Understanding and Evaluating Veterinary Clinical Research
William Buhles, PhD, DVM, Philip H. Kass, MS, PhD, DVM, MPVM, DACVPM
ABSTRACT
Results from investigations conducted in clinical settings contribute greatly to determining how veterinarians practice medicine. It is important for the practitioner to understand how clinical information is collected, analyzed, and communicated in journals and presentations at conferences. Clinical research is either retrospective in observational studies, looking at historical medical records as the source of data, or prospective in both experimental and observational studies, where the study is designed before any patients are included. Prospective, experimental studies provide the more reliable results, although they form a minority of published reports. Randomized, controlled trials are the most reliable format, and attempts should be made to use this design more often in veterinary medicine. Care must be taken in the conduct of clinical research to reduce sources of bias that can yield false findings, particularly in small, retrospective studies. Statistical analysis is the key to data interpretation, but must be applied appropriately to avoid either wrong assumptions or misconception. Regardless of how studies are conducted, it is important for the practitioner to be an astute reader of the clinical literature. An understanding of clinical research methods will result in better medical standard of care recommendations and practice.

Clinical Course of Acute Canine Polyradiculoneuritis Following Treatment with Human IV Immunoglobulin
Katrin Hirschvogel, DVM, Konrad Jurina, DVM, Dr.med.vet., DECVN, Tanja A. Steinberg, DVM, ABSTRACT
Treatment of dogs with acute canine polyradiculoneuritis (ACP) is restricted to physical rehabilitation and supportive care. In humans with Guillain-Barré syndrome, the counterpart of ACP, randomized trials show that IV immunoglobulin (IVIg) speeds recovery. The authors of the current study hypothesized that dogs with ACP would tolerate IVIg well and recover faster than dogs managed with supportive treatment only. Sixteen client-owned dogs with ACP were treated with IVIg, and 14 client owned dogs served as a retrospective control group. Diagnosis was confirmed using clinical features, electrodiagnostics, cerebrospinal fluid analysis, and muscle/nerve biopsies. The duration of the initial progressive phase, the time from IVIg administration until the dogs were ambulating without assistance, and the duration of the complete episode were evaluated. Adverse reactions (anaphylaxis, mild hematuria) were observed in two dogs. Dogs treated with IVIg were ambulating without assistance after a median of 27.5 days (range, 15–127 days) from onset of clinical signs. The control group was ambulatory without assistance at a median of 75.5 days (range, 5–220 days). Even though this result is not statistically significant, there is a clear trend toward faster recovery in dogs treated with IVIg.

Comparison of Epidural and Systemic Tramadol for Analgesia Following Ovariohysterectomy
Sandra Mastrocinque, PhD, Tatiana F. Almeida, MS, Ange´ liça C. Tatarunas, PhD, DVM, Viviani H. Imagawa, ABSTRACT
The objective of the study was to compare epidural and systemic tramadol for postoperative analgesia in bitches undergoing ovariohysterectomy. Twenty animals, randomly divided into two groups, received either epidural (EPI) or intramuscular (IM) tramadol (2 mg/kg) 30 min before anesthetic induction. Analgesia, sedation, cardiorespiratory parameters, end-tidal isoflurane, blood catecholamines and cortisol, and arterial blood gases were measured at different time points up to 24 hr after agent administration. There were no differences between the two groups regarding cardiorespiratory parameters, end-tidal isoflurane, and pain scores. Two dogs in the IM and one in the EPI group required supplemental analgesia. Cortisol was increased (P<0.05) at 120 min (3.59 mg/dL and 3.27 mg/dL in the IM and EPI groups, respectively) and 240 min (2.45 mg/dL and 2.54 mg/dL in the IM and EPI groups, respectively) compared to baseline. Norepinephrine was also increased (P<0.05) at 120 min in both groups compared to baseline values. Epinephrine values were higher (P<0.05) in the IM group compared with the EPI group at 50 min, 120 min, and 1,440 min after tramadol administration. Epidural tramadol is a safe analgesic, but does not appear to have improved analgesic effects compared with IM administration.
Corynebacterium spp. in Dogs and Cats with Otitis Externa and/or Media: A Retrospective Study
Kerstin Henneveld, Dr.med.vet.*, Rodney A.W. Rosychuk, DVM, DACVIM, Francisco J. Olea-Popelka, MSc,
ABSTRACT
The role of Corynebacterium spp. in the pathogenesis of canine and feline otitis externa/media and their appropriate antimicrobial therapy are unclear. The objectives of this study were to (1) better establish the pathogenicity of Corynebacterium spp. in otitis utilizing reported criteria and by assessing clinical response to antibiotic therapy and (2) to determine the antimicrobial susceptibility patterns of Corynebacterium spp. associated with otitis. The study was retrospective, targeting cultures positive for Corynebacterium spp. Corynebacterium spp. were part of mixed microbial populations in 79/81 cultures. Corynebacterium spp. pathogenicity was highly questionable because of their almost invariable presence with other microbes and the observation that Corynebacterium spp. usually disappear from the ear with resolution of other infections, even when the Corynebacterium spp. are resistant to the prescribed antibiotic(s). However, 2/81 cultures came from two canine ears wherein Corynebacterium spp. may have been pathogenic. Antimicrobial sensitivities for Corynebacterium spp. were available for 54 isolates. Most isolates were susceptible to chloramphenicol (53/54), amikacin (50/54), tetracycline (50/54), gentamicin (46/54), and enrofloxacin (32/54). Among those antibiotics available in otic products, gentamicin and enrofloxacin would be rational choices for the empirical, topical therapy of Corynebacterium spp.

Clinical and MRI Findings in Three Dogs with Polycystic Meningiomas
Fiona M. K. James, MSc, DVM, DVSc, DACVIM (Neurology), Ronaldo C. da Costa, PhD, DVM, DACVIM
ABSTRACT
One spayed female Labrador retriever and two castrated male golden retrievers were evaluated for chronic (i.e., ranging from 3 wk to 24 wk) neurologic signs localizable to the prosencephalon. Signs included seizures, circling, and behavior changes. MRI demonstrated extra-axial, contrast-enhancing, multiloculated, fluid-filled, cyst-like lesions with a mass effect, causing compression and displacement of brain parenchyma. Differential diagnoses included cystic neoplasm, abscess or other infectious cyst (e.g., alveolar hydatid cyst), or fluid-filled anomaly (e.g., arachnoid cyst). The cyst-like lesions were attached to the rostral falx cerebri in all cases. In addition, case 2 had a second polycystic mass at the caudal diencephalon. Surgical biopsy (case 3 with a single, rostral tumor via transfrontal craniectomy) and postmortem histology (in cases 1 and 2) confirmed polycystic meningiomas. Tumor types were transitional (cases 1 and 3) and fibrous (case 2), with positive immunohistochemical staining for vimentin. Case 3 was also positive for E-cadherin, s100, and CD34. In all cases, staining was predominantly negative for glial fibrillary acid protein and pancytokeratins, supporting a diagnosis of meningioma. This report describes the first cases of polycystic meningiomas in dogs. Polycystic meningiomas are a rare, but important, addition to the differential diagnoses for intracranial cyst-like lesions, significantly affecting planning for surgical resection and other therapeutic interventions.

MRI Findings of a Middle Ear Cholesteatoma in a Dog
Nathaniel X. Harran, DMV, Kate J. Bradley, MA, VetMB, PhD, DVR, DECVDI, Natasha Hetzel, BSc, BVSc,
ABSTRACT
This article describes the MRI features of a middle ear cholesteatoma in an 8 yr old flat-coated retriever. Physical examination revealed pain on opening the jaw, and otoscopic examination showed tympanic membrane rupture associated with hyperplastic tissue at the entrance of the middle ear. Standard MRI sequences allowed for the identification of a severely expanded bulla containing material that was isointense to brain tissue on T1-weighted images and of mixed intensity on T2-weighted and fluid-attenuated inversion recovery sequences. No postcontrast enhancement of the content was present, but the lining of the bulla was partially enhanced. The images allowed evaluation of the surgical margins and the secondary changes due to the expansion of the mass. Surgery was performed and histopathology confirmed the presumptive diagnosis of cholesteatoma. In the present case, MRI appeared to serve as a good alternative to computed tomography for the diagnosis of cholesteatoma.
MRI of a Split Cord Malformation in a German Shepherd Dog
Brian Allett, DVM, Michael R. Broome, MS, DVM, DABVP, David Hager, DVM, MD, DACVR
ABSTRACT
A 9 yr old spayed female German shepherd dog was referred for MRI of the thoracic and lumbar spine because she had clinical signs of chronic neurogenic bladder dysfunction of an unknown cause. Transverse T2-weighted images identified a type II split cord malformation (i.e., diastematomyelia) in the thoracic spine. Split cord malformations are forms of spinal dysraphism where the abnormal development of spinal cord results in sagittal splitting of a portion of the cord into two hemicords. The location of the lesion in the thoracic spine was consistent with the dog’s clinical signs of an upper motor neuron bladder. Split cord malformations that occur in humans have similar MRI characteristics and can result in similar clinical signs as those identified in the dog described in this report.

49-Month Survival Following Caval Venectomy Without Nephrectomy in a Dog with a Pheochromocytoma
Pierre J. Guillaumot, DrVet*, Dominique Heripret, DrVet, DECVD, Bernard M. Bouvy, MS, DrVet, DECVS, ABSTRACT
An 11 yr old spayed female Labrador retriever was diagnosed with a right adrenal tumor. At surgery, adhesions to the right kidney were dissected, allowing the right kidney to be preserved. The tumor showed extensive invasion into the suprarenal vena cava. It was felt that thrombus removal via venotomy could not be performed. Instead, the vena cava was ligated caudal to the liver and cranial to the right renal vein. The neoplastic gland was then excised en bloc together with the portion of the invaded caudal vena cava. Hind limb edema had developed preoperatively and increased transiently in the first days postoperatively. The animal was discharged 6 days postoperatively with no other clinical disorders, and hind limb edema resolved over time. Histopathology identified a pheochromocytoma. The dog died 49 mo later. A neoplastic thrombus of the vena cava may require venotomy to allow thrombus removal. Occasionally, removal of the thrombus by venotomy may prove impossible. In such a situation, en bloc removal of the concerned portion of the vena cava may be performed with a good long-term outcome provided that gradual occlusion of the vena cava by the thrombus has allowed time for collateral circulation to develop.

Gliomatosis Cerebri in Two Dogs
Brandon L. Plattner, PhD, DVM, DACVP*, Marc Kent, DVM, Brian Summers, BVSc, PhD, MRCVS, ABSTRACT
A 3.5 yr old Saint Bernard was evaluated for nonambulatory tetraparesis and cranial nerve dysfunction, and a 7 yr old Rottweiler was evaluated for progressive paraparesis. Clinical signs of left-sided vestibular and general proprioceptive ataxia and cranial nerve VII dysfunction in the Saint Bernard suggested a lesion affecting the brain stem. Signs in the rottweiler consisted of general proprioceptive/upper motor neuron paraparesis, suggesting a lesion involving the third thoracic (T3) to third lumbar (L3) spinal cord segments. MRI was normal in the Saint Bernard, but an intraaxial lesion involving the T13–L2 spinal cord segments was observed in the rottweiler. In both dogs, the central nervous system (CNS) contained neoplastic cells with features consistent with gliomatosis cerebri (GC). In the Saint Bernard, neoplastic cells were present in the medulla oblongata and cranial cervical spinal cord. In the rottweiler, neoplastic cells were only present in the spinal cord. Immunohistochemistry disclosed two distinct patterns of CD18, nestin, and vimentin staining. GC is a rarely reported tumor of the CNS. Although GC typically involves the cerebrum, clinical signs in these two dogs reflected caudal brainstem and spinal cord involvement.

L-2-Hydroxyglutaric Aciduria in Two Female Yorkshire Terriers
Daniel F. Sanchez-Masian, DVM, MRCVS*, Rafael Artuch, MD, PhD, Joan Mascort, DVM, DECVN, ABSTRACT
Two female Yorkshire terrier puppies were presented with generalized tonic-clonic seizures and ataxia. MRI revealed bilaterally symmetrical, diffuse regions of gray matter hyperintensity on T2-weighted and fluid-attenuated inversion recovery sequences. Urinary organic acids were quantified by gas chromatography-mass spectroscopy and were consistent with a diagnosis of L-2-hydroxyglutaric aciduria (L2HGA). The L2HGDH gene encodes for the enzyme L-2-hydroxyglutarate dehydrogenase, which helps break down L-2-
hydroxyglutaric acid. In both puppies described in this report, a homozygous mutation at the translation
initiation codon of the homolog canine L2HGDH gene was detected (c.1A>G; p.Met1?), confirming the
diagnosis of L2HGA at the DNA level. Canine L2HGA is caused by more than one mutation of L2HGDH, as
reported in humans.

**Australian Veterinary Journal**

**Can dogs carry the global pandemic candidate avian influenza virus H9N2?**
H Amirsalehy, H Nili* and A Mohammadi

Background: H9N2 avian influenza virus (AIV) is one of the most widely circulating viruses in Eurasia. Recent
studies have shown that the molecular recombination of H9N2 and H1N1 could pose a pandemic threat.
Mammals that are susceptible to subtype H9N2 may contribute to the spread of the virus.
Objective: To determine the susceptibility of 1-year-old dogs to H9N2 AIV.
Procedure: H9N2 AIV infection was experimentally reproduced in 1-year-old dogs. The animals were
intranasally inoculated with a titre of $10^{7.5}$ (50% egg infective dose) of H9N2 AIV isolated from a broiler farm
during an outbreak. The animals in the contact group were exposed to contaminated surfaces.
Results: Clinical signs including sneezing, coughing and nasal discharge were observed in the inoculated and
contact groups. The virus was detected in nasal swab, faecal and buffet samples of dogs in both the
inoculated and contact groups and both groups developed antibody titres against AIV H9N2 subtype.
Conclusion: H9N2 AIV isolated from outbreaks in a broiler farm can easily infect dogs and infected animals
shed the virus. Because many Asian countries are facing frequent outbreaks of H9N2 infection in the poultry
industry, dogs could be a potentially important source of virus transmission within and between poultry farms.

**The Australian Veterinary Practitioner**

**Clitoral adenocarcinoma and hypercalcaemia in a dog**
KE Mitchell, MBurgess, MJ Carrigan

A 9-year-old, spayed, female golden retriever was evaluated for hypercalcaemia and a mass protruding from the
vulva. The mass originated from the clitoris and was completely excised. Microscopic examination of the mass
revealed features consistent with adenocarcinoma. There was no evidence of metastasis to the lungs, abdomen
or peripheral lymph nodes at the time of surgical excision. Inguinal lymph node enlargement and recurrence of
hypercalcaemia were noted at a reexamination seven months after surgery. The dog was administered palliative
treatment with oral prednisone. The dog was euthanised 14 months after surgery for clinical signs related to
hypercalcaemia and prolonged corticosteroid use, including gastrointestinal disease, weakness and lethargy. The
clinical features and course of this case share similarities to the other reported case of clitoral adenocarcinoma in
the dog. This case report discusses clinical features of the rarely documented tumour and highlights clitoral
adenocarcinoma as another differential diagnosis for humoral hypercalcaemia of malignancy in a female dog.

**Idiopathic chylothorax in dogs and cats: A review of current treatments**
J Michelsen, G Edwards

Chylothorax in dogs and cats is a challenging condition to treat, partly because its pathogenesis is poorly
understood. When a cause for chylothorax can be established, treatment is directed at correcting this cause.
When no cause is identified and a default diagnosis of idiopathic chylothorax is made, treatment can only be
directed at reducing the chylous pleural effusion. Current recommendations for treatment of idiopathic
chylothorax vary but are based on reported responses to these treatments. Some animals will be refractory to
these treatments. This review presents a brief synopsis of the pathophysiology of idiopathic chylothorax and
examines the benefit of different treatments based on the current veterinary literature.

**The radiographic signs of pneumoperitoneum in dogs: a guide for the practitioner**
JL Day and RD Pechman

Pneumoperitoneum is an important radiographic diagnosis as spontaneous and traumatic pneumoperitoneum are
indications for exploratory coeliotomy. The radiographic signs of pneumoperitoneum observed on standard
lateral and ventrodorsal radiographs of the abdomen are visualisation of both sides of the diaphragm, gas
bubbles in the region of the liver, angular gas bubbles trapped in the omentum and mesentery, increased serosal contrast of abdominal organs (often with concurrent decreased serosal detail due to peritoneal fluid), and large gas bubbles covering most of the abdomen. Horizontal beam (positional) radiography can be performed if confirmation of pneumoperitoneum is required. It may also be considered as part of routine abdominal radiography in animals with unexplained clinical signs referable to the abdomen or with risk factors for gastroduodenal ulceration. A horizontal beam lateral projection made with the animal in dorsal recumbency is the most sensitive position and has the advantage of minimal interference by gas within the gastrointestinal tract. A horizontal beam ventrodorsal projection made with the animal in left lateral recumbency is also sensitive for interpretation. This positioning has the advantage of being better tolerated by animals, particularly dyspnoeic animals. In both projections, gas is seen between the liver and the diaphragm. This paper outlines the techniques and skills for radiographic interpretation of pneumoperitoneum with the intent of improving the proficiency of the practitioner to make this critical diagnosis.

**Compendium**

**Feline Uveitis**
Angie Shukla, BSc, DVM, Chantale Pinard, DVM, MSc, DACVO

Uveitis is defined as inflammation of the vascular tunic of the eye, the uvea. Although inflammation can affect the entire uvea, clinical signs may present predominantly in either the anterior or the posterior chamber. Anterior uveitis lesions may affect the cornea, anterior chamber, iris, and lens, whereas posterior uveitis anomalies may be located in the vitreous and fundus. Uveal inflammation is often a sentinel finding indicative of underlying systemic pathology. Causes of feline uveitis are numerous, with infectious disease being the most common. Clinical signs are often nonspecific, and recurrence of disease is common, posing the challenges of accurate diagnosis and appropriate treatment.

**Journal of Feline Medicine and Surgery**

**Chronic Bartonellosis in Cats: What are the potential implications?**
Bianca Stützer and Katrin Hartmann

Practical relevance: Bartonellae are small, vector-transmitted Gramnegative intracellular bacteria that are well adapted to one or more mammalian reservoir hosts. Cats are the natural reservoir for Bartonella henselae, which is a (re-)emerging bacterial pathogen. It can cause cat scratch disease in humans and, in immunocompromised people, may lead to severe systemic diseases, such as bacillary angiomatosis. Cats bacteraemic with B henselae constitute the main reservoir from which humans become infected. Most cats naturally infected with B henselae show no clinical signs themselves, but other Bartonella species for which cats are accidental hosts appear to have more pathogenicity. Global importance: Several studies have reported a prevalence of previous or current Bartonella species infection in cats of up to 36%. B henselae is common in cats worldwide, and bacteraemia can be documented by blood culture in about a quarter of healthy cats. The distribution of B henselae to various parts of the world has largely occurred through humans migrating with their pet cats. The pathogen is mainly transmitted from cat to cat by fleas, and the majority of infected cats derive from areas with high flea exposure. No significant difference in B henselae prevalence has been determined between male and female cats. In studies on both naturally and experimentally infected cats, chronic bacteraemia has mainly been found in cats under the age of 2 years, while those over 2 years of age are rarely chronically bacteraemic. Evidence base: This article reviews published studies and case reports on bartonellosis to explore the clinical significance of the infection in cats and its impact on humans. The article also discusses possible treatment options for cats and means of minimising the zoonotic potential.

**Feline Physiotherapy and Rehabilitation: 1. Principles and potential**
Brian Sharp

Practical relevance: Physiotherapy is highly valued within human medicine and relatively well established for canine patients. Despite a popular misconception that feline patients will not cooperate with such treatment, physiotherapy is now increasingly being performed with cats. With cat ownership increasing in many countries,
and an emergence of specialist physiotherapy practitioners, there is demand for effective postoperative and post-injury rehabilitation for any cat with compromised physical function due to injury, surgery or disease. Clinical challenges: While physiotherapy and rehabilitation are potentially beneficial for cats, due to their independent nature feline patients certainly present a greater challenge in the pursuit of effective therapy than their canine counterparts. Audience: This two-part review article is directed at the primary care veterinary team. The benefits of physiotherapy and the various treatment modalities available to the qualified veterinary physiotherapist, as well as the non-specialist veterinarian and veterinary nurse or technician, are examined in this first part. Evidence base: The benefits of human physiotherapeutic intervention are well documented, and there is good evidence for the effectiveness of most treatment modalities. Animal studies are still in their infancy, although some preliminary studies in dogs have shown good results.

**Feline Physiotherapy and Rehabilitation : 2. Clinical application**
Brian Sharp

Practical relevance: There is an increasing demand for effective postoperative and post-injury rehabilitation for any cat with compromised physical function due to injury, surgery or disease.

Clinical challenges: The design of a suitable rehabilitation programme that will assist the recovery process, as well as ensure the return of neuromusculoskeletal control to the highest levels of function possible, requires a good understanding of feline behaviour, accurate assessment of the cat’s condition and the correct implementation of a range of physiotherapeutic modalities. Audience: This two-part review article is directed at the primary care veterinary team. The clinical application of a variety of physiotherapeutic modalities in the rehabilitation of cats is examined in this second part. Evidence base: Although evidence supporting the benefits of physiotherapy and rehabilitation with cats is sparse, many techniques, treatments and rehabilitation regimens successfully used on human patients are being readily adapted for animal use. Treatment recommendations described in this review are primarily based on the author’s experience, and that of colleagues, except where specific reference is made to published evidence.

**Cerebral coenurosis in a cat caused by Taenia serialis: neurological, magnetic resonance imaging and pathological features**
Philip Jull, Elizabeth Browne, Belgees S Boufana, Sandra Schöniger and Emma Davies

Clinical summary: A 4-year-old Birman cat was presented with marked obtundation and non-ambulatory tetraparesis. Two well-demarcated, intra-axial T2-hyperintense, T1-hypointense structures, which did not contrast enhance, were evident on magnetic resonance imaging (MRI). Histopathology of the structures revealed metacestodes that were morphologically indicative of larval stages of Taenia species. Polymerase chain reaction amplification of a fragment within the 12S rRNA gene confirmed the subspecies as Taenia serialis.

Practical significance: This is the first report of MRI findings of cerebral coenurosis caused by T serialis in a cat. Early MRI should be considered an important part of the diagnostic work-up for this rare clinical disease, as it will help guide subsequent treatment and may improve the prognosis.

**JVIM (Sep/Oct)**

**Duodenal Endoscopic Findings and Histopathologic Confirmation of Intestinal Lymphangiectasia in Dogs**
R.N. Larson, J.A. Ginn, C.M. Bell, M.J. Davis, and D.S. Foy

Background: The diagnosis of intestinal lymphangiectasia (IL) has been associated with characteristic duodenal mucosal changes. However, the sensitivity and specificity of the endoscopic duodenal mucosal appearance for the diagnosis of IL are not reported.

Hypothesis/Objectives: To evaluate the utility of endoscopic images of the duodenum for diagnosis of IL. Endoscopic appearance of the duodenal mucosal might predict histopathologic diagnosis of IL with a high degree of sensitivity and specificity.

Animals: 51 dogs that underwent upper gastrointestinal (GI) endoscopy and endoscopic biopsies.

Methods: Retrospective review of images acquired during endoscopy. Dogs were included if adequate biopsies were obtained during upper GI endoscopy and digital images were saved during the procedure. Images were assessed for the presence and severity of IL. Using histopathology as the gold standard, the sensitivity and specificity of endoscopy for diagnosing IL were calculated.
Results: Intestinal lymphangiectasia (IL) was diagnosed in 25/51 dogs. Gross endoscopic appearance of the duodenal mucosa had a sensitivity and specificity (95% confidence interval) of 68% (46%, 84%) and 42% (24%, 63%), respectively for diagnosis of IL. Endoscopic images in cases with lymphopenia, hypcholesterolemia, and hypoalbuminemia had a sensitivity of 80%.

Conclusions and Clinical Importance: Endoscopic duodenal mucosa appearance alone lacks specificity and has only a moderate sensitivity for diagnosis of IL. Evaluation of biomarkers associated with PLE improved the sensitivity; however, poor specificity for diagnosis of IL supports the need for histopathologic confirmation.

Acute Azotemia as a Predictor of Mortality in Dogs and Cats
E. Harison, C. Langston, D. Palma, and K. Lamb

Background: Acute kidney injury (AKI) has been shown to be a predictor of mortality in human medicine. Published studies in the veterinary literature evaluating relative changes in serum creatinine concentration as a prognostic factor are limited.

Objective: To evaluate an AKI grading system based on serum creatinine concentration to determine if it correlates with outcome prediction in dogs and cats.

Animals: Six hundred forty-five dogs and 209 cats that had at least 2 serum creatinine concentration measurements measured within 7 days.

Methods: Retrospective study. Dogs and cats with an initial serum creatinine concentrations of _1.6 mg/dL and that had more than 1 concentration measured within 2, 3, and 7 days were placed into levels (0–2) based on absolute changes. Mortality then was determined at 30 and 90 days.

Results: Based on odds ratios calculated with a 95% confidence interval, dogs placed in level 1 within 2 days were approximately 3 times more likely to die within 90 days. Dogs placed in level 2 within 2, 3, or 7 days were approximately 3 times more likely to die within 30 or 90 days. Cats placed in level 2 within 3 or 7 days were approximately 3 times more likely to die at 30 days and 4 times more likely to die if placed in this level within 7 days. If placed in level 2 within 2 or 3 days, cats were approximately 3 times more likely to die within 90 days.

Conclusions and Clinical Importance: Detecting increasing severity of azotemia helps predict mortality in dogs and cats.

Pulmonary Abnormalities in Dogs with Renal Azotemia
K. Le Boedec, H.G. Heng, P.W. Snyder, and B.M. Pressler

Background: Clinical signs associated with respiratory tract disease are regularly encountered in people with kidney failure, and have been anecdotally reported in dogs.

Objectives: To compare clinical signs indicative of pulmonary disease, clinicopathologic findings, radiographic abnormalities, and histologic findings in dogs with acute kidney injury (AKI) or International Renal Interest Society Stage 3 or 4 chronic kidney disease (CKD) to nonazotemic dogs. To determine associations between abnormalities indicative of pulmonary disease and outcome in azotemic dogs.

Animals: One hundred sixty-seven pet dogs (54 AKI dogs, 50 CKD dogs, 63 nonazotemic control dogs diagnosed with intracranial disease).

Methods: Retrospective cohort study comparing signalment, clinical signs, clinicopathologic variables, prevalence, and severity of pulmonary radiographic patterns, histopathologic findings, and survival times in AKI, CKD, and control dogs.

Results: Clinical signs of pulmonary disease were significantly more common in AKI dogs. Prevalence of an alveolar lung pattern was greater in AKI and CKD dogs. Alveolar mineralization was the most common pulmonary histologic lesion in AKI dogs (6 of 8 dogs), with concurrent alveolar concretions or mineralization of pulmonary vessels or bronchioles noted in 1 dog each; mineralization of lung tissues was not noted in control dogs. Neither clinical signs nor presence of an alveolar pattern were associated with likelihood of survival to discharge or median number of days from discharge until death.

Conclusions and Clinical Importance: Abnormalities indicative of pulmonary disease are more common in azotemic dogs than in control dogs; however, prognosis is not associated with presence of clinical or radiographic pulmonary dysfunction.
Incidence, Nature, and Etiology of Metabolic Acidosis in Dogs and Cats
K. Hopper and S.E. Epstein

Background: Metabolic acidosis is an important abnormality in ill and injured dogs and cats. Objectives: To describe the incidence, nature, and etiology of metabolic acidosis in dogs and cats that had arterial or venous blood gases measured for any reason at a university teaching hospital. Animals: Dogs and cats at the Veterinary Medical Teaching Hospital. Methods: Acid base parameters and electrolyte and lactate concentrations in dogs and cats measured during a 13-month period were retrospectively retrieved from a computer database. Metabolic acidosis was defined as a standardized base excess (SBE) in dogs of $<_4$ mmol/L and in cats $<_5$ mmol/L. Results: A total of 1,805 dogs and cats were included; of these, 887 (49%) were classified as having a metabolic acidosis (753 dogs and 134 cats). Primary metabolic acidosis was the most common disorder in dogs, whereas mixed acid base disorder of metabolic acidosis and respiratory acidosis was most common in cats. Hyperchloremic metabolic acidosis was more common than a high anion gap (AG) metabolic acidosis; 25% of dogs and 34% of cats could not be classified as having either a hyperchloremic metabolic acidosis or a high AG metabolic acidosis. Conclusions and Clinical Importance: Metabolic acidosis was found commonly in this patient population and was associated with a wide variety of disease processes. Mixed acid base disorders occur frequently and routine categorization of metabolic acidosis based on the presence of high AG or hyperchloremia may be misleading in a large proportion of cases.

A Longitudinal Study of Survival in Belgian Shepherds with Genetic Epilepsy
C.H. Gulløv, N. Toft, and M. Berendt

Background: Belgian Shepherds have focal genetic epilepsy. The prevalence of epilepsy has been estimated as 9.5% in the breed and as 33% in the family investigated. Dogs with epilepsy might have an increased risk of premature death. Objective/Hypothesis: To investigate survival and selected risk factors for premature death in a Belgian Shepherd family with genetic epilepsy. Animals: One hundred ninety-nine related Belgian Shepherds. Methods: Longitudinal observational study, 2009–2011. Follow-up telephone interviews were all conducted using a structured questionnaire addressing epilepsy, including seizure history and phenomenology, possible remission, possible death, and cause of death. Results: The life span of epileptic dogs was not significantly shortened by the presence of epilepsy ($P = .87$). Epilepsy was the predominant cause of death in the population ($19/75 = 25\%$) and epilepsy-related deaths accounted for 70% (19/27) of all deaths in the group of dogs with epilepsy. Two probable sudden unexpected deaths related to epilepsy occurred in dogs with generalized seizures. Cluster seizures occurred in 33% (17/51) but did not significantly influence the life span of epileptic dogs. Dogs with epilepsy had an epilepsy remission proportion of 13.7%. Conclusion and Clinical Importance: The Belgian Shepherds investigated in the present study display a focal genetic epilepsy with an overall benign course. The life span was not significantly affected by the presence of epilepsy.

Efficacy of Intranasal Administration of a Modified Live Feline Herpesvirus 1 and Feline Calicivirus Vaccine against Disease Caused by Bordetella bronchiseptica after Experimental Challenge
A. Bradley, J. Kinyon, T. Frana, D. Bolte, D.R. Hyatt, and M.R. Lappin

Background: Studies suggest that intranasal vaccination can stimulate nonspecific immunity against agents not contained within the vaccine, but this effect is not reported for cats. Hypothesis: A modified live feline herpesvirus-1 (FHV-1) and feline calicivirus (FCV) intranasal vaccine will reduce clinical signs of disease caused by experimental infection with Bordetella bronchiseptica. Animals: Twenty specific pathogen-free 12-week-old kittens. Methods: Experimental study. Cats were randomized into 2 groups of 10 cats each. The vaccinated group was administered a single intranasal dose of a commercially available vaccine containing modified live strains of FHV-1 and FCV, and the control group remained unvaccinated. All 20 cats were administered B. bronchiseptica by nasal inoculation 7 days later and were observed daily for clinical signs of illness for 20 days.
Results: In the first 10 days after B. bronchiseptica challenge, vaccinated cats were less likely to be clinically ill than control cats with a median clinical score of 0/180 (range 0–5) versus 2/180 (range 0–8) (P = .01). Nine of 10 control cats and 2 of 10 vaccinated cats were recorded as sneezing during days 1–10 after challenge (P = .006).

Conclusions and Clinical Importance: Intranasal vaccination against FHV-1 and FCV decreased signs of illness due to an infectious agent not contained in the vaccine. This nonspecific immunity could be beneficial for protection against organisms for which vaccines are not available and as protection before development of vaccine-induced humoral immunity.

Evaluation of Polymorphisms in the Sulfonamide Detoxification Genes CYB5A and CYB5R3 in Dogs with Sulfonamide Hypersensitivity

Background: Delayed hypersensitivity (HS) reactions to potentiated sulfonamide antimicrobials occur in both dogs and humans, and involve an intermediate hydroxylamine metabolite that is detoxified by cytochrome b₅ and NADH cytochrome b₅ reductase.

Hypothesis/Objectives: We hypothesized that polymorphisms in the genes (CYB5A and CYB5R3) encoding these 2 enzymes would be associated with risk of sulfonamide HS in dogs.

Animals: A total of 18 dogs with delayed HS to potentiated sulfonamide antimicrobials and 16 dogs that tolerated (TOL) a therapeutic course of these drugs without adverse effect.

Methods: CYB5A and CYB5R3 were sequenced from canine liver, and the promoter, exons, and 3’ untranslated regions of both genes were resequenced from genomic DNA obtained from all dogs.

Results: Multiple polymorphisms were found in both genes. When controlled for multiple comparisons, the 729GG variant in CYB5R3 was significantly overrepresented in dogs with sulfonamide HS (78% of dogs), compared to TOL dogs (31%; P = .003).

Conclusions and Clinical Importance: The CYB5R3 729GG variant may contribute to the risk of sulfonamide HS in dogs. Functional characterization of this polymorphism, as well as genotyping in a larger number of HS and TOL dogs, is warranted.

Left Atrial Function in Cats with Left-Sided Cardiac Disease and Pleural Effusion or Pulmonary Edema
S.M. Johns, O.L. Nelson, and J.M. Gay

Background: Congestive heart failure (CHF) in cats with left-sided heart disease is sometimes manifest as pleural effusion, in other cases as pulmonary edema.

Hypothesis: Those cats with pleural effusion have more severe left atrial (LA) dysfunction than cats with pulmonary edema.

Animals: 30 healthy cats, 22 cats with pleural effusion, and 12 cats with pulmonary edema. All cats were client owned.

Methods: Retrospective study. Measurements of LA size and function were made using commercial software on archived echocardiograms. Cases were identified through searches of medical records and of archived echocardiograms for cats with these conditions.

Results: There was no difference (P = .3) in LA size between cats with pleural effusion and cats with pulmonary edema. Cats with pleural effusion had poorer (P = .04) LA active emptying and increased (P = .006) right ventricular (RV) diameter when compared with cats with pulmonary edema and healthy cats. Cats that exhibited LA active emptying of <7.9%, total emptying of <13.6% (diameter) or <19.4% (area), or RV diameter of >3.6 mm were significantly (P < .001) more likely to manifest pleural effusion.

Conclusions and Clinical Importance: Poorer LA function and increased RV dimensions are associated with pleural effusion in cats with left-sided heart disease.

Screening for Dilated Cardiomyopathy in Great Danes in the United Kingdom
H.M. Stephenson, S. Fonfara, J. Lo’pez-Alvarez, P. Cripps, and J. Dukes-McEwan

Background: Great Danes (GD) are predisposed to dilated cardiomyopathy (DCM), but little is known about progression, clinical manifestations, or inheritance in dogs in the UK. For echocardiographic screening, breed-specific reference intervals (RI) are required.
Objectives: To document the prevalence, clinical manifestations, and inheritance of DCM in UK GD. To establish RI for Doppler echocardiography (ECHO) in GD.

Animals: One hundred and seven client-owned GDs.

Methods: Echocardiographic screening study. Dogs were scored on ECHO and ECG variables and classified as normal (NORM), equivocal (EQUIV), or affected (AFX). Forty NORM dogs were used to determine RI for ECHO. Pedigrees from all dogs were examined for mode of inheritance.

Results: The prevalence of DCM in this population, based on score, was 35.6%. Significant differences in M mode left ventricular dimensions (MMLVD) were identified between male and female dogs (P < .011). RI for MMLVD and transformed MMLVD (allometric scaling) were lower than previously suggested. When dogs were reclassified using amended RI for MMLVD, prevalence increased to 47%. End-systolic volume index more reliably identified AFX dogs than other systolic function indices. Ventricular arrhythmias (VA) were commonly identified, with the highest prevalence in AFX dogs (54%). Pedigree analysis suggested an autosomal dominant mode of inheritance.

Conclusions and Clinical Importance: The prevalence of DCM in UK GD is higher than previously reported and autosomal dominant inheritance is likely. Sex or body weight-dependent RI should be used for ECHO in GD and current RI might underestimate ESVI in GD. VA might play an important role in GD with DCM.

Tricuspid Annular Plane Systolic Excursion (TAPSE) in Dogs:
Reference Values and Impact of Pulmonary Hypertension
R. Pariaut, C. Saelinger, K.N. Strickland, H. Beaufre’ re, C.A. Reynolds, and J. Vila

Background: The impact of pulmonary hypertension (PH) on right ventricular systolic function is difficult to assess. Tricuspid annular plane systolic excursion (TAPSE) is an echocardiographic measurement of right ventricular systolic function and a strong predictor of outcome in human PH patients.

Hypothesis/Objectives: Determine a reference range for TAPSE in healthy dogs, and quantify TAPSE in dogs with PH. It is hypothesized that TAPSE is lower in dogs with PH compared with a reference group, and decreases as PH worsens.

Animals: Fifty normal dogs and 30 dogs with PH.

Methods: TAPSE was measured by 2-dimensional echocardiography-guided M-mode from the left apical 4-chamber view. Peak systolic tricuspid valve regurgitation jet velocity was measured by continuous-wave Doppler to estimate right ventricular-to-right atrial pressure gradient. PH was subjectively classified as mild, moderate, and severe.

Results: There was a curvilinear correlation between TAPSE and body weight. The upper and lower limits of the 95% reference interval were determined by quantile regression. Interobserver and intraobserver agreement was adequate with a coefficient of variation <10%. There were significant differences when comparing dogs with PH and the healthy group, as well as between the PH subgroups (P < .01), except between dogs with mild and moderate PH (P = .99). Only dogs in the severe PH group had TAPSE values that were mostly below the lower limit of the reference interval.

Conclusions and Clinical Importance: TAPSE is easily obtainable with acceptable inter and intraobserver agreement. TAPSE is decreased in PH and below the reference interval in most dogs with severe PH.

Autologous Peripheral Blood Hematopoietic Cell Transplantation in Dogs with B-cell Lymphoma
J.L. Willcox, A. Pruitt, and S.E. Suter

Background: Peripheral blood CD34+ hematopoietic cell transplantation (PBHCT) is commonly used to treat human patients with relapsed non-Hodgkin diffuse, large B-cell lymphoma with cure rates approaching 50%.

Objective: To determine the safety and feasibility of performing PBHCT to treat canine B-cell lymphoma (LSA) patients in a clinical academic setting.

Animals: Twenty-four client-owned dogs diagnosed with B-cell LSA.

Methods: After high-dose cyclophosphamide and rhG-colony-stimulating factor treatment, peripheral blood mononuclear cells were collected using cell separator machines. The harvested cells then were infused after a 10 Gy dose of total body irradiation (TBI). Post-irradiation adverse effects were managed symptomatically and dogs were discharged upon evidence of engraftment.

Results: More than 2 9 106 CD34+ cells/kg were harvested in 23/24 dogs. Preapheresis peripheral blood monocyte count was correlated with the number of CD34+ cells/kg harvested. Twenty-one of 24 (87.5%) dogs
engrafted appropriately, whereas 2 dogs (8.3%) died in the hospital. One (5%) dog exhibited delayed engraftment and died 45 days after PBHCT. One dog developed presumed TBI-induced pulmonary fibrosis approximately 8 months after PBHCT. The median disease-free interval and overall survival (OS) of all dogs from the time of PBHCT was 271 and 463 days, respectively. Five of 15 (33%) dogs transplanted before they relapsed remain in clinical remission for their disease at a median OS of 524 days (range, 361–665 days).

Conclusions and Clinical Importance: In most cases, PBHCT led to complete hematologic reconstitution. Therefore, PBHCT may be considered as a treatment option for dogs with B-cell lymphoma.

**Histologic and Immunohistochemical Review of Splenic Fibrohistiocytic Nodules in Dogs**

A.S. Moore, A.E. Frimberger, N. Sullivan, and P.F. Moore

**Background:** Splenic fibrohistiocytic nodules (SFHN) are commonly diagnosed. It is suspected that these represent a heterogeneous group of malignant and nonmalignant diseases, separation of which could improve the ability of clinicians to prognosticate for dogs.

**Hypothesis/Objectives:** Immunohistochemistry will differentiate histologic diagnoses within the group of SFHN; survival after splenectomy is associated with those histologic types.

**Animals:** Thirty-two dogs with SFHN treated by or under direction from veterinary oncologists.

**Methods:** Retrospective case record analysis from dogs followed from splenectomy until death. Clinical, histopathologic, and immunohistochemistry data analyzed for an association with survival time.

**Results:** Thirty-two dogs had SFHN; grade 1 (2 dogs), grade 2 (9 dogs), and grade 3 (lymphoid percentage <40%; 21 dogs). Twenty-two dogs died, 10 were censored (9 alive median of 883 days after splenectomy). Median overall survival was 387 days, and grade 3 SFHN was positively associated with survival time as previously reported (P < .001). Of 31 available samples, dogs had diseases reclassified as nodular hyperplasia (13; 8 complex, 5 lymphoid including 2 marginal zone), lymphoma (4; 2 marginal zone lymphoma, 1 high grade B-cell lymphoma, and 1 marginal zone transitional to high grade B-cell lymphoma), 8 stromal sarcomas, and 6 histiocytic sarcomas. Dogs with histiocytic sarcoma had worse survival (median 74 days) than dogs with other diseases.

**Conclusions and Clinical Importance:** Splenic histiocytic sarcoma is an aggressive disease; however, some dogs with stromal sarcomas had long survival times. The term SFHN is no longer warranted for this group of disorders.

**Prospective Study of Thrombospondin-1 Mimetic Peptides, ABT-510 and ABT-898, in Dogs with Soft Tissue Sarcoma**

A.I. Sahora, A.W. Rusk, J. Henkin, E.M. McKeegan, Y. Shi, and C. Khanna

**Background:** Exposure to anti-angiogenic thrombospondin-1 (TSP-1) mimetic peptides (MPs) has resulted in sporadic anti-tumor activity in humans and dogs.

**Hypothesis:** Novel TSP-1 MPs formulations will be safe, tolerated, and clinically active in soft tissue sarcoma (STS) in dogs.

**Animals:** Sixty-two client-owned dogs with measurable STS were enrolled, excluding hemangiosarcoma.

**Methods:** A prospective, single agent, multicenter, open-label study assessing ABT-510 bolus, ABT-898 bolus, or ABT-898 depot formulations of TSP-1 in dogs. Endpoints included tolerability, antitumor activity, and the assessment of ability of clinical covariates and circulating endothelial cells (CEC) concentration to predict tumor response.

**Results:** Two non-dose-limiting toxicoses possibly attributed to treatment were observed (keratitis and osteoarthritis). Antitumor activity (10/44 = 23% responses) was observed in study subjects who received treatment for >28 days (n = 44) including both partial (7) and minimal responses (3). Responses were disproportionately seen in dogs receiving ABT-898 formulations (9/28 = 32%) versus those receiving ABT-510 (1/16 = 6%; P < .045). Disease stabilization for >84 days was also documented (8/44 = 18%). Slow rates of tumor progression before study entry correlated with anti-tumor activity in treated dogs, whereas no significant association was found between changes in total CEC concentration and tumor response (P = .28) or time to progression (P = .42).

**Conclusions and Clinical Importance:** Safely achieved antitumor activity was documented with TSP-1 MPs in dogs with STS. The most notable activity was achieved with the ABT-898 formulations.
**Ehrlichia muris Infection in a Dog from Minnesota**
B.C. Hegarty, R.G. Maggi, P. Koskinen, M.J. Beall, M. Eberts, R. Chandrashekar, and E.B. Breitschwerdt

**Congenital Adrenal Hyperplasia Associated with Mutation in an 11b-Hydroxylase-Like Gene in a Cat**

**Bilateral Sciatic Neuropathy in Dogs Caused by Spontaneous Muscular and Intraneural Hemorrhage**
S. Ro´denas, M. Pumarola, R.R. Gopegui, and S. An´or

**The Veterinary Journal**
Special Issue: Bovine Lameness LOL

**Journal of Small Animal Practice**

**Geriatric screening in first opinion practice – results from 45 dogs**
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OBJECTIVES: To evaluate and report the results of screening geriatric dogs in a first opinion practice.

METHODS: A prospective health screen of dogs over nine-years-old involving history taking, physical examination and urinalysis.

RESULTS: At least one previously unrecognised problem was identified in 80% of 45 dogs and 353 findings (mean 7.8 per dog) were recorded. Owners often failed to recognise and report serious signs of age-related disease. However, they most often reported increased sleeping (31%), loss of hearing (29%) or sight (20%), stiffness or lameness (22%) and “slowing down” (20%). Increased lens opacity (64%), increased thirst (58%), pain (24%), increased frequency of urination (24%), signs of osteoarthritis (24%) and dental disease (22%) were most frequently identified at the time of consultation. Potentially, life-threatening findings included respiratory distress, palpable abdominal masses and metastatic lung disease. Screening resulted in 29 further diagnostic procedures, including 10 dental procedures, seven medical treatments, two surgical procedures and euthanasia of two dogs.

CLINICAL SIGNIFICANCE: Screening elderly dogs identified unrecognised and unreported health risk factors resulting in lifestyle modification and ongoing monitoring, as well as signs of age-related diseases resulting in diagnostic investigations, early diagnoses and surgical and medical interventions to improve quality of life.

**Errors in abdominal ultrasonography in dogs and cats**
D. A. A. Garcia and Tilde R. Froes

OBJECTIVES: To compare ultrasonographic diagnoses with the findings of surgical exploration to identify and classify potential diagnostic errors.

METHODS: A cross-sectional prospective study of surgically confirmed ultrasound findings was conducted over a period of 29 months in two veterinary hospitals. Any errors in diagnosis made by the sonographer were classified as perceptual, cognitive, equipment-related, inevitable or multifactorial.

RESULTS: One hundred and five ultrasound examinations were performed in 88 dogs and 17 cats. Errors in ultrasound diagnosis occurred in 17 animals (16.2%). These errors were identified as cognitive in 10 animals, inevitable in 5 and multifactorial in 2.

CLINICAL SIGNIFICANCE: This study demonstrates that whilst errors of diagnosis do occur during ultrasonographic examination of the abdomen, understanding the causes of these errors will contribute to the development of this imaging modality.

**Free skin grafts for immediate wound coverage following tumour resection from the canine distal limb**
T. Tong and D. J. Simpson

OBJECTIVE: To evaluate free skin graft as a closure method immediately following extensive oncological resections in the distal limb of dogs.
METHOD: Evaluation of medical records of dogs that received a full-thickness, meshed, free skin graft in the distal limb immediately after tumour removal.

RESULTS: Oncological resection was performed on the antebrachium of six dogs and the tarso-metatarsal area of one dog. Tumour types were mast cell tumour (n=4), soft tissue sarcoma (n=2) and histiocytic sarcoma (n=1). The recipient bed consisted predominately of muscles and tendons. Three grafts survived completely. There was partial, superficial epidermal necrosis in some areas of four grafts. None of the dogs had full thickness necrosis or required further reconstruction. Good to excellent cosmetic results were achieved. Tumour resection was complete in every case. There was no local tumour recurrence at the time of last follow-up (6–49 months).

CLINICAL SIGNIFICANCE: Free grafting can be used reliably to reconstruct extensive surgical wounds in the distal limb in dogs after large tumour resection without the need for a delay to allow granulation tissue to form. Immediate grafting is useful as an alternative to other reconstructive surgical techniques or second intention healing.

Canine idiopathic epilepsy: prevalence, risk factors and outcome associated with cluster seizures and status epilepticus

R. Monteiro, V. Adams*, D. Keys† and S. R. Platt‡

OBJECTIVES: To evaluate the prevalence of cluster seizures and status epilepticus in dogs with idiopathic epilepsy and determine risk factors for cluster seizure frequency, severity and patient outcome.

METHODS: Retrospective review of medical records of 407 dogs with idiopathic epilepsy was made. Follow-up questionnaires were evaluated in cases with cluster seizures.

RESULTS: Mean age at diagnosis of idiopathic epilepsy was 4 years. Cluster seizures were documented in 169 (41%) dogs. German shepherds and boxers were significantly (P=0.04 and 0.01, respectively) more likely to suffer from cluster seizures compared to Labrador retrievers. There was no association between the occurrence of status epilepticus and cluster seizures and frequency and severity of cluster seizures and status epilepticus episodes with age or breed. Intact males were twice as likely (P=0.003) than neutered dogs to suffer from cluster seizures. Intact females had significantly (P=0.007) more frequent cluster seizures than neutered dogs. The median survival time for all dogs with cluster seizures was 95 months. Significantly (P=0.03) more dogs with frequent cluster seizures were euthanased because of the cluster seizures.

CLINICAL SIGNIFICANCE: There was a high prevalence of cluster seizures in dogs with idiopathic epilepsy. Neutering status appears to influence cluster seizure occurrence with intact females more likely to experience more frequent episodes. Euthanasia is associated with frequency of cluster seizure episodes.

Measurement of prothrombin time and activated partial thromboplastin time in citrated whole blood samples from clinically ill dogs following storage

C. L. Maunder*, M. Costa †‡, S. M. Cue‡, E. M. Crawford‡, K. Papasouliotis†‡ and K. F. Murphy*†

OBJECTIVES: To assess the reliability of prothrombin time and activated partial thromboplastin time results generated from citrated whole blood samples following short-term storage at room temperature.

METHODS: Clotting times were measured in blood samples from 40 dogs that showed a variety of clinical signs. Before measurement of prothrombin time and activated partial thromboplastin time in citrated plasma, whole blood samples were split in three aliquots; one was processed within 30 minutes of collection (fresh) while the remaining two were stored unseparated at room temperature for 24 (24RT) or 48 (48RT) hours.

RESULTS: The median prothrombin time for the 24RT (7 seconds) and 48RT (7.2 seconds) samples were not significantly different to those obtained from the fresh (7.1 seconds) samples but the median activated partial thromboplastin time for the 24RT (12-6 seconds) and 48RT (12 seconds) samples were significantly shorter than those obtained from the fresh samples (14-2 seconds).

CLINICAL SIGNIFICANCE: Storage of citrated whole blood at room temperature for 24 or 48 hours did not significantly alter the measurement of prothrombin time but resulted in significantly shorter activated partial thromboplastin time results. Extrapolating from these findings, it is proposed that unseparated clinical samples that are submitted to an external diagnostic laboratory for the performance of clotting times, may generate reliable prothrombin time but unreliable activated partial thromboplastin time results.

Evaluation of preputial cytology in diagnosing oestrogen producing testicular tumours in dogs

U. Dreimanis, K. Vargmar*, T. Falk†, M. Cigut and L. Toresson
OBJECTIVES: The purpose of this study was to evaluate the diagnostic sensitivity and specificity of preputial cytology in oestrogen producing testicular tumours in dogs.

METHODS: Forty-five dogs with palpable testicular masses and 30 healthy control dogs were included. Dogs were evaluated for signs of alopecia and/or feminisation. Analyses of preputial cytology, haematology and serum oestradiol were performed. Dogs with testicular masses were neutered and the testes were submitted for histopathological examination. The dogs were divided into three groups: (1) control dogs (n=30), (2) dogs with a testicular mass and serum oestradiol concentration <40 pmol/L (n=35), (3) dogs with a testicular mass and serum oestradiol concentration >40 pmol/L (n=10).

RESULTS: More than 20% superficial cells in preputial smear was significantly associated with serum oestradiol concentration >40 pmol/L (P<0.001). The number of superficial cells was significantly increased (P<0.001) in preputial smears from dogs with alopecia.

CLINICAL SIGNIFICANCE: It appears that the preputial cytology has a high sensitivity and specificity for the diagnosis of oestrogen producing testicular tumours in dogs.

Idiopathic hypertrophic pachymeningitis in six dogs: MRI, CSF and histological findings, treatment and outcome
P. Roynard, S. Behr*, G. Barone†, F. Llabrés-Diaz‡ and Giunio Bruto Cherubini§
Idiopathic hypertrophic pachymeningitis has been described in humans as a rare, chronic progressive non-specific inflammatory and fibrotic disease of the dura mater. This is a case series of six canine cases of presumptive or confirmed intracranial idiopathic hypertrophic pachymeningitis. These dogs were included in this retrospective study, based on magnetic resonance imaging findings. All presented with pachymeningeal thickening and enhancement without involvement of the leptomeninges on magnetic resonance imaging and no underlying cause identified on cerebrospinal fluid analysis, complete blood count, serum biochemistry and infectious disease tests. Histopathological examination was available in one case. Response to immunomodulatory treatment (corticosteroids and cytosine arabinoside) was achieved in five cases. Idiopathic hypertrophic pachymeningitis should be considered as a possible differential diagnosis for dogs with pachymeningeal thickening on magnetic resonance imaging and no identified underlying cause. The prognosis appears to be fair to poor.

Presumed brain infarctions in two dogs with systemic leishmaniasis
R. José-López, C. De la Fuente and S. Añor
Clinical signs and magnetic resonance imaging findings of multiple brain infarcts in two dogs infected with Leishmania spp. are reported. Clinical signs of intracranial dysfunction were peracute and there was no further deterioration. Magnetic resonance images of the brain were consistent with multifocal, non-haemorrhagic, ischaemic lesions. Routine serum biochemistry revealed hyperproteininaemia and hyperglobulinaemia. Serum antibody titres were highly positive for Leishmania infantum and Leishmania amastigotes were seen within bone marrow macrophages in both cases. Canine leishmaniasis can cause cerebrovascular alterations, such as vasculitis, that might predispose dogs to brain infarcts.

Journal of the American Veterinary Medical Association
Evaluation of cognitive learning, memory, psychomotor, immunologic, and retinal functions in healthy puppies fed foods fortified with docosahexaenoic acid–rich fish oil from 8 to 52 weeks of age
Steven C. Zicker, Dennis E. Jewell, Ryan M. Yamka, Norton W. Milgram, Objective—To assess effects of foods fortified with docosahexaenoic acid (DHA)–rich fish oil on cognitive, memory, psychomotor, immunologic, and retinal function and other measures of development in healthy puppies. Design—Evaluation study. Animals—48 Beagle puppies. Procedures—Puppies were assigned to 3 groups after weaning (n = 16/group) and received 1 of 3 foods (low-DHA, moderate-DHA, or high-DHA food) as their sole source of nutrition until 1 year of age. Visual discrimination learning and memory tasks, psychomotor performance tasks, and physiologic tests including blood and serum analysis, electroretinography, and dual-energy x-ray absorptiometry were performed at various time points. Anti-rabies virus antibody titers were evaluated 1, 2, 4, and 8 weeks after vaccination at 16 weeks of age. Results—Foods had similar proximate analysis results but varied in concentration of DHA from fish oil; the high-DHA food also contained higher concentrations of vitamin E, taurine, choline, and L-carnitine than did other foods. The high-DHA group had significantly better results for reversal task learning, visual contrast
discrimination, and early psychomotor performance in side-to-side navigation through an obstacle-containing maze than did the moderate-DHA and low-DHA groups. The high-DHA group had significantly higher anti-rabies antibody titers 1 and 2 weeks after vaccination than did other groups. Peak b-wave amplitudes during scotopic electroretinography were positively correlated with serum DHA concentrations at all evaluated time points. **Conclusions and Clinical Relevance**—Dietary fortification with fish oils rich in DHA and possibly other nutrients implicated in neurocognitive development following weaning improved cognitive, memory, psychomotor, immunologic, and retinal functions in growing dogs.

**Comparative vaccine-specific and other injectable-specific risks of injection-site sarcomas in cats** Anup Srivastav, Philip H. Kass, Lawrence D. McGill, Thomas B. Farver, Michael S. Kent. **Objective**—To compare associations between vaccine types and other injectable drugs with development of injection-site sarcomas in cats. **Design**—Case-control study. **Animals**—181 cats with soft tissue sarcomas (cases), 96 cats with tumors at non-vaccine regions (control group I), and 159 cats with basal cell tumors (control group II). **Procedures**—Subjects were prospectively obtained from a large pathology database. Demographic, sarcoma location, basal cell tumor, and vaccine and other injectable history data were documented by use of a questionnaire and used to define case, control, and exposure status. Three control groups were included: cats with sarcomas at non-vaccine sites, cats with basal cell tumors, and a combined group of cats with sarcomas at non-vaccine sites and cats with basal cell tumors. χ² tests, marginal homogeneity tests, and exact logistic regression were performed. **Results**—In the broad interscapular region, the frequency of administration of long-acting corticosteroid injections (dexamethasone, methylprednisolone, and triamcinolone) was significantly higher in cases than in controls. In the broad rear limb region, case cats were significantly less likely to have received recombinant vaccines than inactivated vaccines; ORs from logistic regression analyses equaled 0.1, with 95% confidence intervals ranging from 0 to 0.4 and 0 to 0.7, depending on control group and time period of exposure used. **Conclusions and Clinical Relevance**—This case-control study measuring temporal and spatial exposures efficiently detected associations between administrations of various types of vaccines (recombinant vs inactivated rabies) and other injectable products (ie, long-acting corticosteroids) with sarcoma development without the need to directly measure incidence. These findings nevertheless also indicated that no vaccines were risk free. The study is informative in allowing practitioners to weigh the relative merits and risks of commonly used pharmaceutical products.

**Use of fluoroscopically guided percutaneous antegrade urethral catheterization for the treatment of urethral obstruction in male cats: 9 cases (2000–2009)** Elaine S. Holmes, Chick Weisse, Allyson C. Berent. **Objective**—To describe the technique and determine outcome for male cats with urethral obstruction treated with fluoroscopically guided percutaneous antegrade urethral catheterization (PAUC). **Design**—Retrospective case series. **Animals**—9 client-owned neutered male cats with urethral obstruction and inability to pass a retrograde urinary catheter. **Procedures**—Information regarding the procedure and hospitalization was obtained from medical records. Long-term follow-up was obtained via medical record review or telephone interview. **Results**—Diagnoses included iatrogenic urethral tear (n = 6), obstructive urethral calculi (1), urethral ulceration (1), and urethral stricture (1). Seven of the 9 procedures were successful. The 2 patients in which PAUC failed had mechanical obstructions preventing guide wire access across the urethral obstruction. Procedure times ranged from 25 to 120 minutes. No complications were noted in any patients during the procedure. One patient was euthanized because of unrelated disease. Follow-up information was available for 6 of 8 surviving patients. No complications that could be directly attributed to the procedure were noted. All 6 patients had a perineal urethrostomy performed 0 days to 6 weeks following the procedure because of reobstruction of the lower urinary tract. None of these patients had documented urethral strictures and none had recurrence of clinical signs following perineal urethrostomy. **Conclusions and Clinical Relevance**—Results suggested that PAUC can be a simple, rapid, minimally invasive, and safe technique to facilitate tranurethral catheterization in select cases. Patients with iatrogenic urethral tears may be good candidates. Patients with impacted urethral calculi, severe strictures or ulcerations, or a nondistended urinary bladder may be less amenable to PAUC.

**Evaluation of a single subcutaneous infusion of carboplatin as adjuvant chemotherapy for dogs with osteosarcoma: 17 cases (2006–2010)** James O. Simcock, Sita S. Withers, Cassandra Y. Prpich, Charles A. Kuntz, Bronwyn E. Rutland. **Objective**—To evaluate adverse effects and survival times in dogs with osteosarcoma that received a single SC infusion of carboplatin as adjunctive chemotherapeutic treatment following limb amputation or limb-sparing surgery. **Design**—Retrospective case series. **Animals**—17 client-owned dogs with spontaneously occurring osteosarcoma. **Procedures**—Medical records of dogs that underwent limb amputation or limb-sparing surgery followed by a single continuous SC infusion of carboplatin (total dose, 300 mg/m² infused over 3, 5, or 7 days) were evaluated. Signalment, tumor location, type of surgery (amputation or limb-sparing), duration of carboplatin infusion, results of hematologic and serum biochemical analyses, and adverse effects were recorded. Kaplan-Meier survival analysis was performed. **Results**—Median
survival time for all dogs was 365 days. Nine dogs had adverse bone marrow–related (hematologic) effects, 1 had adverse gastrointestinal effects, and 7 had infections at the surgical site. No significant differences were detected in survival times of dogs grouped according to tumor location, type of surgery, duration of carboplatin infusion, or development of postoperative infection. Conclusions and Clinical Relevance—Median survival time and adverse effects in dogs with osteosarcoma that received a single SC infusion of carboplatin over a 3-, 5-, or 7-day period as adjunctive treatment following limb amputation or limb-sparing surgery were comparable to those of previously reported chemotherapy protocols requiring IV drug administration over several weeks. Further investigation is needed to evaluate the efficacy of this protocol as adjunctive treatment for osteosarcoma and other tumors in dogs.

September 15

Rabies surveillance in the United States during 2011 Jesse D. Blanton, Jessie Dyer, Jesse McBryer, Charles E. Rupprecht, Summary—During 2011, 49 states and Puerto Rico reported 6,031 rabid animals and 6 human rabies cases to the CDC, representing a 1.9% decrease from the 6,153 rabid animals and 2 human cases reported in 2010. Approximately 92% of reported rabid animals were wildlife. Relative contributions by the major animal groups were as follows: 1,981 raccoons (32.8%), 1,627 skunks (27.0%), 1,380 bats (22.9%), 427 foxes (7.1%), 303 cats (5.0%), 65 cattle (1.1%), and 70 dogs (1.2%). Compared with 2010, there was a substantial increase in the number of rabid skunks reported. Six cases of rabies involving humans were reported from California, Massachusetts, New Jersey, New York, and South Carolina. Three cases reported from Massachusetts, New Jersey, and New York were determined to be a result of canine rabies virus variants acquired outside the United States.

Assessment of fracture healing after minimally invasive plate osteosynthesis or open reduction and internal fixation of coexisting radius and ulna fractures in dogs via ultrasonography and radiography

Antonio Pozzi, Marije Risselada, Matthew D. Winter, Objective—To evaluate fracture healing after minimally invasive plate osteosynthesis (MIPO) or open reduction and internal fixation (ORIF) of coexisting radius and ulna fractures in dogs via ultrasonography and radiography. Design—Prospective cohort study. Animals—16 dogs with radius-ulna fractures that underwent MIPO (n = 9; 2 dogs were subsequently not included in the analyses because of incomplete follow-up information) or ORIF (7). Procedures—Dogs in the 2 treatment groups were matched by age, body weight, and configuration of the fractures. Fracture healing was evaluated with ultrasonography, power Doppler ultrasonography, and radiography every 3 to 4 weeks until healing was complete; a semiquantitative score based on the number of Doppler signals was used to characterize neovascularization, and subjective B-mode ultrasonographic and radiographic scores were assigned to classify healing. Results—Fractures in dogs that underwent MIPO healed in significantly less time than did fractures in dogs that underwent ORIF (mean ± SD; 30 ± 10.5 days and 64 ± 10.1 days, respectively). Radiography revealed that fractures in dogs that underwent MIPO healed with significantly more callus formation than did fractures in dogs that underwent ORIF. Although Doppler ultrasonography revealed abundant vascularization in fractures that were healing following MIPO, no significant difference in neovascularization scores was found between groups. Conclusions and Clinical Relevance—For dogs with radius-ulna fractures, data indicated that bridging osteosynthesis combined with a minimally invasive approach contributed to rapid healing after MIPO. The MIPO technique may offer some clinical advantage over ORIF, given that complete radius-ulna fracture healing was achieved in a shorter time with MIPO.

Effect of extradurally administered morphine on postoperative analgesia in dogs undergoing surgery for thoracolumbar intervertebral disk extrusion. Francesco Aprea, Giunio B. Cherubini, Viktor Palus, Enzo Vettorato, Federico Corletto, Objective—to investigate the effect of intraoperative extradural morphine administration on postoperative analgesia in dogs undergoing thoracolumbar spinal surgery to treat disk extrusion. Design—Prospective clinical trial. Animals—26 client-owned dogs undergoing thoracolumbar spinal surgery. Procedures—Animals were randomly allocated to receive morphine (0.1 mg/kg [0.045 mg/lb], extradurally) or no treatment (control group). Following preanesthetic medication with methadone (0.25 mg/kg [0.11 mg/lb], IM), anesthesia was induced with propofol and maintained with isoflurane or sevoflurane in oxygen. Lidocaine and fentanyl were administered during surgery in both groups at fixed rates. In the morphine administration group, morphine was splashed over the dura mater immediately prior to wound closure. Postoperative analgesia was assessed for 48 hours by assessors unaware of group allocation, and methadone was administered as rescue analgesic. Demographic characteristics, urinary output, days of hospitalization, and perioperative use of analgesics were compared via a Mann-Whitney U test. Results—Demographic data were similar between groups. In the morphine administration group, 2 of 13 dogs required postoperative methadone, and in the control group, methadone was administered to 11 of 13 dogs. The total number of doses of methadone administered in the 48 hours after surgery was 28 in the control group and 3 in the morphine administration.
group. No adverse effects were recorded in any group. **Conclusions and Clinical Relevance**—Intraoperative extradural morphine administration was effective in reducing postoperative analgesic requirement. Dogs undergoing thoracolumbar spinal surgery benefited from topical administration of preservative-free morphine administered directly on the dura mater as part of analgesic management.

**Clinical and clinicopathologic abnormalities in young dogs with acquired and congenital portosystemic shunts: 93 cases (2003–2008).** Fiona H. Adam, Alexander J. German, J. Fraser McConnell, Mary R. Trehy, Nat Whiteley, Alison Collings, Penny J. Watson, Rachel D. Burrow. **Objective**—To determine whether clinical and clinicopathologic data could assist differentiation of congenital portosystemic shunts (CPSSs) from acquired portosystemic shunts (APSSs) in young dogs. **Design**—Retrospective case series. **Animals**—Dogs < 30 months of age with CPSSs (n = 62) or APSSs (31). **Procedures**—Medical records from 3 referral centers identified 31 dogs with APSSs and 62 dogs with CPSSs diagnosed from July 2003 to July 2008. Signalment, clinical signs, physical examination, and clinicopathological data were recorded, and statistical analyses were performed to determine differences between groups. **Results**—Univariable analysis showed APSS patients were older, heavier, and in poorer body condition, compared with CPSS patients. In CPSS patients, diarrhea was less prevalent, and neurologic signs were more prevalent. Ascites was more prevalent in APSS (Fisher exact test; OR, 50.2; 95% confidence interval [CI], 6.2 to 409.7), with no significant difference in albumin concentration between groups. The logistic regression model used to assess clinicopathological parameters showed lower Hct (OR, 1.42 × 10^{-12}; 95% CI, 1.42 × 10^{-12} to 4.0 × 10^{-8}), higher mean corpuscular volume (OR, 1.27; 95% CI, 1.08 to 1.50), and higher alanine aminotransferase concentrations (OR, 1.005; 95% CI, 1.001 to 1.009) were more likely in APSS patients. **Conclusions and Clinical Relevance**—Several clinicopathologic differences between dogs with congenital and acquired shunts were identified; however, assessed alone, these would be unlikely to enable differentiation between the 2 conditions. Awareness of the rarity of ascites in CPSS cases should prompt recognition of a likely diagnosis of APSS, allowing the veterinarian to target further diagnostics and counsel the owner appropriately.

**Use of a spiral rectal diaphragm technique to control anal sphincter incontinence in a cat** Michael Pavletic, Matt Mahn, Jean Duddy. **Case Description**—A 10-year-old castrated male domestic shorthair cat was examined for a mass involving the right anal sac region. **Clinical Findings**—The mass was diagnosed as a fibrosarcoma, and resulted in progressive tenesmus, requiring repeated resection. **Treatment and Outcome**—Surgical removal of the fibrosarcoma was performed on 4 occasions, including complete resection of the anal sphincter muscles and portions of the rectum. A perineal urethrostomy was required during the third surgical procedure secondary to tumor invasion of the preputial tissues. To reduce involuntary loss of feces, the remaining rectal wall was rotated approximately 225° prior to surgical closure during the second, third, and fourth surgical procedures. This procedure created a natural spiral diaphragm within the rectal lumen. The elastic spiral barrier reduced inadvertent fecal loss and facilitated fecal distention of the terminal portion of the colon, allowing the patient to anticipate the impending passage of feces and to use the litter tray on a daily basis. **Clinical Relevance**—With complete loss of the terminal portion of the rectum and anal sphincter muscles, spiraling the rectum created a deformable threshold barrier to reduce excessive loss of stool secondary to fecal incontinence. On the basis of the positive outcome in this patient, this novel technique may be a useful option to consider for the treatment of cats with loss of anal sphincter function.

**Assessment of on-screen measurements, magnification, and calibration in digital radiography.** Robyn L. Read, Colleen G. Duncan, Aaron D. Wallace, James A. Perry, Felix M. Duer. **Objective**—To compare calibration methods for digital radiography in terms of measurement accuracy and interobserver variability. **Design**—Prospective study. **Sample**—Digital radiographic images of a 155-mm-long Steinmann pin. **Procedures**—Measurement of pin length on digital radiographs was determined with a 25.4-mm-diameter calibration ball and commercially available software program via 3 calibration methods (ie, no calibration, autocalibration, and manual calibration). Digital radiographs of the calibration ball and pin were obtained with each placed at various vertical heights from the table (7 heights) and horizontal distances from the center of the beam (4 distances). Measurements of pin length on digital radiographs were made by 4 observers who were blinded to the orientation of the calibration ball and pin. **Results**—Pin lengths obtained by each calibration method were significantly different from each other and from the true value. Manual calibration was the most accurate. There was no significant interobserver variability in measurements. There was no significant change in measurements when the calibration ball was moved horizontally, but pin length measurements changed significantly when the ball was moved vertically (away from the table) with an approximate magnification error of 1% per centimeter of distance between the calibration ball and pin. **Conclusions and Clinical Relevance**—For digital radiography, manual calibration is recommended to achieve the most accurate measurements. Ideally, the calibration ball should be placed at the same vertical height as the object to be measured; however, if this cannot be achieved, the magnification error can be expected to be approximately 1% per centimeter of distance.
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Array-based comparative genomic hybridization–guided identification of reference genes for normalization of real-time quantitative polymerase chain reaction assay data for lymphomas, histiocytic sarcomas, and osteosarcomas of dogs Pei-Chien Tsai, Matthew Breen. Objective—To identify suitable reference genes for normalization of real-time quantitative PCR (RT-qPCR) assay data for common tumors of dogs. Sample—Malignant lymph node (n = 8), appendicular osteosarcoma (9), and histiocytic sarcoma (12) samples and control samples of various nonneoplastic canine tissues. Procedures—Array-based comparative genomic hybridization (aCGH) data were used to guide selection of 9 candidate reference genes. Expression stability of candidate reference genes and 4 commonly used reference genes was determined for tumor samples with RT-qPCR assays and 3 software programs. Results—LOC611555 was the candidate reference gene with the highest expression stability among the 3 tumor types. Of the commonly used reference genes, expression stability of HPRT was high in histiocytic sarcoma samples, and expression stability of Ubi and RPL32 was high in osteosarcoma samples. Some of the candidate reference genes had higher expression stability than did the commonly used reference genes. Conclusions and Clinical Relevance—Data for constitutively expressed genes with high expression stability are required for normalization of RT-qPCR assay results. Without such data, accurate quantification of gene expression in tumor tissue samples is difficult. Results of the present study indicated LOC611555 may be a useful RT-qPCR assay reference gene for multiple tissue types. Some commonly used reference genes may be suitable for normalization of gene expression data for tumors of dogs, such as lymphomas, osteosarcomas, or histiocytic sarcomas.

Simplified procedure for the estimation of glomerular filtration rate following intravenous administration of iodixanol in cats Rieko Katayama, Jun Saito, Masaaki Objective—To compare the use of a single-sample method involving IV administration of iodixanol with a multisample method involving inulin for the estimation of glomerular filtration rate (GFR) in cats. Animals—24 cats, including 15 healthy cats and 9 cats with naturally occurring renal diseases. Procedures—Each cat was coadministered iodixanol (a nonionic contrast medium; dose providing 40 mg of I/kg) and inulin (50 mg/kg), IV, and blood samples were collected 60, 90, and 120 minutes later. Serum iodixanol and inulin concentrations were determined by means of high-performance liquid chromatography and colorimetry, respectively. Serum urea nitrogen and creatinine concentrations were also measured. Results—Analysis of the data from healthy cats and cats with naturally occurring renal diseases revealed an excellent correlation between GFR values estimated by the multisample and single-sample methods with iodixanol. Likewise, GFR values estimated from the single-sample method with iodixanol were closely correlated with those calculated from the multisample method with inulin. Conclusions and Clinical Relevance—For estimation of GFR in cats, use of a single-sample method with iodixanol, instead of a multisample procedure, may be an expedient tool in both clinical and research settings because of its benefits to patient well-being as a result of reduced stress associated with blood sample collection.

Hemodynamic effects in dogs after intramuscular administration of a combination of dexmedetomidine-butorphanol-tiletamine-zolazepam or dexmedetomidine-butorphanol-ketamine Rebecca A. Krimins, Jeff C. Ko, Ann B. Weil, Mark E. Payton, Peter D. Constable. Objective—To evaluate hemodynamic effects in dogs after IM administration of dexmedetomidine (7.5 μg/kg; butorphanol (0.15 mg/kg), and tiletamine-zolazepam (3 mg/kg [DBTZ]) or dexmedetomidine (15 μg/kg), butorphanol (0.3 mg/kg), and ketamine (3 mg/kg [DBK]). Animals—5 healthy adult mixed-breed dogs. Procedures—Each dog received DBTZ and DBK in a randomized crossover study with a 48-hour interval between treatments. Anesthesia was induced and maintained with sevoflurane in 100% oxygen while instrumentation with Swan-Ganz and arterial catheters was performed. Following instrumentation, hemodynamic measurements were recorded at 3.54% (1.5 times the minimum alveolar concentration) sevoflurane; then sevoflurane administration was discontinued, and dogs were allowed to recover. Six hours after cessation of sevoflurane administration, baseline hemodynamic measurements were recorded, each dog was given an IM injection of DBTZ or DBK, and hemodynamic measurements were obtained at predetermined intervals for 70 minutes. Results—DBTZ and DBK induced hyperventilation (Paco2, approx 60 to 70 mm Hg), respiratory acidosis (pH, approx 7.2), hypertension (mean arterial blood pressure, approx 115 to 174 mm Hg), increases in systemic vascular resistance, and reflex bradycardia. Cardiac output, oxygen delivery, and oxygen consumption following DBTZ or DBK administration were similar to those following sevoflurane administration to achieve a surgical plane of anesthesia. Blood lactate concentrations remained within the reference range at all times for all protocols. Conclusions and Clinical Relevance—In healthy dogs, both DBTZ and DBK maintained oxygen delivery and oxygen consumption to tissues and blood lactate concentrations within the reference range. However, ventilation should be carefully monitored and assisted when necessary to prevent hyperventilation.
Hind limb kinematics during therapeutic exercises in dogs with osteoarthritis of the hip joints. Barbara A. Bockstahler, Bettina Prickler, Elisabeth Lewy, Peter J. Holler, Angela Vobornik, Christian Peham. Objectives—To assess joint kinematics in dogs with osteoarthritis of the hip joints during walking up an incline or down a decline and over low obstacles and to compare findings with data for nonlame dogs. Animals—10 dogs with osteoarthritis of the hip joints (mean ± SD age, 6.95 ± 3.17 years; mean body weight, 34.33 ± 13.58 kg) and 8 nonlame dogs (3.4 ± 2.0 years; 23.6 ± 4.6 kg). Procedures—Reflective markers located on the limbs and high-speed cameras were used to record joint kinematics during walking up an incline or down a decline and over low obstacles. Maximal flexion, extension, and range of motion of the hip joints were calculated. Results—Osteoarthritis of the hip joints reduced extension of both hip joints and flexion of the contralateral hind limb, compared with flexion of the same hind limb, during walking down a decline. Walking up an incline resulted in decreased extension of the stifle joint in both hind limbs of osteoarthritic dogs; extension was significantly decreased for the same hind limb. During walking over low obstacles, maximal flexion of the stifle joint was increased significantly for the contralateral hind limb. Maximal flexion was increased in both tarsal joints.

Conclusions and Clinical Relevance—Osteoarthritis of the hip joints led to complex changes in the gait of dogs, which involved more joints than the affected hip joint alone. Each exercise had specific effects on joint kinematics that must be considered when planning a rehabilitation program.

Ultrasoundography and noncontrast computed tomography of medial retropharyngeal lymph nodes in healthy cats Sarah Nematic, Nathan C. Nelson. Objectives—To determine various measurements of medial retropharyngeal lymph nodes (MRPLNs) in healthy cats via ultrasonography and CT. Animals—45 cats (age range, 2 to 8 years). Procedures—Cats underwent CT of the head and ultrasonography of the cervical region. Various measurements of MRPLNs were obtained, and parenchymal heterogeneity, presence of a hilus, appearance of margins, and attenuation of MRPLNs were determined. Results—Data for 7 cats were excluded because they did not meet inclusion criteria; data for 38 cats were evaluated. Measurements of left and right MRPLNs were not significantly different. Mean length × rostral height × rostral width dimensions of MRPLNs were 20.7 × 12.4 × 3.7 mm and 20.7 × 13.1 × 4.7 mm in ultrasonographic and CT images, respectively. Maximum MRPLN dimensions were approximately 32 × 20 × 7 mm. Mean attenuation of MRPLNs was 40.2 Hounsfield units. Parenchyma of MRPLNs was mildly (via CT) to moderately (via ultrasonography) heterogeneous. A hilus was identified in 95% (via ultrasonography) and 24% or 92% (via CT [depending on criteria used to define a hilus]) of MRPLNs. Lymph node margins were smooth in CT images and mildly irregular in ultrasonographic images. A negative linear correlation was detected between age of cat and MRPLN volume. Conclusions and Clinical Relevance—MRPLNs in cats were easily imaged via ultrasonography and CT. Left and right MRPLNs were symmetric, and MRPLNs were larger in young adult cats versus old cats. Data were intended to serve as references for evaluation of MRPLNs in healthy cats.

Perinuclear antineutrophil cytoplasmic autoantibodies in dogs infected with various vector-borne pathogens and in dogs with immune-mediated hemolytic anemia. Anna E. Karagianni, Laia Solano-Gallego, Edward B. Breitschwerdt, Frédéric P. Gaschen, Michael J. Day, Michele Trotta, Barbara Wieland, Karin Allenspach. Objectives—To determine the prevalence of perinuclear antineutrophil cytoplasmic autoantibodies (pANCA) in dogs with confirmed or suspected immune-mediated hemolytic anemia (IMHA) or dogs infected with various vector-borne pathogens, including Rickettsia rickettsii, Bartonella henselae, Bartonella vinsonii subsp berkhoffii, Ehrlichia canis, Borrelia burgdorferi, and Leishmania infantum. Animals—55 dogs with confirmed or suspected IMHA, 140 dogs seroreactive for vector-borne pathogens, and 62 healthy dogs and dogs seronegative for vector-borne pathogens. Procedures—Samples were allocated to subgroups on the basis of the health status of the dogs and the degree of seroreactivity against various vector-borne pathogens. Serum samples were tested retrospectively via indirect immunofluorescence assay to determine pANCA status. Results—26 of 55 (47%) dogs with confirmed or suspected IMHA and 67 of 140 (48%) dogs seroreactive for vector-borne pathogens had positive results when tested for pANCA. Serum samples with the highest antibody concentrations against L. infantum antigen had the highest proportion (28/43 [65%]) that were positive for pANCA. One of 20 (5%) dogs seronegative for tick-borne pathogens and 8 of 22 (36%) dogs seronegative for L. infantum had positive results for pANCA. One of 20 (5%) healthy dogs had serum antibodies against pANCA. Conclusions and Clinical Relevance—pANCA were detected in a high percentage of dogs with IMHA and vector-borne infectious diseases. Therefore, pANCA may be a relatively nonspecific marker for dogs with inflammatory bowel disease, although they could represent a biomarker for immune-mediated diseases and infections.

Animals—15 healthy Beagles. Procedures—Dogs were randomly assigned to 3 treatment groups (n = 5/group); 38-hour IV infusion of saline (0.9% NaCl) solution (control group), saline solution with 8.5% amino acids (2.3 g/kg/d), or saline solution with 8.5% amino acids (1.8 g/kg/d) and 20% l-alanyl-l-glutamine (Ala-Gln; 0.5 g/kg/d). High-dose MPSS treatment was initiated at the same time that IV infusions began, such that a total dose of 85 mg of MPSS/kg was administered through multiple IV injections over a 26-hour period. The infusions were maintained until 12 hours after the last MPSS injection. Blood samples collected before MPSS injections began and 2, 12, and 24 hours after injections ceased were used to evaluate PMN function. Results—MPSS injections resulted in an increase in the total number of circulating leukocytes and increases in neutrophil and monocyte counts but did not affect lymphocyte, eosinophil, or basophil counts. Lymphocyte counts in the Ala-Gln group were higher than in the control group 12 hours after MPSS injections finished. Relative to preinfusion values, phagocytic capacity, oxidative burst activity, and filamentous actin polymerization of PMNs were suppressed in all dogs except those that received Ala-Gln. Conclusions and Clinical Relevance—Parenteral Ala-Gln administration in dogs resulted in an increase in PMN phagocytic responses that were suppressed by high-dose MPSS treatment.

Hemostatic response to surgical neutering via ovarioectomy and ovariohysterectomy in dogs. Elena R. Moldal, Annemarie T. Kristensen, Marijke E. Peeters, Ane Nødtedt, Jolle Kirpensteijn. Objective—To investigate the hemostatic response to surgery and compare the response for ovariohysterectomy with that for ovarioectomy and to evaluate the usefulness of thromboelastography on plasma samples. Animals—42 female dogs. Procedures—Dogs were assigned to undergo ovariohysterectomy or ovarioectomy. Blood samples were collected immediately before and 1, 6, and 24 hours after surgery and stored at −80°C for subsequent analysis. Plasma samples were subjected to thromboelastography after thawing. In addition, coagulation variables were measured, including concentrations of von Willebrand factor antigen, fibrinogen, antithrombin, and protein C; activity of factor VIII; activated partial thromboplastin time; prothrombin time; and thrombin time. The fibrinolytic response was assessed via concentrations of D-dimer, plasminogen, and α2-antiplasmin (plasmin inhibitor). Results—Substantial hemostatic and fibrinolytic activation was evident after surgery in both groups, as characterized by significantly increased global clot strength and an overall hypercoagulable state at 4 hours after surgery in addition to decreases in von Willebrand factor antigen and factor VIII concentrations and shortened prothrombin and thrombin times. The dogs also typically had activation of the fibrinolytic system, as evidenced by increased postoperative concentrations of D-dimer, plasminogen, and plasmin inhibitor. Differences between the 2 groups could not be detected for any variables. Conclusions and Clinical Relevance—Elective surgery with limited tissue trauma induced hemostatic activation in dogs, which led to hypercoagulability after surgery. A difference between the ovariohysterectomy and ovarioectomy groups was not detected. Thromboelastography can be used on plasma samples and may be useful for evaluating patterns over time.

Neurotoxic effects of ivermectin administration in genetically engineered mice with targeted insertion of the mutated canine ABCB1 gene. Krystyna L. Orzechowski, Marla D. Swain, Martin G. Robl, Constanza A. Tinaza, Heidi L. Swaim, Yolanda L. Jones, Michael J. Myers, Haile F. Yancy. Objective—To develop in genetically engineered mice an alternative screening method for evaluation of P-glycoprotein substrate toxicosis in ivermectin-sensitive Collies. Animals—14 wild-type C57BL/6J mice (controls) and 21 genetically engineered mice in which the abcb1a and abcb1b genes were disrupted and the mutated canine ABCB1 gene was inserted. Procedures—Mice were allocated to receive 10 mg of ivermectin/kg via SC injection (n = 30) or a vehicle-only formulation of propylene glycol and glycerol formal (5). Each was observed for clinical signs of toxic effects from 0 to 7 hours following drug administration. Results—After ivermectin administration, considerable differences were observed in drug sensitivity between the 2 types of mice. The genetically engineered mice with the mutated canine ABCB1 gene had signs of severe sensitivity to ivermectin, characterized by progressive lethargy, ataxia, and tremors, whereas the wild-type control mice developed no remarkable effects related to the ivermectin. Conclusions and Clinical Relevance—The ivermectin sensitivity modeled in the transgenic mice closely resembled the lethargy, stupor, disorientation, and loss of coordination observed in ivermectin-sensitive Collies with the ABCB1–1Δ mutation. As such, the model has the potential to facilitate toxicity assessments of certain drugs for dogs that are P-glycoprotein substrates, and it may serve to reduce the use of dogs in avermectin derivative safety studies that are part of the new animal drug approval process.

Renal effects of carprofen and etodolac in euvoletic and volume-depleted dogs. Kathryn K. Surdyk, Dawn L. Sloan, Scott A. Brown. Objective—To determine the effects of carprofen and etodolac on renal function in euvoletic dogs and dogs with extracellular fluid volume depletion induced via administration of furosemide. Animals—12 female Beagles. Procedures—Dogs received a placebo, furosemide, carprofen, etodolac, furosemide and carprofen, and furosemide and etodolac. The order in which dogs received treatments was
Bone volume and regional density of the central tarsal bone detected using computed tomography in a cross-sectional study of adult racing greyhounds

DJ Thompson* x, NJ Cave*, JP Bridges*, K Reuvers, MC Owen* and EC Firth*

AIMS: To determine whether left-to-right asymmetry of the central tarsal bone (CTB) of racing greyhounds was detectable using computed tomography (CT) in live dogs; to quantify the asymmetry in terms of average bone volume, volumetric bone mineral density (vBMD), and dorsal cortical shape, and to determine if age, gender, bodyweight, number of starts or history of tarsal injury were significant covariates.

METHODS: One trainer supplied 11 male and seven female, unrelated, skeletally mature, actively racing greyhounds, including dogs with a history of tarsal injury diagnosed by the trainer and/or track veterinarian (n=48), and dogs without a history of tarsal injury (n=140). Using CT, standardised parameters of the CTB were measured including volume and average vBMD of the left and right CTB, vBMD of regions within the CTB, and bone shape. RESULTS: There was no difference in the volumes of the left and right CTB and no association with number of racing tarts. Volume of CTB in dogs with a history of tarsal injury was greater than in dogs with no history of injury (p=0.001). Mean vBMD of the right was greater than the left CTB (p<0.001), and was independent of history of injury, gender, bodyweight, and number of starts. Males with a history of injury weighed more than those with no history of injury (p=0.004). The region of greatest difference in vBMD between right and left limbs was the centrodorsomedial aspect of the CTB. Middle plantar ligament enthesiopathies and fractures of tarsal bones other than the central tarsal bone were identified in dogs with and without a history of tarsal injury.

CONCLUSIONS: Significant left-to-right asymmetry of the CTB in racing greyhounds was detected using CT. Contrary to previous suggestions, the asymmetry was not associated with the number of racing starts. We propose that the majority of the adaptive modelling of the CTB occurred rapidly following the onset of counterclockwise training, with little further modelling throughout the racing career of the dog, however further investigation is warranted.