ($P = 0.16$). Clinical signs (stridorous breathing with various activity levels) manifested early in puppyhood. Affected dogs were noted to tire more easily; severely affected dogs collapsed after short exercise. All neurologic examinations were unremarkable. Unilateral cricoarytenoid laryngoplasty was performed in five dogs including biopsy of cricoarytenoideus dorsalis (DCAm) and cranial tibialis muscles, caudal laryngeal and peroneal nerves. Surgery resulted in significant improvement in breathing and activity. Histological examination of DCAm showed neurogenic atrophy; cranial tibialis muscles were normal; a mucosal tag displayed redundant normal mucosal and submucosal tissue. The examined peripheral nerve sections did not support a polyneuropathy. CLP exists in AKH, is likely a heritable condition with bimodal onset occurring in association with blue eyes, white facial markings and oral mucosal tags, and lacks a generalized, progressive polyneuropathy component. More results are expected from pedigree analysis and DNA extraction.

TPLO: Handling of the Muscle Envelope — To Elevate or Not? Dirsko J. von Pfeil¹, Michael R. Edwards¹, Brian Beale², Nelson Priddy II¹, Nathan Nelson³. ¹Veterinary Specialists of Alaska, P.C., Anchorage, AK; ²Gulf Coast Veterinary Specialists, Houston, TX; ³College of Veterinary Medicine, Michigan State University, East Lansing, MI.

The necessity of muscle elevation and placement of sponges during TPLO (elevation technique – ET) has been questioned in an *ex vivo* study and may not be necessary in the clinical setting (non-elevation technique – NET). We hypothesized that NET is a feasible procedure and would be associated with decreased osteotomy healing time and decreased surgery time when compared to ET.

Medical records and radiographs of dogs undergoing TPLO with either ET ($n = 40$) or NET ($n = 19$) were reviewed. Healing score, surgery time, signalment, operated side, type of used plate, meniscal treatment, pre- or postoperative tibial-plateau-angle (TPA), amount of rehabilitation, complications, time until good leg use and final outcome were evaluated. Unpaired t-tests, Wilcoxon rank sum and Fisher's exact tests were used to determine significance ($P \leq 0.05$).

Mean \pm SEM cortical healing score was significantly higher ($P = 0.04$) with NET (3.11 \pm 0.19) compared to ET (2.68 \pm 0.13). Mean \pm SEM surgery time was significantly shorter ($P < 0.0001$) with NET (65.53 min \pm 3.43) compared to ET (88.95 min \pm 2.30). The SYNTHES Locking-Plate was significantly associated with faster surgery time compared to Veterinary Orthopedic Implants Plate ($P = 0.001$). Preoperative TPA between groups was significantly different ($P = 0.03$) with NET (28.00° \pm 0.07) compared to ET (25.23° \pm 0.57). No significant differences were found for all other parameters.

NET appears to be a feasible alteration to the original TPLO technique. This alteration appears to result in decreased bone healing times and shorter surgery times without adverse effects on outcome or complication rates. A prospective, standardized, double blinded, randomized case-controlled cohort study would be necessary to accurately evaluate the effect of NET on final outcome.

Comparison of Transforming Growth Factor Beta-1, -2 and -3 Induced Chondrogenesis in Pre-Implant Stem Cell Cultures. Ashlee E. Watts, Kate P. Morris, Alan J. Nixon. Cornell University, Ithaca, NY.

It is well known that members of the transforming growth factor-beta family of growth factors are required during chondrogenesis; however, a direct comparison of the three peptides has not been performed. The purpose

of this study was to compare *in vitro* chondrogenesis from TGF beta-1, TGF beta-2, and TGF beta-3 for equine, bone marrow derived, mesenchymal stem (stromal) cells (MSCs). MSCs from 9 horses were maintained in 3D pellet cultures for 4 weeks with chondrogenic medium supplemented with 10 ng/ml of TGFβ1, TGFβ2 or TGFβ3. Harvest and assessment of gene expression was performed at 1, 14 and 28 days. Chondrogenesis was verified with all 3 peptides, and there were no differences in aggrecan or collagen type IIB expression at any time-point. At 28 days, there was significantly higher Sox9 and significantly lower collagen type X expression for TGFβ3 treated pellets compared to TGFβ1 and TGFβ2, suggesting that TGFβ3 better maintains a hyaline-like chondrogenic state rather than chondrogenic hypertrophy. Alcian blue staining of histologic preparations confirmed glycosaminoglycan accumulation within pellets from all three peptide groups, without obvious differences between the peptides. The addition of TGFβ3, rather than TGFβ1 or TGFβ2, to culture medium during MSC isolation and expansion may better drive chondrogenesis in autologous MSCs prior to implantation in cartilage defects, where the clinical goal is the production of hyaline-like cartilage. In addition to *in vitro* pre-differentiation, TGFβ3 may be better suited for use in gene therapy techniques, where autologous MSCs would continue over-expression of inserted genes within the articular environment, after implantation to cartilage defects.

Distribution and Homing of Stem Cells After Intra-Articular Injection to Normal and Arthritic Joints. Ashlee E. Watts, Alan J. Nixon. Cornell University, Ithaca, NY.

Stem cells can home to sites of bone injury, but evidence for accumulation in cartilage lesions is not robust.

We hypothesized that autologous bone marrow derived mesenchymal stem (stromal) cells (MSCs) would engraft to cartilage in OA joints but not in normal joints following intra-articular injection.

Twenty-nine joints from 10 horses were characterized as normal or OA through lameness and radiographic examination. Second passage autologous MSCs (3×10^6 for fetlocks and 5×10^6 for femoropatellar joints) were labeled with fluorescent nanoparticles (Quantum® dots; Qdot®) or remained unlabeled (7 joints). Seventeen normal and 12 OA joints were injected and examined after 1 week by necropsy and fluorescent microscopy.

Clinical findings included increased lameness (2), and severe effusion (11), moderate (3), or slight effusion (4). Synovial fluid abnormalities included elevated nucleated cell counts (median 2,800/ul; interquartile range 1,750–4,450/ul), consisting of large mononuclear cells and small lymphocytes. There were no statistically significant differences in synovial parameters between Qdot® labeled and unlabeled MSC injected joints. Qdot® labeled MSCs were found predominantly in the synovial membrane compared to cartilage ($P < 0.0001$). Adherence of labeled MSCs to cartilage was minimal and found in 17 of 97 cartilage sections. The proportion of positive sections from synovium and cartilage was not different between OA and normal joints ($P = 0.79$).

Although mild, joint flares were common after intra-articular MSC injection. Synovial cytology was indicative of non-septic inflammation and antigenic stimulation. MSCs did not reliably home to cartilage injury in OA joints.

Endovascular Treatment and/or Evaluation of Canine Intrahepatic Portosystemic Shunts: Short- and Long-Term Experience in 100 Dogs. Chick Weisse¹, Allyson Berent¹, Kim Todd², Jeffrey Solomon². ¹Animal Medical Center, New York, NY; ²University of Pennsylvania, Philadelphia, PA.

The purpose of this study was to retrospectively evaluate the short- and long-term results following endovascular management of canine intrahepatic portosystemic shunts.

100 dogs with congenital IHPSS received 112 procedures (80% had one treatment, 15% had >1 treatment, and 5% had 0 treatments due to excessive portal-central venous pressure gradients). Percutaneous vascular access and angiography identified 41 right divisional, 35 left divisional, and 19 central divisional shunts (5 not reported) of which 9% were complex/multiple shunts. Partial shunt attenuation was performed in 92 cases using caval stent placement and thrombogenic coils within the shunt while monitoring portal blood pressure. Complete acute shunt occlusion was possible in 3 cases. Major intra-operative complications (2/112; 2%) included temporary severe portal hypertension in one dog and GI hemorrhage in one dog. Major perioperative (<1 week post-op) complications (12/110; 11%) included seizures/HE (6%), cardiac arrest (2%), jugular site bleeding (2%), pneumonia (1%), and acute death (1%). Median follow time for treated cases was 828 days (range 0–3411). Median survival time for treated dogs was 2204 days (range 0–3411) with 93% 60 day, 83% 1 yr, 74% 2 yr, and 63% 3 yr survival rates. Outcome was considered excellent (48/90; 53%) or good (19/90; 21%) in 74% of treated dogs.

Endovascular treatment for canine intrahepatic shunts may result in lower perioperative morbidity and mortality rates with similar success rates when compared with previously reported open surgical procedures. Gastrointestinal ulceration was a common finding among this population of dogs and lifelong gastroprotectant medications are now recommended by the authors.

Biomechanical Evaluation of Medial Femoral Condylar Subchondral Bone Cysts and the Effects of Treatment with Internal Fixation. Jarred M. Williams¹, Elizabeth Santschi¹, Alan Litsky². ¹Veterinary Clinical Sciences, Ohio State University, Columbus, OH; ²The Orthopaedic BioMaterials Laboratory, Ohio State University, Columbus, OH.

Subchondral bone cysts (SBCs) of the medial femoral condyle (MFC) are a source of lameness. The goals of treatment are to reduce lameness, ideally by healing the subchondral bone and the deeper bone defect. The objective of this study was to measure the strain on the MFC before and after the creation of a cyst-like defect, and to evaluate the changes in strain following placement of a lag screw across the MFC. Stifle joints were collected and uniaxial strain gages were placed abaxially on the MFC. The stifle was fixed at an angle of ~135°. Axial compression was applied in increments of 100 lbs from 100–900 lbs, and the strain measured. A defect was created in the MFC at the site of weight-bearing and the limb was retested. Lastly, a 4.5 mm cortical bone screw was placed in lag fashion across the defect, and the limb was tested for a final time. There was no significant difference in peripheral condylar bone strain before and after the creation of the defect; however following lag screw placement, peripheral bone strain decreased. Most likely, bone strain was directed across the condyle and through the bone defect. This redirection of strain into a bone void could promote healing of SBCs and a reduction in lameness.

Determination of the Mechanical Axis and Joint Orientation Lines in the Canine Humerus: A Radiographic Cadaveric Study. Mirae C. Wood, Derek B. Fox, James L. Tomlinson. Comparative Orthopaedic Laboratory, University of Missouri Veterinary Medical Teaching Hospital, Columbia, MO.

Although humeral angulation alone is not well documented in the literature, fragmented medial coronoid disease (FMCD) has been theorized to occur secondary to humeral malalignment. This theory has prompted the performance of sliding osteotomies in cases where humeral mechanical axis deviation is suspected. However, the normal humeral mechanical axis and its relationship with the canine elbow have yet to be definitively determined. We hypothesized that a radiographic method could be developed to determine the mechanical axis and associated joint orientation lines of the canine humerus in orthogonal planes. Humeri of skeletally mature, nonchondrodystrophic canine cadavers weighing greater than 20 kilograms with no evidence of orthopedic disease were studied. Anatomic landmarks were established and frontal plane radiographs were used to determine the mechanical lateral distal humeral angle (mLDHA). Mediolateral radiographs were used to establish anatomic landmarks and measure the mechanical caudal proximal humeral angle (mCaPHA) and mechanical cranial distal humeral angle (mCrDHA). Means \pm SD for the joint orientation angles were: mLDHA, $86.92 \pm 1.24^\circ$, mCaPHA, $43.28 \pm 5.44^\circ$, and mCrDHA, $71.86 \pm 3.97^\circ$. The 95% CI ranges for the joint orientation angles were mLDHA, $86.58\text{--}87.86^\circ$, mCaPHA, $41.77\text{--}44.79^\circ$, and mCrDHA, $70.76\text{--}72.96^\circ$. This information could be used in assessing humeri for angulation. Using these reference values, dogs with FMCD could be assessed to ascertain if differences exist in the mechanical axis or joint orientation angles. The location of the normal humeral mechanical axis and values for humeral joint angles may be clinically useful for diagnosis, treatment, and assessment of canine forelimb abnormalities.

Use of a Carrel Patch for Multiple Renal Arteries in Feline Renal Transplantation. Jodi Woods, Jonathan F. McNulty. Veterinary Medical Teaching Hospital, University of Wisconsin, Madison, WI.

Feline renal transplantation currently involves procurement of the left kidney and end-to-side anastomosis of the renal vessels. When the left kidney has multiple arteries, the right kidney is used but is not optimal due to a shorter renal vein, making implantation more difficult. Cats with bilateral multiple renal arteries are currently not considered feasible donors.

The Carrel Patch technique involves removal of a cuff of aortic wall containing the renal artery(s). In feline renal transplantation, a Carrel Patch has potential advantages as it could permit use of the preferred left kidney when the left or both kidneys have multiple arteries. It may also be easier to implant and less prone to bleeding or thrombosis.

We performed renal transplantation in four cats with chronic renal failure using a Carrel patch technique for donor left kidney procurement. A patch of donor aortic wall was removed with either two or one renal artery(s) and

the aorta closed using a 9-0 nylon overlapping simple continuous suture pattern. Implantation of the Carrel Patch in recipient cats was performed end-to-side on the left by standard methods. The renal vein and ureter were implanted as previously described. All donors and recipients survived surgery without vascular complication.

The Carrel patch is a novel approach allowing for the acquisition of kidneys with multiple renal arteries, as well as providing the benefit of simplifying the implant procedure with possible decreased risks of bleeding and thrombosis. This technique provides a new and advantageous technique for use in feline renal transplant procedures.

Delayed Gadolinium Enhanced Magnetic Resonance Imaging of Cartilage Predicts Short-Term Outcome in Dogs Surgically Treated for a Fragmented Coronoid Process. Katja L. Wucherer, Christopher P. Ober, Michael G. Conzemius. Clinical Sciences, University of Minnesota, St Paul, MN.

The clinical success and quality of life for dogs treated for fragmentation of the medial coronoid process (FCP) is variable, regardless of treatment regimen chosen. Preoperative predictors outcome are lacking and recommendations to clients about whether a patient is a good candidate for surgery is based largely on clinician preference. Studies in human orthopedic disease have shown that delayed gadolinium enhanced magnetic resonance imaging of cartilage (dGEMRIC) can be used preoperatively to predict long term outcome in people with hip dysplasia. This is because dGEMRIC is highly sensitive to the glycosaminoglycan (GAG) content within cartilage and thus to the integrity of the cartilage prior to surgery. This study compares preoperative dGEMRIC indices in dogs undergoing arthroscopic removal of their FCP +/- proximal ulnar osteotomy with six month ground reaction forces and owner assessment. In dogs that were considered to have a successful outcome, dGEMRIC values were significantly higher preoperatively than in dogs that had an unsuccessful outcome. For dogs with a FCP our early results strongly suggest that an estimate of glycosaminoglycan content in the medial compartment of the elbow before surgery predicts the probability of a successful outcome.

Adult Equine Mesenchymal Stromal Cells on Collagen Scaffolds for In Vitro Tissue Generation. Lin Xie¹, Mandi Lopez¹, Jeffrey Gimble². ¹Veterinary Clinical Sciences, Louisiana State University, Baton Rouge, LA; ²Pennington Biomedical Research Center, Louisiana State University, Baton Rouge, LA.

The goal of this study was to quantify adipogenesis, osteogenesis and chondrogenesis of adult equine adipose (ASCs) and bone marrow derived multipotent stromal cells (BMSCs) on commercially available bovine collagen I scaffolds. ASCs and BMSCs harvested from four equine donors (7–10 years) were seeded onto collagen scaffolds by perfusion bioreactor. The cell surface marker profile of cells was established by flow cytometry prior to loading. Scaffold-cell constructs were assessed immediately after loading and after 7, 14, and 21 days of culture in stromal, adipogenic, chondrogenic, or osteogenic medium. Confocal laser microscopy, light microscopy, PicoGreen assays, and scanning electron microscopy were used to evaluate cell viability, distribution, proliferation and construct ultrastructure, respectively. Tissue specific induction was confirmed by tissue microstructure and mRNA levels of tissue specific genes. Approximately 3% of cells were CD34+ and 86% were CD44+. Based on confocal laser microscopy, uniform cell distribution was achieved with perfusion bioreactor loading. Loading efficiency was similar between different cell types. ASC proliferation rates were significantly greater than that of BMSCs. RT-PCR results showed significantly decreased expression of Sox 2 with culture time for both cell types on scaffolds. Light microscopy showed increased extra cellular matrix formation in cell-scaffold constructs cultured in induction versus stromal medium for both cells types. Scanning electron microscopy of scaffold-cell constructs confirmed adipocyte morphology, collagenous extracellular matrix formation and osteoblast morphology. These results support adipogenic, osteogenic, and chondrogenic differentiation of equine ASCs and BMSCs on type I collagen scaffolds and have positive implications for in vivo tissue regeneration.

In Vitro Expansion Rates and Multi-Potential of Adult Canine Stifle Adipose, Synovium and Cranial Cruciate Ligament Multipotent Stromal Cells. Nan Zhang, Mandi Lopez. Veterinary Clinical Sciences, Louisiana State University, Baton Rouge, LA.

Rupture of cranial cruciate ligament (CrCL) is one of the most common causes of canine hind limb lameness. Tissue engineering with adult stromal (stem) cells has significant potential for CrCL regeneration to restore stifle function. This study was designed to compare in vitro expansion capacities and multi-potential of adult multipotent stromal cells derived from three tissues within the stifle, adipose – (ASC), synovium- (SSC) and cranial cruciate ligament- (LSC). Patellar fat pad, synovium, and CrCL were

collected from six normal canine stifles, and cells were characterized by cell proliferation rate, multi-potentiality, and stromal cell surface markers. The overall cell doublings (CD) (P0–6) for ASC, SSC, and LSC were 2.29 ± 0.42 CD/day, 1.81 ± 0.36 CD/day, and 1.40 ± 0.47 CD/day, respectively. The ASC CD number was significant higher than SSC and LSC. The LSCs had significantly higher adipogenic, osteogenic, and fibroblast colony forming

units (CFU) than ASCs and SSCs for P3. All three cell types displayed comparable chondrogenesis. All types were highly positive (>80%) for CD29, CD44, and CD90 (stromal), and highly negative (>80%) for CD34 and CD45 (hematopoietic) from P0-P6. As passages increased, the percentage of CD29 and CD44 positive cells decreased. This study demonstrates that ASCs may have better potential for tissue engineering than SSC and LSC.