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Outcome and Prognostic Indicators in Cats Undergoing Splenectomy for Splenic Mast Cell Tumors
Kelly A. Kraus, VMD, Craig A. Clifford, MS, DVM, DACVIM (Oncology), Garrett J. Davis, DVM, DACVS, Kristina M. Kiefer, DVM, Kenneth J. Drobatz, DVM, MCSE, DACVECC, DACVIM
This was a multi-institutional retrospective study evaluating the outcome and clinical parameters associated with the postoperative prognosis of 36 cats with splenic mast cell tumors treated with splenectomy. Clinical parameters reviewed included signalment, clinical history, results of staging tests, surgical variables, administration of blood products, presence of metastasis, postoperative complications, administration of chemotherapy postoperatively, chemotherapy protocol, and response to chemotherapy. Overall median survival time was 390 days (range, 2–1737 days). Administration of a blood product (P < .0001), metastasis to a regional lymph node (P = .022), and evidence of either concurrent or historical neoplasia (P = .037) were negatively associated with survival. Response to chemotherapy (P = .0008) was associated with an improved median survival time. Larger-scale prospective studies evaluating different chemotherapy protocols are required to elucidate the discrepancy between lack of survival benefit with administration of chemotherapy and improvement in survival time with positive response to chemotherapy.

Clinical Signs, Treatment, and Outcome in Cats with Myeloma-Related Disorder Receiving Systemic Therapy
Claire M. Cannon, BVSc, DACVIM (Oncology)*, Christina Knudson, BA, Antonella Borgatti, MS, DVM, DACVIM (Oncology), DECVIM (Oncology)
Myeloma-related disorder (MRD) is an uncommon disease in cats, for which there is no established standard of care. In this retrospective study, we evaluated presentation, response to treatment, and toxicity in cats with MRD receiving systemic treatment. Previously reported prognostic factors were evaluated for their impact on survival in cats receiving chemotherapy. Of fifteen cases identified, thirteen received melphalan or cyclophosphamide +/- corticosteroids as first-line therapy. Chlorambucil was commonly used as rescue therapy in cats with progressive disease, or in cases of chemotherapy-related toxicity with first line agents. Overall response rates were 71% and 83% for melphalan- and cyclophosphamide-treated cats, respectively. Discontinuation of melphalan due to toxicity was common. Survival times for cats initially treated with melphalan or cyclophosphamide were not significantly different (median 252 and 394 days, respectively), and no statistically significant prognostic factors were identified. This study suggests that the combination of cyclophosphamide and corticosteroids is well tolerated and may be considered as first-line therapy for cats with systemic MRD.
within the male reference range progesterone and dihydrotestosterone that returned to baseline 3 mo after surgery. Testosterone levels that were
follicles. Hormone assays completed before and after gonadohysterectomy showed an elevation in the levels of
tubules lined only with Sertoli cells and abundant interstitial cells among primordial, primary, and seconda
revealed the presence of bilateral ovotestes and uterus. The gonad had interstitial cells within seminiferous
clitoris. Ultrasonographic examination revealed the presence of both gonadal and uterine structures. Retrograde
cystourethrovaginogram showed the presence of an os clitoris and severe vagina
mo old beagle was presented for evaluation of
This report describes a disorder of the sexual development in a beagle dog resulting in an intersex condition. A 6
Ana Whyte, PhD, DVM, Mercedes Sánchez de la Muela, PhD, DVM
Enrique García
José F. Pérez
Bilateral Ovotestes in a 78, XX
procedure but was euthanatized 6 wk postoperatively for medically
the time of surgery confirmed a chronic glomerulopathy. The dog made a good initial recovery from the
patent ductus venosus
Congenital Extrahepatic Abdominal Arteriovenous Fistula and Apparent Patent Ductus Venosus in a
Dog
Robert N. White, BSc, BVetMed, CertVA, DSAS, DECVS, MRCVS, Kate Murphy, BVSc, DSAM, DECVIM-
CA, MRCVS, Helen Renfrew, BVetMed, CertVR, MRCVS, Chris Shales, MA, VetMB, CertSAS, DECVS, MRCVS
A 3 mo old male German shepherd dog presented with a 2 wk history of diarrhea with possible melena followed by
inappetence and progressive abdominal distension. Clinical findings, serum biochemical analysis, and
abdominal ultrasound were highly suggestive of an extrahepatic abdominal arteriovenous fistula and concurrent
patent ductus venosus, which were confirmed during an abdominal exploratory surgery. Renal biopsies taken at
the time of surgery confirmed a chronic glomerulopathy. The dog made a good initial recovery from the
procedure but was euthanatized 6 wk postoperatively for medically unresponsive renal disease.

Bilateral Ovotestes in a 78, XX SRY-Negative Beagle Dog
José F. Pérez-Gutiérrez, PhD, DVM, Luis V. Montague, PhD, DVM, Antonio Rodríguez-Bertos, PhD, DVM,
Enrique García-Pérez, DVM, Maria J. Sánchez-Calabuig, MSc, DVM, Concepción García-Botey, PhD, DVM, Ana
Whyte, PhD, DVM, Mercedes Sánchez de la Muela, PhD, DVM
This report describes a disorder of the sexual development in a beagle dog resulting in an intersex condition. A 6
mo old beagle was presented for evaluation of a protruding structure from the vulva consistent with an enlarged
clitoris. Ultrasonographic examination revealed the presence of both gonadal and uterine structures. Retrograde
cystourethrovaginogram showed the presence of an os clitoris and severe vaginal stenosis. Histological studies
revealed the presence of bilateral ovotestes and uterus. The gonad had interstitial cells within seminiferous-like
tubes lined only with Sertoli cells and abundant interstitial cells among primordial, primary, and secondary
follicles. Hormone assays completed before and after gonadohysterectomy showed an elevation in the levels of
progesterone and dihydrotestosterone that returned to baseline 3 mo after surgery. Testosterone levels that were
within the male reference ranges before surgery decreased to basal levels postsurgically. 17β-Estradiol levels

showed little variation and values were always within the reference ranges for a male. Cytogenetic analysis showed a normal female karyotype (2n = 78, XX) and polymerase chain reaction analysis revealed the absence of the sex-determining region Y gene. In summary, the dog presented bilateral ovotestes and a 2n = 78, XX chromosomal complement lacking the sex determining region Y gene, consistent with a diagnosis of true hermaphroditism.

Cerebral Ventriculitis Associated with Otogenic Meningoencephalitis in a Dog
Chih-Ching Wu, DVM, Ya-Pei Chang, DVM, MVM, DipECVN
A dog was evaluated for rapidly progressive mentation change, ataxia, and tetraparesis. The dog's neurological status deteriorated drastically. It became comatose with bilateral mydriasis, and the pupillary light reflex was absent. An anti-inflammatory dose of methylprednisolone was administered, and temporary stabilization of neurological status was achieved. MRI findings were suggestive of ventriculitis and meningoencephalitis originating from the left tympanic cavity. A gadolinium leakage phenomenon was noted, likely resulting from severe damage to the blood-cerebrospinal fluid barrier during the inflammatory process. Analysis of the cerebrospinal fluid and materials in the left tympanic cavity further confirmed the diagnosis. Following surgical and antibiotic treatment, the dog recovered well with only a mild residual head tilt. Seven months after surgery, the dog had a recurrent infection of the left tympanic cavity without intracranial involvement. A second surgery led to an uneventful recovery, and the dog was clinically normal except for a mild head tilt 3 yr after the initial presentation. This is the first report describing ventriculitis associated with otogenic meningoencephalitis in dogs and a gadolinium leakage phenomenon displayed on MRI. The long-term outcome of ventriculitis-complicated otogenic meningoencephalitis in dogs could be satisfied with prompt diagnosis and treatment.

Sternal Cleft Associated with Cantrell's Pentalogy in a German Shepherd Dog
Manuel Benlloch-Gonzalez, DVM, Cyrill Poncet, DVM, DECVS
A 5 mo old male German shepherd dog weighing 15.5 kg was presented with an abdominal wall hernia and exercise intolerance. Physical examination showed a grade II/VI systolic heart murmur and an area of cutaneous atrophy overlying a midline supraumbilical wall defect. Thoracic radiography, computed tomography, and ultrasound examination revealed a congenital caudal sternal cleft, a supraumbilical diastasis rectus, and a patent ductus arteriosus. Exploratory surgery confirmed defects of the pars sternalis of the diaphragm and caudoventral pericardium and a persistent left cranial vena cava. Those findings were compatible with Cantrell's pentalogy. Surgical treatment included ligation of the patent ductus arteriosus through the sternal cleft, diaphragmatic reconstruction with paracostal extension of the diaphragmatic defect, pericardial and linea alba appositional reconstruction, and primary approximation of the sternal halves. Growth and exercise activity were normal 10 mo after surgery. The discovery of a midline cranial abdominal wall, pericardial, diaphragmatic, or sternal defect should prompt a thorough examination to rule out any possible associated syndrome. Cantrell's pentalogy presents various degrees of expression and is rare in dogs. Management involves early surgical repair of congenital anomalies to protect the visceral structures. The prognosis in dogs with mild forms of the syndrome is encouraging.

Methylmalonic Aciduria Secondary to Selective Cobalamin Malabsorption in a Yorkshire Terrier
Gerard McLauchlan, BVMS, DECVIM (Companion Animal), MRCVS, Angela McLaughlin, BVMS, MRCVS, Adrian C. Sewell, Dr rer nat.*, Rory Bell, MVB, DSAM, DECVIM (Companion Animal), MRCVS† An 8 wk old male Yorkshire terrier was presented with a 2 wk history of recurrent hypoglycemia, lethargy, and seizures. Investigations revealed a marked increase in blood ammonia, low serum cobalamin, and increased levels of urinary methylmalonic acid (MMA) excretion. No liver vascular abnormality was detected. The patient was diagnosed with methylmalonic aciduria due to cobalamin malabsorption. The patient responded well to parenteral cobalamin administration, and the urinary MMA levels normalized rapidly following instigation of treatment. Due to the suspected hereditary nature of selective cobalamin deficiency, one sibling of this dog was screened and found to be normal. This is the first reported case of MMA secondary to hypocobalaminemia in Yorkshire terriers, and the second report of this disease in a dog in the United Kingdom. Given the fact that clinical signs of MMA are similar to those seen in dogs with portosystemic shunts and that Yorkshire terriers are predisposed to liver vascular abnormalities, this case report adds important clinical information to the current available literature.

Veterinary Clinics of North America (Jul/Aug)

Urology: It's Gold for a Reason!
Amanda J. Callens, Joseph W. Bartges
Performing a urinalysis should be part of a minimum database in addition to physical examination, historical information gathering, complete blood cell counts, and serum/plasma biochemical analysis. Urinalysis provides
information on function of various organs and information on renal function. It is necessary to interpret blood urea nitrogen and serum/plasma creatinine concentrations and is useful in assessing urine concentrating and diluting ability, glomerular barrier function, tubular function, proteinuria, discolored urine, urolithiasis, and neoplasia. Performing a urinalysis is technically easy and does not require expensive equipment or disposable supplies.

**Diagnostic Imaging of Lower Urinary Tract Disease**
Silke Hecht
Diagnostic imaging is routinely performed in small animals with lower urinary tract disease. Survey radiographs allow identification of radiopaque calculi, gas within the urinary tract, and lymph node or bone metastases. Cystography and urethrography remain useful in the evaluation of bladder or urethral rupture, abnormal communication with other organs, and lesions of the pelvic or penile urethra. Ultrasonography is the modality of choice for the diagnosis of most disorders. Computed tomography and magnetic resonance imaging are useful in evaluating the ureterovesical junction and intrapelvic lesions, monitoring the size of lesions, and evaluating lymph nodes and osseous structures for metastases.

**Cystoscopy in Dogs and Cats**
Megan Morgan, Marnin Forman
Cystoscopy has become an important and widely available component of the diagnostic evaluation of diseases of the lower urinary tract in dogs and cats. In addition, a large number of cystoscopic guided procedures have been described that can be used to treat disease processes that were previously treatable only with invasive surgical procedures. This article reviews the indications and contraindications for cystoscopy, cystoscopy equipment and techniques for male and female dogs and cats, potential complications associated with cystoscopy, and management options for these complications.

**Congenital Diseases of the Lower Urinary Tract**
Joseph W. Bartges, Amanda J. Callens
Congenital lower urinary tract diseases occur with variable frequency and may result in clinical signs of urinary incontinence, urinary obstruction, or urination through abnormal openings. This article discusses diagnosis of congenital diseases of the urinary bladder and urethra and describes treatment of these disorders.

**Urinary Tract Infections: Treatment/Comparative Therapeutics**
Shelly J. Olin, Joseph W. Bartges
Urinary tract infection (UTI) occurs when there is compromise of host defense mechanisms and a virulent microbe adheres, multiplies, and persists in a portion of the urinary tract. Most commonly, UTI is caused by bacteria, but fungi and viruses are possible. Urine culture and sensitivity are the gold standards for diagnosis of bacterial UTI. Identifying the location of infection (eg, bladder, kidney, prostate) as well as comorbidities (eg, diabetes mellitus, immunosuppression) is essential to guide the diagnostic and therapeutic plan. Antimicrobial agents are the mainstay of therapy for bacterial UTI and selected ideally based on culture and sensitivity.

**Urolithiasis**
Joseph W. Bartges, Amanda J. Callens
Uroliths occur commonly in the bladder and/or urethra of dogs and cats and can be life-threatening if urethral obstruction occurs. The majority of uroliths are composed of struvite or calcium oxalate; however, other minerals such as urate and cystine occur. Uroliths may be composed of more than one mineral. Some uroliths are amenable to medical dissolution (eg, struvite, urate, and cystine) while others (eg, calcium oxalate) are not. Medical management involves decreasing urine saturation for the minerals that form uroliths.

**Micturition Disorders**
Julie K. Byron
Supplementary content Evaluation of dogs and cats with micturition disorders can be challenging. It is important to determine the duration, timing, and frequency of the disorder, as well as assessing for any additional medical problems, such as neurologic or orthopedic disease, that may be affecting micturition. Observation of the patient during voiding can be particularly helpful in determining the type of disorder. Treatment of micturition disorders is varied and outcome depends on an accurate diagnosis. Patient response is also highly variable, even with appropriate therapy, and owners’ expectations must be set accordingly.

**Feline Idiopathic Cystitis**
S. Dru Forrester, Todd L. Towell
While FIC remains a diagnosis of exclusion, studies over the last two decades suggest that it results from complex interactions between the urinary bladder, neuroendocrine system and environmental factors, and stress appears to play a role in the pathogenesis. The self-limiting nature of FIC and importance of environmental factors on recurrence of clinical signs emphasize the need for controlled, prospective, double-blinded clinical studies to determine the best management options. Current best evidence for initial management of acute, non-obstructive FIC supports a specific nutritional recommendation for a therapeutic urinary food proven to reduce recurrent episodes, environmental enrichment and feeding moist food.

**Lower Urinary Tract Cancer**
Claire M. Cannon, Sara D. Allstadt

Lower urinary tract neoplasia is uncommon in dogs and cats, though transitional cell carcinoma (TCC) is the most common tumor of the lower urinary tract in both species. Clinical signs are not specific for neoplasia, but neoplasia should be considered in patients that are older, have specific risk factors, or have persistent, severe, or relapsing signs. Local disease is often the cause of death or euthanasia; local control is challenging owing to tumor size and location. Systemic therapy is the mainstay of treatment. Prognosis is generally guarded, but therapy can result in improvement in clinical signs and quality of life.

**Interventional Urology: Endourology in Small Animal Veterinary Medicine**
Allyson C. Berent

The use of novel image-guided techniques in veterinary medicine has become more widespread, especially in urologic diseases. With the common incidence of urinary tract obstructions, stones disease, renal disease, and urothelial malignancies, combined with the recognized invasiveness and morbidity associated with traditional surgical techniques, the use of minimally invasive alternatives using interventional radiology and interventional endoscopy techniques has become incredibly appealing to owners and clinicians. This article provides a brief overview of some of the most common procedures done in endourology in veterinary medicine to date, providing as much evidence-based medicine as possible when comparing with traditional surgical alternatives.

**Complementary and Integrative Therapies for Lower Urinary Tract Diseases**
Donna M. Raditic

Consumer use of integrative health care is growing, but evidence-based research on its efficacy is limited. Research of veterinary lower urinary tract diseases could be translated to human medicine because veterinary patients are valuable translational models for human urinary tract infection and urolithiasis. An overview of complementary therapies for lower urinary tract disease includes cranberry supplements, mannos, oral probiotics, acupuncture, methionine, herbs, or herbal preparations. Therapies evaluated in dogs and cats, in vitro canine cells, and other relevant species, in vivo and in vitro, are presented for their potential use as integrative therapies for veterinary patients and/or translational research.

**Journal of Veterinary Internal Medicine**

**LGI Proteins and Epilepsy in Human and Animals**

Leucine-rich glioma-inactivated (LGI) protein was first thought to have a suppressor effect in the formation of some cancers. Developments in physiology and medicine made it possible to characterize the function of the LGI protein family and its crucial role in different conditions more precisely. These proteins play an important role in synaptic transmission, and dysfunction may cause hyperexcitability. Genetic mutation of LGI1 was confirmed to be the cause of autosomal dominant lateral temporal lobe epilepsy in humans. The LGI2 mutation was identified in benign familial juvenile epilepsy in Lagotto Romagnolo (LR) dogs. Cats with familial spontaneous temporal lobe epilepsy have been reported, and the etiology might be associated with LGI protein family dysfunction. In addition, an autoimmune reaction against LGI1 was detected in humans and cats with limbic encephalitis. These advances prompted a review of LGI protein function and its role in different seizure disorders.

**A Review of Paclitaxel and Novel Formulations Including Those Suitable for Use in Dogs**
C. Khanna, M. Rosenberg and D. M. Vail

Paclitaxel is a commonly used chemotherapeutic agent with a broad spectrum of activity against cancers in humans. In 1992, paclitaxel was approved by the U.S. Food and Drug Administration (FDA) as Taxol® for use in advanced ovarian cancer. Two years later, it was approved for the treatment of metastatic breast cancer. Paclitaxel was originally isolated from the bark of the Pacific yew tree, Taxus brevifolia in 1971. Taxanes are a family of microtubule inhibitors. As a member of this family, paclitaxel suppresses spindle microtubule
dynamics. This activity results in the blockage of the metaphase-anaphase transitions, and ultimately in the inhibition of mitosis, and induction of apoptosis in a wide spectrum of cancer cells. Additional anticancer activities of paclitaxel have been defined that are independent of these effects on the microtubules and may include the suppression of cell proliferation as well as antiangiogenic effects. Based on its targeting of a fundamental feature of the cancer phenotype, the mitotic complex, it is not surprising that paclitaxel has been found to be active in a wide variety of cancers in humans. This review summarizes the evidence in support of paclitaxel's broad anticancer activity and introduces the rationale for, and the progress in development of novel formulations of paclitaxel that may preferentially target cancers and that are not associated with the risks for hypersensitivity in dogs. Of note, a novel nanoparticle formulation of paclitaxel that substantially limits hypersensitivity was recently given conditional approval by the FDA Center for Veterinary Medicine for use in dogs with resectable and nonresectable squamous cell carcinoma and nonresectable stage III, IV and V mammary carcinoma.

Sound Pressure Levels in 2 Veterinary Intensive Care Units
Background Intensive care units (ICUs) in human hospitals are consistently noisy environments with sound levels sufficient to substantially decrease sleep quality. Sound levels in veterinary ICUs have not been studied previously, but environmental sound has been shown to alter activity in healthy dogs. Hypothesis Veterinary ICUs, like those in human medicine, will exceed international guidelines for hospital noise. Animals NA.
Methods Prospective, observational study performed consecutively and simultaneously over 4 weeks in 2 veterinary ICUs. Conventional A-weighted sound pressure levels (equivalent continuous level [a reflection of average sound], the sound level that is exceeded 90% of the recording period time [reflective of background noise], and maximum sound levels) were continuously recorded and the number of spikes in sound >80 dBA were manually counted. Results Noise levels were comparable to ICUs in human hospitals. The equivalent continuous sound level was higher in ICU1 than in ICU2 at every time point compared, with greatest differences observed on week day (ICU1, 60.1 ± 3.7 dBA; ICU2, 55.9 ± 2.5 dBA, P < .001) and weekend nights (ICU1, 59.9 ± 2.4 dBA; ICU2, 53.4 ± 1.7 dBA, P < .0001) reflecting a 50% difference in loudness. Similar patterns were observed for the maximum and background noise levels. The number of sound spikes was up to 4 times higher in ICU1 (162.3 ± 84.9 spikes) than in ICU2 (40.4 ± 12.2 spikes, P = .001). Conclusions and Clinical Importance These findings show that sound in veterinary ICUs is loud enough to potentially disrupt sleep in critically ill veterinary patients.

Mucopolysaccharidosis VII in a Cat Caused by 2 Adjacent Missense Mutations in the GUSB Gene
Background Mucopolysaccharidoses (MPS) are common lysosomal storage disorders causing typically progressive skeletal and ocular abnormalities. Objectives To describe the clinic features, metabolic profile and a unique mutation in a domestic shorthair (DSH) kitten with MPS VII. Animals Affected kitten and 80 healthy cats. Methods Serum lysosomal enzyme activities and urinary glycosaminoglycan (GAG) accumulation were assessed. Exons of the β-glucuronidase gene (GUSB) were sequenced from genomic DNA and genotyping was conducted. Results A 3-month-old DSH cat was presented for stunted growth, paresis, facial dysmorphia, multiple skeletal deformities, and corneal opacities. Evaluation of blood smears disclosed metachromatic granules in leukocytes and a urinary mucopolysaccharide spot test was positive. The proband had no GUSB activity but normal or increased activities for other lysosomal enzymes. Sequencing of the GUSB gene from the proband and comparison to the sequence of 2 healthy cats and the published feline genome sequence demonstrated 2 unique single base transitions (c.1421T>G and c.1424C>T) in exon 9, altering 2 adjacent codons (p.Ser475Ala and p.Arg476Trp). These amino acid changes are in a highly conserved domain of the GUSB protein and nontolerable to maintain function. Moreover, the p.Arg476Trp mutation previously has been identified in human patients. None of the other clinically healthy cats had these mutations. Conclusions and Clinic Importance The diagnostic approach to MPS disorders is delineated. This is only the second mutation known to cause MPS VII in cats. Similarly, 2 different mutations have been described in MPS VII dogs, thereby showing the molecular heterogeneity of MPS VII in companion animals.

Comparison between Urine Protein: Creatinine Ratios of Samples Obtained from Dogs in Home and Hospital Settings
M.E. Duffy, A. Specht and R.C. Hill
Background The urine protein:creatinine ratio (UPC) is used to quantify urine protein excretion and guide recommendations for monitoring and treatment of proteinuria. Hypothesis/Objectives Home urine samples will have lower UPCs than hospital samples. The objectives were to compare UPCs of samples collected in each setting and to determine whether environment of sample collection might affect staging, monitoring or treatment recommendations. Animals Twenty-four client-owned dogs. Methods Prospective, nonmasked study. Clients collected a urine sample from their dog at home and a second sample was collected at the hospital. Dogs receiving corticosteroids or angiotensin-converting enzyme inhibitors were excluded, as were those with urine samples of inadequate volume, no protein on dipstick analysis, or active urine sediment. Samples were refrigerated after collection, dipstick and sediment evaluations were completed and each sample was frozen at −80°C within 12 hours. UPCs were performed on frozen samples within 2 months. Results From 81 paired samples, 57 were excluded. Of the remaining 24, 12/24 (50%) had higher hospital sample UPCs, 9/24 (38%) had identical UPCs, and 3/24 (12%) had lower hospital UPCs. The UPCs of hospital samples were higher than home samples for the total population (P = .005) and the subset with UPC > 0.5 (P = .001). Conclusions Setting and related circumstances of urine collection in dogs is associated with UPC differences; results are usually higher in hospital than in home samples. This difference has the potential to affect clinical interpretation.

**Symmetric Dimethylarginine Assay Validation, Stability, and Evaluation as a Marker for the Early Detection of Chronic Kidney Disease in Dogs**


Background Symmetric dimethylarginine (SDMA) is a small molecule formed by methylation of arginine, and released into blood during protein degradation. SDMA is primarily eliminated by renal excretion and is a promising endogenous marker of glomerular filtration rate (GFR). Objectives To validate an assay for SDMA measurement, determine stability of SDMA in blood, and compare SDMA with serum creatinine concentration (sCr) and GFR for early detection of decreasing kidney function in dogs with chronic kidney disease (CKD). Animals Eight male dogs affected with X-linked hereditary nephropathy and 4 unaffected male littermates. Methods Prospective study validating SDMA measurement using liquid chromatography-mass spectrometry, assessing stability of SDMA in serum and plasma, and serially determining sCr, SDMA, and GFR (using iohexol clearance) in dogs during progression from preclinical disease to end-stage renal failure. Correlations were determined using linear regression. Timepoints at which sCr, SDMA, and GFR identified decreased renal function were compared using defined cutoffs, trending in an individual dog, and comparison with unaffected littermates. Results Symmetric dimethylarginine was highly stable in serum and plasma, and the assay demonstrated excellent analytical performance. In unaffected dogs, SDMA remained unchanged whereas in affected dogs, SDMA increased during disease progression, correlating strongly with an increase in sCr (r = 0.95) and decrease in GFR (r = −0.95). Although trending improved sCr's sensitivity, SDMA identified, on average, <20% decrease in GFR, which was earlier than sCr using any comparison method. Conclusions and Clinical Importance Symmetric dimethylarginine is useful for both early identification and monitoring of decreased renal function in dogs with CKD.

**Antimicrobial Susceptibility Patterns in Urinary Tract Infections in Dogs (2010–2013)**

C. Wong, S.E. Epstein and J.L. Westropp

Background Urinary tract infections (UTIs) are common in dogs. The responsible bacterial populations have evolved with increasing resistance to many antimicrobials. Objective To characterize the antimicrobial susceptibility patterns of canine urinary tract isolates over a 51-month period. Animals One thousand six hundred and thirty-six bacterial isolates from 1,028 dogs. Methods Aerobic bacterial isolate growth and susceptibility data from urine cultures of dogs were identified, retrospectively. Medical records were reviewed to obtain signalment, comorbidities, and antimicrobial use in the previous 30 days. The UTIs were further categorized as uncomplicated, complicated, or pyelonephritis. Results Common bacterial isolates identified were Escherichia coli (52.5%), Staphylococcus spp. (13.6%), and Enterococcus spp. (13.3%). In vitro susceptibility among all isolates varied for commonly prescribed antimicrobials (amoxicillin [59%], amoxicillin/clavulanic acid [76%], cephalaxin [66%], enrofloxacin [74%] and trimethoprim-sulfamethoxazole [86%]). For all antimicrobials tested (except aminoglycosides), in vitro susceptibility was higher in uncomplicated versus complicated infections (P < .05). Uncomplicated infection isolate susceptibility rates remained <90% for PO administered antimicrobials. Administration of amoxicillin, doxycycline, and enrofloxacin, but not amoxicillin/clavulanic acid in the previous 30 days was associated with resistance to that antimicrobial. Multidrug resistant isolates of E. coli and Staphylococcus spp. were more common in dogs with
complicated than uncomplicated UTIs (36% versus 21%, P < .0001). Conclusions and Clinical Importance In vitro susceptibility was highly variable and no PO administered antimicrobial had >90% efficacy among isolates tested. Multidrug resistance was frequent among isolates tested suggesting that routine culture and susceptibility testing is indicated. Previously prescribed antimicrobials may affect empirical choices made pending susceptibility testing.

**Thromboelastographic Evaluation of Dogs with Acute Liver Disease**

D. Kelley, C. Lester, S. Shaw, A. de Laforcade and C.R.L. Webster

Background Given the liver's pivotal role in hemostasis and fibrinolysis, the coagulopathy accompanying hepatic disease is complex. Hypothesis/Objectives To prospectively evaluate kaolin-activated thromboelastography (TEG) in dogs with acute liver disease (ALD) and compare with plasma-based coagulation tests. Animals Twenty-one dogs with a diagnosis of ALD based on recent onset of clinical signs accompanied by increases in serum bilirubin concentration and alanine aminotransferase activity. Methods Clinical presentation, CBC, serum biochemistry, platelet count, prothrombin time (PT), activated partial thromboplastin time (aPTT), and TEG analysis were evaluated in 21 dogs with a subset also having fibrinogen, antithrombin (AT) activity, protein C (PC) activity, d-dimers, and von Willebrand's factor (vWF) activity analyzed. A PT >1.5 times the upper limit of normal defined acute liver failure (ALF). Results Dogs with ALD had mean increases in R, K, LY30, PT, aPTT, and vWF activity, and decreases in angle, maximal amplitude (MA), G, AT activity, and PC activity. The TEG results defined dogs as hypocoagulable (11/21), normocoagulable (8/21), or hypercoagulable (2/21). Increases in LY30 defined 8/21 dogs as hyperfibrinolytic. Hypocoagulable and hyperfibrinolytic dogs had lower fibrinogen and PC activity than dogs without these abnormalities. Overall, ALD dogs had greater increases in K and LY30, and decreases in MA, G, and PC activity than dogs with less severe hepatic impairment. Results for MA and LY30 were positively correlated with serum bilirubin concentration and white blood cell count, and negatively correlated with serum cholesterol concentration. Conclusions and Clinical Importance ALD dogs have a range of coagulation abnormalities that trend toward hypocoagulability and hyperfibrinolysis as functional impairment occurs.

**Effect of Feeding an Iodine-Restricted Diet in Cats with Spontaneous Hyperthyroidism**

T.Y. Hui, D.S. Bruyette, G.E. Moore and J.C. Scott-Moncrieff

Background Exclusive feeding of an iodine-restricted diet has been proposed as a method for controlling clinical manifestations of hyperthyroidism in hyperthyroid cats. Objectives To determine the effect of feeding an iodine-restricted diet on TT4 concentrations and clinical signs in cats with spontaneous hyperthyroidism. Animals Forty-nine client-owned cats with spontaneous hyperthyroidism. Methods Retrospective case series. Hyperthyroid cats were exclusively fed a commercially available iodine-restricted diet. Clinical response was assessed by change in weight and heart rate and serum TT4, blood urea nitrogen (BUN), and creatinine concentrations at various times during dietary management (21–60 days, 60–180 days). Results Serum TT4 normalized in 20/48 cats (42%) and 39/47 cats (83%) at 21–60 days and 61–180 days, respectively. Cats in which the TT4 concentrations were still above reference range at 21–60 days had a significantly higher starting TT4 than those that normalized their TT4 levels during the same time period (P = .038). Body weight did not significantly increase (P = .34) nor heart rate decrease (P = .64) during the study. There was a significant decrease in serum creatinine (P = .028). Cats in the low reference range for serum TT4 concentrations did not have a significant increase in body weight (P = .41) nor creatinine (P = .54) when compared to those with high reference range. Conclusions and Clinical Importance Restricted-iodine diets were effective at maintaining serum TT4 concentrations within reference ranges for a majority of cats with spontaneous hyperthyroidism over 1 year, although not all clinical signs of hyperthyroidism improved.

**Abdominal Ultrasound Examination Findings in 534 Hyperthyroid Cats Referred for Radioiodine Treatment Between 2007–2010**


Background The prevalence of concurrent disease in hyperthyroid cats is unknown. Objectives To identify the prevalence of concurrent intra-abdominal disease using abdominal ultrasound examination (AUS) in hyperthyroid cats referred for radioactive iodine treatment (RIT) and to determine whether the requirement for pretreatment AUS is justified. Animals Five hundred and thirty-four client-owned cats diagnosed with hyperthyroidism and referred for RIT. Methods Retrospective study. Age, breed, sex, body weight, clinical signs, total serum T4 concentration, blood urea nitrogen (BUN) concentration, serum creatinine concentration,
urine specific gravity (USG), AUS results, and biopsy or cytology results, or both (if obtained) were collected from the medical records. Results The prevalence of concurrent disease identified using AUS in hyperthyroid cats referred for RIT was 36.1%; 22.8% of the cats in the study had renal disease and 2.4% had confirmed neoplasia. Significant differences in median USG (P value 0.032) and median BUN (P value 0.028) were found between cats that had abnormal kidneys on AUS compared to those with normal-appearing kidneys. Only 2.2% of the cats were not treated with RIT as a result of changes identified on AUS and subsequently obtained cytology or biopsy results. Conclusions and Clinical Importance The results indicate that pretreatment AUS in hyperthyroid cats referred for RIT is unnecessary in most patients.

**Pasireotide for the Medical Management of Feline Hypersomatotropism**

C.J. Scudder, R. Gostelow, Y. Forcada, H.A. Schmid, D. Church and S.J.M. Niessen

Background Feline hypersomatotropism (HST) is a cause of diabetes mellitus in cats. Pasireotide is a novel multireceptor ligand somatostatin analog that improves biochemical control of humans with HST.

Hypothesis/Objectives Pasireotide improves biochemical control of HST and diabetes mellitus in cats. Animals Hypersomatotropism was diagnosed in diabetic cats with serum insulin-like growth factor-1 (IGF-1) concentration >1,000 ng/mL by radioimmunoassay and pituitary enlargement. Methods Insulin-like growth factor 1 was measured and glycemic control assessed using a 12-hour blood glucose curve on days 1 and 5. On days 2, 3, and 4, cats received 0.03 mg/kg pasireotide SC q12h. IGF-1, insulin dose, and estimated insulin sensitivity (product of the area under the blood glucose curve [BGC] and insulin dose) were compared pre- and post treatment. Paired t-tests or Wilcoxon signed rank tests were employed for comparison where appropriate; a linear mixed model was created to compare BGC results. Results Insulin-like growth factor 1 decreased in all 12 cats that completed the study (median [range] day 1: 2,000 ng/mL [1,051–2,000] and day 5: 1,105 ng/mL [380–1,727], P = .002, Wilcoxon signed rank test). Insulin dose was lower on day 5 than on day 1 (mean reduction 1.3 [0–2.7] units/kg/injection, P = .003, paired t-test). The product of insulin dose and area under the BGC was lower on day 5 than day 1 (difference of means: 1,912; SD, 1,523; u × mg/dL × hours, P = .001; paired t-test). No clinically relevant adverse effects were encountered. Conclusions Short-acting pasireotide rapidly decreased IGF-1 in cats with HST and insulin-dependent diabetes. The decrease in IGF-1 was associated with increased insulin sensitivity.

**Behavioral Abnormalities in Lagotto Romagnolo Dogs with a History of Benign Familial Juvenile Epilepsy: A Long-Term Follow-Up Study**


Background Lagotto Romagnolo (LR) dogs with benign juvenile epilepsy syndrome often experience spontaneous remission of seizures. The long-term outcome in these dogs currently is unknown. In humans, behavioral and psychiatric comorbidities have been reported in pediatric and adult-onset epilepsies.

Hypothesis/Objectives The objectives of this study were to investigate possible neurobehavioral comorbidities in LR with a history of benign familial juvenile epilepsy (BFJE) and to assess the occurrence of seizures after the remission of seizures in puppyhood. Animals A total of 25 LR with a history of BFJE and 91 control dogs of the same breed. Methods Owners of the LR dogs in the BFJE and control groups completed an online questionnaire about each dog's activity, impulsivity, and inattention. Principal component analysis (PCA) served to extract behavioral factors from the data. We then compared the scores of these factors between the 2 groups in a retrospective case–control study. We also interviewed all dog owners in the BFJE group by telephone to inquire specifically about possible seizures or other neurological problems after remission of seizures as a puppy. Results Lagotto Romagnolo dogs with BFJE showed significantly higher scores on the factors Inattention and Excitability/Impulsivity than did the control group (P = .003; P = .021, respectively). Only 1 of the 25 BFJE LR exhibited seizures after remission of epilepsy in puppyhood. Conclusions and Clinical Importance Although the long-term seizure outcome in BFJE LR seems to be good, the dogs exhibit behavioral abnormalities resembling attention deficit hyperactivity disorder (ADHD) in humans, thus suggesting neurobehavioral comorbidities with epilepsy.

**Association of Sphingosine-1-phosphate (S1P)/S1P Receptor-1 Pathway with Cell Proliferation and Survival in Canine Hemangiosarcoma**


Background Sphingosine-1-phosphate (S1P) is a key biolipid signaling molecule that regulates cell growth and survival, but it has not been studied in tumors from dogs. Hypothesis/Objectives S1P/S1P1 signaling will
contribute to the progression of hemangiosarcoma (HSA). Animals Thirteen spontaneous HSA tissues, 9 HSA
cell lines, 8 nonmalignant tissues, including 6 splenic hematomas and 2 livers with vacuolar degeneration, and 1
endothelial cell line derived from a dog with splenic hematoma were used. Methods This was a retrospective
case series and in vitro study. Samples were obtained as part of medically necessary diagnostic procedures.
Microarray, qRT-PCR, immunohistochemistry, and immunoblotting were performed to examine S1P1
expression. S1P concentrations were measured by high-performance liquid chromatography/mass spectrometry.
S1P signaling was evaluated by intracellular Ca2+ mobilization; proliferation and survival were evaluated using
the MTS assay and Annexin V staining. Results Canine HSA cells expressed higher levels of S1P1 mRNA than
nonmalignant endothelial cells. S1P1 protein was present in HSA tissues and cell lines. HSA cells appeared to
produce low levels of S1P, but they selectively consumed S1P from the culture media. Exogenous S1P induced
an increase in intracellular calcium as well as increased proliferation and viability of HSA cells. Prolonged
treatment with FTY720, an inhibitor of S1P1, decreased S1P1 protein expression and induced apoptosis of HSA
cells. Conclusions and clinical importance S1P/S1P1 signaling pathway functions to maintain HSA cell viability
and proliferation. The data suggest that S1P1 or the S1P pathway in general could be targets for therapeutic
intervention for dogs with HSA.

**Pulse-Administered Toceranib Phosphate Plus Lomustine for Treatment of Unresectable Mast Cell
Tumors in Dogs**

Thamm

Background Nonresectable mast cell tumors (MCT) in dogs remain a therapeutic challenge, and investigation of
novel combination therapies is warranted. Intermittent administration of tyrosine kinase inhibitors (TKI)
combined with cytotoxic chemotherapy may effectively chemosensitize canine MCT while decreasing cost and
adverse effects associated with either agent administered as monotherapy. Hypothesis/Objectives The primary
study objectives were to (1) identify the maximally tolerated dose (MTD), (2) determine the objective response
rate (ORR) and (3) describe the adverse event profile of pulse-administered toceranib phosphate (TOC)
combined with lomustine. Animals Forty-seven client-owned dogs with measurable MCT. Methods Toceranib
phosphate was given PO on days 1, 3 and 5 of a 21-day cycle at a target dosage of 2.75 mg/kg. Lomustine was
given PO on day 3 of each cycle at a starting dosage of 50 mg/m2. All dogs were concurrently treated with
diphenhydramine, omeprazole, and prednisone. Results The MTD of lomustine was established at 50 mg/m2
when combined with pulse-administered TOC; the dose-limiting toxicity was neutropenia. Forty-one dogs
treated at the MTD were evaluable for outcome assessment. The ORR was 46% (4 complete response, 15 partial
response) and the overall median progression-free survival (PFS) was 53 days (1 to >752 days). On multivariate
analysis, variables significantly associated with improved PFS included response to treatment, absence of
metastasis, and no previous chemotherapy. Conclusions and clinical importance Combined treatment with
pulse-administered TOC and lomustine generally is well tolerated and may be a reasonable treatment option for
dogs with unresectable or metastatic MCT.

**The Veterinary Journal**

C-kit as a prognostic and therapeutic marker in canine cutaneous mast cell tumours: From laboratory to
clinic

Rui M. Gil da Costa

Cutaneous mast cell tumours (MCTs) are some of the most common canine neoplasms and their variable and
often aggressive biological behaviour makes them particularly challenging for the veterinary practitioner. Over
the years, scientists have accumulated a wealth of knowledge on these tumours and developed better prognostic
markers and targeted therapies, mostly focused on inhibiting c-kit, a protein that plays a major role in the
biopathology of MCTs. Masitinib and toceranib, targeted inhibitors of c-kit and other receptor tyrosine-kinases
(RTKs), offer the promise of improving the outcome of patients with aggressive MCTs. Much of the available
knowledge on MCTs is dispersed, making it difficult for practitioners to benefit when consulting a pathologist
or making therapeutic decisions. This article seeks to bring together current knowledge on the biopathology of
MCTs, reviewing prognostic markers and their applications, and the development of c-kit inhibitors in the
context of the basic cellular, molecular and pathological features of MCTs. Future perspectives following recent
biopathological data and experimental therapeutic approaches are also addressed.
Magnetic resonance compositional imaging of articular cartilage: What can we expect in veterinary medicine?
Fanny Hontoir, Peter Clegg, Jean-François Nisolle, Simon Tew, Jean-Michel Vandeweerd
Since cartilage has limited ability to repair itself, it is useful to determine its biochemical composition early in clinical cases. It is also important to assess cartilage content in research animals in longitudinal studies in vivo. In recent years, compositional imaging techniques using magnetic resonance imaging (MRI) have been developed to assess the biochemical composition of cartilage. This article describes MR compositional imaging techniques, and discusses their use and interpretation. Technical concerns still limit the use of some techniques for research and clinical use, especially in veterinary medicine. Glycosaminoglycan chemical-exchange saturation transfer and sodium imaging are better used with high field magnets, which have limited availability. Long acquisition times are sometimes required, for instance in T1rho (ρ) and diffusion-weighted imaging, and necessitate general anaesthesia. Even in human medicine, some techniques such as ultra-short echo T2 are not fully validated, and nearly all techniques require validation for veterinary research and clinical practice. Delayed gadolinium-enhanced MRI of cartilage and T2 mapping appear to be the most applicable methods for compositional imaging of animal cartilage. Combining T2 mapping and T1ρ allows for the assessment of proteoglycans and the collagen network, respectively.

Prognostic factors in dogs with protein-losing enteropathy
Canine protein-losing enteropathy (PLE) is associated with severe gastrointestinal disorders and has a guarded to poor prognosis although little information is available regarding factors affecting prognosis. The purpose of this study was to identify the prognostic factors for survival of dogs with PLE. Ninety-two dogs diagnosed with PLE from 2006 to 2011 were included in a retrospective cohort study. Survival analysis was performed using the Kaplan–Meier method and log-rank test. Variables recorded at the time of diagnosis were statistically analysed for possible prognostic factors in a univariate and multivariate Cox proportional hazard model. In the multivariate analysis, the predictors for mortality in dogs with PLE were more highly scored in terms of canine inflammatory bowel disease activity index (CIBDAI) (P = 0.0003), clonal rearrangement of lymphocyte antigen receptor genes (P = 0.003), and elevation of blood urea nitrogen (BUN) (P = 0.03). Using histopathological diagnosis, both small- and large-cell lymphomas were associated with significantly shorter survival times than chronic enteritis (CE) and intestinal lymphangiectasia (IL). Normalization of CIBDAI and plasma albumin concentration within 50 days of initial treatment was associated with a longer survival time. In conclusion, CIBDAI, clonal rearrangement of lymphocyte antigen receptor genes, histopathological diagnosis, and response to initial treatments would be valuable in separating the underlying causes and could be important in predicting prognosis in dogs with PLE.

Analgesic and antihyperalgesic effects of dipyrone, meloxicam or a dipyrone–meloxicam combination in bitches undergoing ovariohysterectomy
The analgesic and antihyperalgesic effects of dipyrone, meloxicam or a dipyrone–meloxicam combination were compared in dogs undergoing elective ovariohysterectomy. In a double-blinded, prospective, randomised design, 40 bitches premedicated with intramuscular pethidine (4 mg/kg) and anaesthetised with isoflurane received one of four intravenous treatments (n = 10 per group) before ovariohysterectomy: control (physiological saline), meloxicam (0.2 mg/kg), dipyrone (25 mg/kg or 0.2 mg/kg, respectively). Glasgow composite measure pain scale (GCMPS) and mechanical nociceptive thresholds (MNT) were assessed before anaesthesia and at 1, 2, 3, 4, 6, 8, 12 and 24 h postoperatively. Rescue analgesia (0.5 mg/kg morphine) was administered intramuscularly if the GCMPS was ≥3. The GCMPS and MNT did not differ among groups. The frequency of rescue analgesia was significantly (P < 0.05) lower in the dipyrone group (30%) than in controls (50%), but there were no significant differences from the control group in bitches treated with meloxicam (70%) or dipyrone–meloxicam (40%). There was a significant reduction in the total number of rescue treatments in the dipyrone (n = 5) and dipyrone–meloxicam (n = 5) groups when compared with the control (n = 17) and meloxicam (n = 19) groups. Meloxicam and dipyrone–meloxicam significantly reduced the percentage of animals exhibiting severe pain during MNT measurements (30% and 0%, respectively) compared with the control group (50%). Dipyrone produced superior analgesia (reduced
morphine consumption), while meloxicam produced better antihyperalgesia (fewer episodes of severe pain) in contrast to controls. When used in tandem, the beneficial effects were combined.

**Chemotherapy-induced neutropenia is associated with prolonged remission duration and survival time in canine lymphoma**
S.L. Wang, J.J. Lee, A.T. Liao
Myelosuppression is one of the most common side effects of chemotherapy. The aim of this study was to determine whether chemotherapy-induced neutropenia is a positive prognostic indicator for remission and survival time in dogs with lymphoma. Fifty dogs with multicentric lymphoma received CHOP-based (Cyclophosphamide; H-hydroxydaunorubicin; O-vincristine; P-prednisolone) chemotherapy using conventional dosages. Complete blood counts were recorded to determine the presence or absence of neutropenia after treatment. Toxicity, remission, and survival times were recorded and analysed. Thirteen dogs had chemotherapy-induced neutropenia and 37 had no neutropenia during the study period. No statistical difference was found between the groups for signalment or the presence of historical negative prognostic factors, except for bodyweight ($P = 0.02$). The median first remission times in the neutropenia and no neutropenia groups were 812 and 219 days, respectively ($P < 0.01$). The median survival times of dogs in the neutropenia and no neutropenia groups were 952 and 282 days, respectively ($P < 0.01$). Dogs with lymphoma that had chemotherapy-induced neutropenia exhibited significantly increased remission and survival times compared with dogs without neutropenia. Chemotherapeutic dosages may be adjusted individually to induce neutropenia without severe adverse effects in order to achieve longer remission and survival times.

**The relationship between the Southern Oscillation Index, rainfall and the occurrence of canine tick paralysis, feline tick paralysis and canine parvovirus in Australia**
Tamara Rika-Heke, Mark Kelman, Michael P. Ward
The aim of this study was to describe the association between climate, weather and the occurrence of canine tick paralysis, feline tick paralysis and canine parvovirus in Australia. The Southern Oscillation Index (SOI) and monthly average rainfall (mm) data were used as indices for climate and weather, respectively. Case data were extracted from a voluntary national companion animal disease surveillance resource. Climate and weather data were obtained from the Australian Government Bureau of Meteorology. During the 4-year study period (January 2010–December 2013), a total of 4742 canine parvovirus cases and 8417 tick paralysis cases were reported. No significant ($P \geq 0.05$) correlations were found between the SOI and parvovirus, canine tick paralysis or feline tick paralysis. A significant ($P < 0.05$) positive cross-correlation was found between parvovirus occurrence and rainfall in the same month (0.28), and significant negative cross-correlations ($-0.26$ to $-0.36$) between parvovirus occurrence and rainfall 4–6 months previously. Significant ($P < 0.05$) negative cross-correlations ($-0.34$ to $-0.39$) were found between canine tick paralysis occurrence and rainfall 1–3 months previously, and significant positive cross-correlations ($0.29$–$0.47$) between canine tick paralysis occurrence and rainfall 7–10 months previously. Significant positive cross-correlations ($0.37$–$0.68$) were found between cases of feline tick paralysis and rainfall 6–10 months previously. These findings may offer a useful tool for the management and prevention of tick paralysis and canine parvovirus, by providing an evidence base supporting the recommendations of veterinarians to clients thus reducing the impact of these diseases.

**Agreement between veterinary patient data collected from different sources**
Natalie J. Robinson, Marnie L. Brennan, Malcolm Cobb, Rachel S. Dean
Determining the accuracy of the electronic medical record (EMR) is vital to the progress of practice-based research. The aim of this study was to determine the agreement between the EMR and other sources of signalment data. Data were gathered during direct observation of small animal consultations in eight veterinary practices. Breed, age, sex and neuter status were recorded, where available, from the EMR, owner and observer and then compared for agreement. Agreement was ‘almost perfect’ or ‘strong’ for 18/28 comparisons, although there was variation between the species. The results have implications for researchers collecting data from the EMR of first opinion practices. Future work could focus on the accuracy of other data obtained from the EMR.

**Surgically planned versus histologically measured lateral tumor margins for resection of cutaneous and subcutaneous mast cell tumors in dogs: 46 cases (2010-2013).**
Risselada M, Mathews KG, Griffith E.
OBJECTIVE: To compare preplanned lateral surgical margins and measured lateral histologic margins for cutaneous and subcutaneous mast cell tumor (MCT) resections in dogs. DESIGN: Retrospective case series. SAMPLE: 51 biopsy specimens from dogs (n = 46) with MCTs. PROCEDURES: All canine patients that underwent curative-intent surgical resection of cutaneous or subcutaneous MCTs from January 1, 2010, through June 30, 2013, with complete medical records including signalment, body condition score (BCS), surgery report (with measured surgical margins), and histopathology report were included. The surgically measured tumor margins in each quadrant were grouped and compared with the corresponding histologic margins. Specimens from dogs with truncal MCTs and a BCS of 7 to 9 on a scale from 1 to 9 (ie, high) were compared with those of dogs with a BCS of 4 to 6 to evaluate effect of BCS on tissue margins. RESULTS: 51 specimens were included. Surgically mapped lateral margins differed significantly from histologically reported margins in all 4 quadrants. The mean histologic margins were 35% to 42% smaller than the surgical margins for the combined 51 specimens. A higher BCS did not significantly influence the magnitude of the difference in lateral margins measured histologically. No significant difference was found for the magnitude of the differences between any of the 4 lateral margins. CONCLUSIONS AND CLINICAL RELEVANCE: Results of this study suggested that surgical and histologic margins may differ significantly for canine cutaneous and subcutaneous MCTs. This may be a result of tissue shrinkage following excision and fixation, extension of the MCT beyond palpable margins, or both. Histologic measurements may significantly underestimate the tumor-free margins in dogs with cutaneous and subcutaneous MCTs.

Lidbury JA, Ivanek R, Suchodolski JS, Steiner JM.
OBJECTIVE: To elucidate the relationship between plasma ammonia concentration and severity of hepatic encephalopathy and determine whether factors that precipitate hepatic encephalopathy in humans are associated with the presence of clinical signs of hepatic encephalopathy in dogs previously treated for the disease. DESIGN: Retrospective case series. ANIMALS: 118 dogs with hepatic encephalopathy. PROCEDURES: The medical records database of a veterinary teaching hospital was searched for records of dogs in which hepatic encephalopathy was diagnosed between October 1, 1991, and September 1, 2014. Hepatic encephalopathy severity was graded on a 5-point scale, and the correlation between disease severity and plasma ammonia concentration was determined. Respectively associations between hepatic encephalopathy and systemic inflammatory response syndrome, gastrointestinal hemorrhage, dietary indiscretion, constipation, furosemide treatment, azotemia, hypokalemia, hyponatremia, alkalosis, and hyperammonemia were assessed by Fisher exact tests followed by multivariable logistic regression. RESULTS: Severity of hepatic encephalopathy at hospital admission was not significantly correlated with plasma ammonia concentration. Dogs treated for hepatic encephalopathy prior to hospital admission were significantly less likely to have clinical signs of the disease at hospital admission, compared with dogs that were not treated for the disease (OR, 0.36; 95% confidence interval, 0.17 to 0.78). None of the putative precipitating factors for hepatic encephalopathy were significantly associated with the presence of clinical signs of the disease at hospital admission. CONCLUSIONS AND CLINICAL RELEVANCE: Results indicated that hepatic encephalopathy treatment alleviated clinical signs of the disease. Further investigation is necessary to identify precipitating factors for hepatic encephalopathy in dogs.

OBJECTIVE: To determine the signalment, clinical features, echocardiographic findings, and outcome of dogs and cats with ventricular septal defects (VSDs). DESIGN: Retrospective case series. ANIMALS: 56 dogs and 53 cats with VSDs. PROCEDURES: Medical records of dogs and cats with VSDs diagnosed by means of conventional and Doppler echocardiography were reviewed. Signalment, clinical status, echocardiographic findings, and outcome data were recorded. Variables of interest were analyzed for the study population and subgroups according to species and clinical status. RESULTS: VSDs were isolated (ie, solitary defects) in 53 of 109 (48.6%) patients. Most (82/109 [75.2%]) VSDs were membranous or perimembranous. Terriers and French Bulldogs were commonly represented canine breeds. Most isolated VSDs were subclinical (43/53 [81%]) and had a pulmonary-to-systemic flow ratio < 1.5 (24/32 [75%]). The VSD diameter and VSD-to-aortic diameter ratio were significantly correlated with pulmonary-to-systemic flow ratio in dogs (r = 0.529 and r = 0.689, respectively) and in cats (r = 0.713 and r = 0.829, respectively). One dog underwent open surgical repair for an
isolated VSD and was excluded from survival analysis. Of the remaining animals with isolated VSDs for which data were available (37/52 [71%]), no subclinically affected animals developed signs after initial diagnosis, and median age at death from all causes was 12 years. CONCLUSIONS AND CLINICAL RELEVANCE: Most dogs and cats with isolated VSDs had a long survival time; few had clinical signs at diagnosis, and none with follow-up developed clinical signs after diagnosis.

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End-to-end ureteral anastomosis and double-pigtail ureteral stent placement for treatment of iatrogenic ureteral trauma in two dogs.

Wormser C, Clarke DL, Aronson LR.
CASE DESCRIPTION: A 6-month-old spayed female Soft-Coated Wheaten Terrier and 8-month-old spayed female Shih Tzu were referred because of complications related to inadvertent ureteral ligation and transection during recent ovariohysterectomy. CLINICAL FINDINGS: The Soft-Coated Wheaten Terrier had a 2-day history of stranguria and polyuria that began after ovariohysterectomy. Initial examination findings were unremarkable with the exception of high rectal temperature. The Shih Tzu had a 10-day history of pyrexia, vomiting, diarrhea, and stranguria that began after ovariohysterectomy. On examination, the dog had signs of depression; clinicopathologic tests revealed hypoalbuminemia, neutrophilia, lymphocytosis, and monocytosis. Abdominal ultrasonography was performed for both dogs, revealing severe unilateral pyelectasia and hydrourereter (proximal portion). TREATMENT AND OUTCOME: Both dogs underwent exploratory celiotomy; ureteral ligation and transection was confirmed. Ventral cystotomy was performed to allow retrograde placement of a double-pigtail ureteral stent into the affected ureter and renal pelvis. End-to-end ureteral anastomosis was performed over the stent with the aid of an operating microscope. Stent position was confirmed via fluoroscopy, and incisions were closed routinely. Dogs continued to have intermittent signs of stranguria until stent removal via cystoscopy 6 or 7 weeks after surgery. Ultrasonographic examination of the urogenital tract was performed 2 or 4 months after surgery, revealing resolution of pyelectasia and hydrourereter. CLINICAL RELEVANCE: The surgical technique used provided a viable option for preserving renal function in dogs with focal, iatrogenic ureteral trauma. Use of a ureteral stent facilitated ureteral anastomosis and minimized postoperative complications.


Haley AL, Mann FA, Middleton J, Nelson CA.
OBJECTIVE: To compare perioperative RBC transfusion among dogs undergoing liver lobectomy, splenectomy, partial gastrectomy, rhinotomy, thyroidectomy, perineal herniorrhaphy, and intrathoracic surgery. DESIGN: Retrospective case series. ANIMALS: 207 client-owned dogs that underwent various surgeries. PROCEDURES: Medical records were reviewed for dogs that had undergone liver lobectomy, splenectomy, partial gastrectomy, rhinotomy, neoplastic thyroidectomy, perineal herniorrhaphy, or intrathoracic surgery. Transfusion requirement (packed RBC, whole blood, and bovine hemoglobin-based oxygen carrier) and survival rate at 2 weeks after surgery were compared among dogs undergoing the various surgeries. RESULTS: Patients undergoing splenectomy and liver lobectomy were significantly more likely to receive RBC transfusion when each was compared with patients undergoing all other procedures. A significant association was found between body weight and perioperative RBC transfusion, with greater odds of transfusion as body weight increased. Dogs receiving perioperative RBC transfusions were significantly less likely to survive to 2 weeks after surgery. CONCLUSIONS AND CLINICAL RELEVANCE: Results indicated that dogs undergoing splenectomy and liver lobectomy may require RBC transfusion perioperatively. Veterinarians who perform these procedures should plan accordingly and have packed RBCs or whole blood donors readily available.

Association of blood lactate concentration with physical perfusion variables, blood pressure, and outcome for cats treated at an emergency service.

Reineke EL, Rees C, Drobatz KJ.
OBJECTIVE: To determine the association of blood lactate concentration with physically assessed perfusion variables, systolic arterial blood pressure (SAP), and outcome in cats evaluated by an emergency service. DESIGN: Prospective, observational study. ANIMALS: 111 cats. PROCEDURES: Initial blood lactate concentration and SAP (prior to any therapeutic interventions) as well as physically assessed perfusion variables (mucous membrane color, capillary refill time, peripheral pulse quality, heart rate, and rectal temperature) were
**Detemir insulin for the treatment of diabetes mellitus in dogs.**
Fracassi F, Corradini S, Hafner M, Boretti FS, Sieber-Ruckstuhl NS, Reusch CE.

**OBJECTIVE:** To investigate the effects of insulin detemir in dogs with diabetes mellitus.

**DESIGN:** Prospective, uncontrolled clinical trial.

**ANIMALS:** 10 client-owned dogs with naturally occurring diabetes mellitus.

**PROCEDURES:** Dogs were treated with insulin detemir SC every 12 hours for 6 months. Follow-up evaluations were done at 1, 2, 4, 12, and 24 weeks and included evaluation of clinical signs and measurement of blood glucose concentration curves and serum fructosamine concentrations.

**RESULTS:** Insulin detemir administration resulted in a significant decrease in blood glucose and serum fructosamine concentrations at 6 months, compared with pretreatment values. Median insulin dosage at the end of the study was 0.12 U/kg (0.055 U/lb; range, 0.05 to 0.34 U/kg [0.023 to 0.155 U/lb], SC, q 12 h). Hypoglycemia was identified in 22% (10/45) of the blood glucose concentration curves, and 6 episodes of clinical hypoglycemia in 4 dogs were recorded. A subjective improvement in clinical signs was observed in all dogs during the 6-month study period. On the basis of clinical signs and blood glucose concentration curves, efficacy of insulin detemir at the end of the study was considered good in 5 dogs, moderate in 3, and poor in 2.

**CONCLUSIONS AND CLINICAL RELEVANCE:** Results suggested that SC injection of insulin detemir every 12 hours may be a viable treatment for diabetes mellitus in dogs. Insulin detemir dosages were lower than reported dosages of other insulin types needed to maintain glycemic control, suggesting that insulin detemir should be used with caution, especially in small dogs.

**Journal of Feline Medicine & Surgery**

**Something old, something new: Update of the 2009 and 2013 ABCD guidelines on prevention and management of feline infectious diseases**
Karin Möstl, Diane D Addie, Corine Boucraut-Baralon et al.

**Overview:** The ABCD has published 34 guidelines in two Special Issues of the Journal of Feline Medicine and Surgery (JFMS): the first in July 2009 (Volume 11, Issue 7, pages 527–620) and the second in July 2015 (Volume 15, Issue 7, pages 528–652). The present article contains updates and new information on 18 of these (17 disease guidelines and one special article ‘Prevention of infectious diseases in cat shelters’). For detailed information, readers are referred to the guidelines published in the above-mentioned JFMS Special Issues.

**Matrix vaccination guidelines: 2015 ABCD recommendations for indoor/outdoor cats, rescue shelter cats and breeding catteries**
Margaret J Hosie, Diane D Addie, Corine Boucraut-Baralon et al.

**Overview:** In 2013, the ABCD published ‘Matrix vaccination guidelines: ABCD recommendations for indoor/outdoor cats, rescue shelter cats and breeding catteries’ in a Special Issue of the Journal of Feline Medicine and Surgery (Volume 15, Issue 7, pages 540–544). The ABCD’s vaccination recommendations were presented in tabulated form, taking into account that there is no universal vaccination protocol for all cats. To support the veterinarian’s decision making, recommendations for four lifestyles were made: for cats with outdoors access, cats kept solely indoors, rescue shelter cats and cats in breeding catteries. This update article follows the same approach, offering current and, where relevant, expanded recommendations.

**Blood transfusion in cats: ABCD guidelines for minimising risks of infectious iatrogenic complications**
Maria Grazia Pennisi, Katrin Hartmann, Diane D Addie et al.
Overview: The availability of blood components has increased the number of indications for transfusing cats, and fresh whole blood is readily accessible to clinicians because it can be taken from in-house donor cats or “volunteer” feline blood donors. A certain amount of risk remains to the recipient cat, as immediate or delayed adverse reactions can occur during or after transfusion, related to immunemediated mechanisms. This article, however, focuses on adverse events caused by infectious agents, which may originate either from contamination of blood following incorrect collection, storage or transfusion, or from transfusion of contaminated blood obtained from an infected donor. Prevention of blood contamination: In cats, blood cannot be collected through a closed system and, therefore, collection of donor blood requires a multi-step manipulation of syringes and other devices. It is crucial that each step of the procedure is performed under the strictest aseptic conditions and that bacterial contamination of blood bags is prevented, as bacterial endotoxins can cause an immediate febrile reaction or even fatal shock in the recipient cat. Prevention of disease transmission: With a view to preventing transmission of blood-borne infectious diseases, the American College of Veterinary Internal Medicine has adopted basic criteria for selecting pathogens to be tested for in donor pets. The worldwide core screening panel for donor cats includes feline leukaemia virus, feline immunodeficiency virus, Bartonella species and feline haemoplasma. The list should be adapted to the local epidemiological situation concerning other vector-borne feline infections. The most practical, rapid and inexpensive measure to reduce transfusion risk is to check the risk profile of donor cats on the basis of a written questionnaire. Blood transfusion can never, however, be considered entirely safe.

Disinfectant choices in veterinary practices, shelters and households: ABCD guidelines on safe and effective disinfection for feline environments
Diane D Addie, Corine Boucraut-Baralon, Herman Egberink et al.
Overview: Regardless of whether a pathogen is viral, bacterial, parasitic, fungal or an emerging unknown, the mainstay of infectious disease control is hygiene, and the cornerstone of good hygiene is effective disinfection. Challenges and current choices: Certain pathogens present a challenge to kill effectively: parvovirus, protozoal oocysts, mycobacteria, bacterial spores and prions resist most disinfectants but can be eliminated through heat, especially steam, which will kill protozoal oocysts. Heat is the safest and most effective disinfectant, but cannot be universally applied. Temperatures in washing machines and dishwashers should be at least 60°C to eliminate pathogenic spores and resistant viruses. Enveloped viruses are susceptible to most disinfectants; of the non-enveloped viruses, parvovirus is recognised as being the most difficult to eradicate. Sodium hypochlorite is recommended for many applications: cleaning of floors, laundry, food preparation surfaces and utensils. Skin scrubs and rubs containing alcohols are more effective than those containing chlorhexidine, and less subject to contamination. Disinfectants to avoid: Deficiency of the enzyme UDP-glucuronosyl transferase renders the cat susceptible to the toxic effects of phenol-based disinfectants (including many essential oils), so these should be avoided in feline environments. Quaternary ammonium compounds (eg, benzalkonium chloride) are also probably best avoided. The future: Veterinary disinfection approaches in the future may include use of ultraviolet radiation and, increasingly, silver.

Feline injection-site sarcoma: ABCD guidelines on prevention and management
Katrin Hartmann, Michael J Day, Etienne Thiry et al.
Overview: In cats, the most serious of adverse effects following vaccination is the occurrence of invasive sarcomas (mostly fibrosarcomas): so-called ‘feline injection-site sarcomas’ (FISSs). These develop at sites of previous vaccination or injection. They have characteristics that are distinct from those of fibrosarcomas in other areas and behave more aggressively. The rate of metastasis ranges from 10–28%. Pathogenesis: The pathogenesis of these sarcomas is not yet definitively explained. However, chronic inflammatory reactions are considered the trigger for subsequent malignant transformation. Injections of long-acting drugs (such as glucocorticoids, and others) have been associated with sarcoma formation. Adjuvanted vaccines induce intense local inflammation and seem therefore to be particularly linked to the development of FISS. The risk is lower for modified-live and recombinant vaccines, but no vaccine is risk-free. Treatment and prevention: Aggressive, radical excision is required to avoid tumour recurrence. The prognosis improves if additional radiotherapy and/or immunotherapy (such as recombinant feline IL–2) are used. For prevention, administration of any irritating substance should be avoided. Vaccination should be performed as often as necessary, but as infrequently as possible. Non-adjuvanted, modified-live or recombinant vaccines should be selected in preference to adjuvanted vaccines. Injections should be given at sites at which surgery would likely lead to a complete cure; the interscapular region should generally be avoided. Post-vaccination monitoring should be performed.
Borna disease virus infection in cats: ABCD guidelines on prevention and management
Hans Lutz, Diane D Addie, Corine Boucrut-Baralon et al.
Overview: Borna disease virus (BDV) has a broad host range, affecting primarily horses and sheep, but also cattle, ostriches, cats and dogs. In cats, BDV may cause a non-suppurative meningoencephalomyelitis (‘staggering disease’). Infection: The mode of transmission is not completely elucidated. Direct and indirect virus transmission is postulated, but BDV is not readily transmitted between cats. Vectors such as ticks may play a role and shrews have been identified as a potential reservoir host. Access to forested areas has been reported to be an important risk factor for staggering disease. Disease signs: It is postulated that BDV may infect nerve endings in the oropharynx and spread via olfactory nerve cells to the central nervous system. A strong T-cell response may contribute to the development of clinical disease. Affected cats develop gait disturbances, ataxia, pain in the lower back and behavioural changes. Diagnosis: For diagnostic purposes, detection of viral RNA by reverse transcription PCR in samples collected from cats with clinical signs of Borna disease can be considered diagnostic. Serology is of little value; cats without signs of Borna disease may be seropositive and yet not every cat with BDV infection has detectable levels of antibodies. Human infection: A hypothesis that BDV infection may be involved in the development of selected neurological disorders in man could not be confirmed. A research group within the German Robert Koch Institute studied the potential health threat of BDV to humans and concluded that BDV was not involved in the aetiology of human psychiatric diseases.

West Nile virus infection in cats: ABCD guidelines on prevention and management
Herman Egberink, Diane D Addie, Corine Boucrut-Baralon et al.
Overview: West Nile virus (WNV) is a zoonotic mosquito-borne virus with a broad host range that infects mainly birds and mosquitoes, but also mammals (including humans), reptiles, amphibians and ticks. It is maintained in a bird–mosquito–bird transmission cycle. The most important vectors are bird-feeding mosquitoes of the Culex genus; maintenance and amplification mainly involve passerine birds. WNV can cause disease in humans, horses and several species of birds following infection of the central nervous system. Infection in cats: Cats can also be infected through mosquito bites, and by eating infected small mammals and probably also birds. Although seroprevalence in cats can be high in endemic areas, clinical disease and mortality are rarely reported. If a cat is suspected of clinical signs due to an acute WNV infection, symptomatic treatment is indicated.

Streptococcal infections in cats: ABCD guidelines on prevention and management
Tadeusz Frymus, Diane D Addie, Corine Boucrut-Baralon et al.
Overview: Streptococcus canis is most prevalent in cats, but recently S equi subsp zooepidemicus has been recognised as an emerging feline pathogen. S canis infection: S canis is considered part of the commensal mucosal microflora of the oral cavity, upper respiratory tract, genital organs and perianal region in cats. The prevalence of infection is higher in cats housed in groups; and, for example, there may be a high rate of vaginal carriage in young queens in breeding catteries. A wide spectrum of clinical disease is seen, encompassing neonatal septicaemia, upper respiratory tract disease, abscesses, pneumonia, osteomyelitis, polyarthritis, urogenital infections, septicemia, sinusitis and meningitis. S equi subsp zooepidemicus infection: S equi subsp zooepidemicus is found in a wide range of species including cats. It was traditionally assumed that this bacterium played no role in disease of cats, but it is now considered a cause of respiratory disease with bronchopneumonia and pneumonia, as well as meningoencephalitis, often with a fatal course. Close confinement of cats, such as in shelters, appears to be a major risk factor. As horses are common carriers of this bacterium, contact with horses is a potential source of infection. Additionally, the possibility of indirect transmission needs to be considered. Diagnosis: Streptococci can be detected by conventional culture techniques from swabs, bronchoalveolar lavage fluid or organ samples. Also real-time PCR can be used, and is more sensitive than culture. Treatment: In suspected cases, treatment with broad-spectrum antibiotics should be initiated as soon as possible and, if appropriate, adapted to the results of culture and sensitivity tests.

Lungworm disease in cats: ABCD guidelines on prevention and management
Maria Grazia Pennisi, Katrin Hartmann, Diane D Addie et al.
Overview: Cardiopulmonary nematodes are emerging parasites of cats in Europe. A number of helminth parasites may be involved. The most prevalent lungworm in domestic cats is Aeluromstrongylus abstrusus. Olsers rostratus and Troglostrongylus species are found mainly in wild cats. The trichurid Capillaria aerophila has a low host specificity and is not uncommon in cats. Additionally the lung flukes Paragonimus species are
reported in many species outside of Europe, including cats. Clinical signs: Lungworm infections may be asymptomatic, or cause mild to severe respiratory signs, dependent on the worm species and burden; mixed infections are observed. Kittens can be vertically infected and may develop a more severe disease. Affected cats show a productive cough, mucopurulent nasal discharge, tachypnoea, dyspnoea and, in severe cases, respiratory failure and death. Management: Early diagnosis and treatment greatly improves the prognosis. First-stage larvae can be easily detected in fresh faecal samples; the Baermann migration method is the enrichment technique of choice, but takes 24 h. Lungworm larvae can be found in tracheal swabs and bronchoalveolar lavage fluid, but with less sensitivity than in faeces. Molecular methods have been developed that exhibit high specificity and sensitivity, and allow diagnosis in the prepatent phase. Treatment options include fenbendazole paste, milbemycin oxime/praziquantel and various spot-on formulations. Severe cases should receive prompt medical care in an intensive care unit. Prevention: Avoiding predation is at present the only preventive measure for pulmonary worms with indirect life cycles. Zoonotic risk: *C. aerophila* has zoonotic potential, causing severe pulmonary disease in humans. Some *Paragonimus* species are also of zoonotic concern.

**Cytauxzoonosis in cats: ABCD guidelines on prevention and management**

Albert Lloret, Diane D Addie, Corine Boucraut-Baralon et al.

Overview: *Cytauxzoon* species are apicomplexan haemoparasites, which may cause severe disease in domestic cats, as well as lions and tigers. For many years, cytauxzoonosis in domestic cats was only reported in North and South America, but in recent years the infection has also been seen in Europe (Spain, France and Italy).

Infection: *Cytauxzoon felis* is the main species; it occurs as numerous different strains or genotypes and is transmitted via ticks. Therefore, the disease shows a seasonal incidence from spring to early autumn and affects primarily cats with outdoor access in areas where tick vectors are prevalent. Domestic cats may experience subclinical infection and may also act as reservoirs. Clinical signs: *Cytauxzoonosis* caused by *C felis* in the USA is an acute or paracute severe febrile disease with non-specific signs. Haemolytic anaemia occurs frequently; in some cats neurological signs may occur in late stages. The *Cytauxzoon* species identified in Europe differ from *C felis* that causes disease in the USA and are probably less virulent. The majority of infected cats have been healthy; in some cases anaemia was found, but disease as it occurs in the USA has not been reported to date. Diagnosis: Diagnosis is usually obtained by *Cytauxzoon* detection in blood smears and/or fine-needle aspirates from the liver, spleen and lymph nodes. PCR assays are able to detect low levels of parasitaemia and may be used for confirmation. Treatment: Currently a combination of the antiprotozoal drugs atovaquone and azithromycin is the treatment of choice. Concurrent supportive and critical care treatment is extremely important to improve the prognosis. Cats that survive the infection may become chronic carriers for life. Prevention: Cats with outdoor access in endemic areas should receive effective tick treatment.

**Hepatozoonosis in cats: ABCD guidelines on prevention and management**

Albert Lloret, Diane D Addie, Corine Boucraut-Baralon et al.

Overview: Hepatozoonosis of domestic cats has been reported in several countries, mainly as a subclinical infection. Disease agent: Infection has been described mostly in areas where canine infection is present and, in recent years, Hepatozoon felis has been identified as a distinct species by molecular techniques. The vector for feline hepatozoonosis remains unknown and the pathogenesis has not been elucidated. Infection in cats: Feline hepatozoonosis is mainly a subclinical infection and few cases have been reported with clinical signs. The diagnosis of hepatozoonosis in cats can be made by observation of parasite gamonts in blood smears, parasite meronts in muscles by histopathology, and detection of parasite DNA in blood and tissue by PCR. Disease management: The treatment of choice is not known, but single cases have been treated with doxycycline or oxytetracycline and primaquine. Although the mode of transmission and the type of vector is not known, preventive treatment against blood-sucking vectors (fleas and ticks) is advised.

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**Comparison of axillary and rectal temperatures for healthy Beagles in a temperature- and humidity-controlled environment.**

Justin C. Mathis, Vicki L. Campbell.

OBJECTIVE To compare axillary and rectal temperature measurements obtained with a digital thermometer for Beagles in a temperature- and humidity-controlled environment. ANIMALS 26 healthy Beagles (17 sexually intact males and 9 sexually intact females). PROCEDURES Dogs were maintained in a temperature- and humidity-controlled environment for 56 days before rectal and axillary temperatures were measured. Axillary
and rectal temperatures were obtained in triplicate for each dog by use of a single commercially available manufacturer-calibrated digital thermometer. RESULTS Mean rectal and axillary temperatures of Beagles maintained in a temperature- and humidity-controlled environment were significantly different, with a median ± SD difference of 1.4° ± 0.15°C (range, 0.7° to 2.1°C). Mean rectal and axillary temperatures were 38.7°C (range, 37.6° to 39.5°C) and 37.2°C (range, 36.6° to 38.3°C), respectively. CONCLUSIONS AND CLINICAL RELEVANCE Results of this study indicated that the historical reference of a 0.55°C gradient between rectal and axillary temperatures that has been clinically used for veterinary patients was inaccurate for healthy Beagles in a temperature- and humidity-controlled environment. Rectal and axillary temperatures can be measured in veterinary patients. Reliable interpretation of axillary temperatures may accommodate patient comfort and reduce patient anxiety when serial measurement of temperatures is necessary. Further clinical studies will be needed.

Effect of exercise on serum markers of muscle inflammation in Spanish Greyhounds.
Vanessa Lucas, Rafael Barrera, Francisco J. Duque, Patricia Ruiz, Concepcion Zaragoza.
OBJECTIVE To investigate effects of exercise on hematologic and biochemical values (especially markers of inflammation and muscle damage) in Spanish Greyhounds used for hunting without previous training.
ANIMALS 32 Spanish Greyhounds and 31 dogs of other breeds.
PROCEDURES Hematologic variables and concentrations of C-reactive protein (CRP) and other biochemical markers were compared in samples obtained from Spanish Greyhounds 24 hours after exercise (eg, a hunting race) and 2 months after exercise (ie, at rest) and from non–Spanish Greyhounds at rest. All dogs were healthy. Hematologic and biochemical analyses were performed within 24 hours after samples were obtained, and results were compared by means of a Student t test.
RESULTS CRP concentration and muscle enzyme (creatinine kinase, lactate dehydrogenase, and aspartate aminotransferase) activities were significantly higher and serum iron concentration was significantly lower for Spanish Greyhounds after exercise than at rest. The WBC and neutrophil counts were significantly higher after exercise then at rest. Plasma alanine transaminase activity and total protein, calcium, and phosphorus concentrations were significantly higher after exercise than at rest. Spanish Greyhounds at rest had higher RBC counts, PCVs, and hemoglobin concentrations and lower WBC, neutrophil, and lymphocyte counts, compared with values for non–Spanish Greyhounds at rest. CONCLUSIONS AND CLINICAL RELEVANCE Exercise of Spanish Greyhounds without prior training activated an acute-phase response represented by an increase in serum CRP concentration and decrease in serum albumin and iron concentrations. These changes, along with leukocytosis and neutrophilia, were indicative of a subclinical inflammatory state in Spanish Greyhounds.

Effects of azathioprine, 6-mercaptopurine, and 6-thioguanine on canine primary hepatocytes.
Kathleen E. LaDuke; Sarah Ehling; John M. Cullen, Wolfgang Bäumer.
OBJECTIVE To investigate the cytotoxic effects of azathioprine, 6-mercaptopurine, and 6-thioguanine on canine hepatocytes. SAMPLE Commercially available cryopreserved canine primary hepatocytes.
PROCEDURES The study consisted of 2 trials. In trial 1, hepatocytes were incubated with azathioprine, 6-mercaptopurine, or 6-thioguanine at 1 of 6 concentrations (0.468, 0.937, 1.875, 3.750, 7.500, or 15.000 µmol/L) for 24, 48, or 72 hours. At each time, cell viability and lactate dehydrogenase (LDH) activity were determined for each thiopurine-concentration combination, and alanine aminotransferase (ALT) activity was determined for cells incubated with each thiopurine at a concentration of 15 µmol/L. In trial 2, hepatocytes were incubated with azathioprine, 6-mercaptopurine, or 6-thioguanine at 1 of 3 concentrations (18.75, 37.50, or 75.00 µmol/L) for 24 hours, after which the free glutathione concentration was determined for each thiopurine-concentration combination and compared with that for hepatocytes incubated without a thiopurine (control). RESULTS Incubation of hepatocytes with each of the 3 thiopurines adversely affected cell viability in a time- and concentration-dependent manner; however, this decrease in cell viability was not accompanied by a concurrent increase in LDH or ALT activity. Likewise, free glutathione concentration for hepatocytes incubated for 24 hours with supratherapeutic thiopurine concentrations (> 18.75 µmol/L) did not differ significantly from that of control cells. CONCLUSIONS AND CLINICAL RELEVANCE Results indicated that thiopurines adversely affected the viability of canine hepatocytes in a time- and concentration-dependent manner but had a nonsignificant effect on the LDH and ALT activities and free glutathione depletion of those hepatocytes.

Journal of Small Animal Practice

Evaluation of a combination chemotherapy protocol including lomustine and doxorubicin in canine histiocytic sarcoma.
C. Cannon, A. Borgatti, M. Henson and B. Husbands

OBJECTIVES - To describe a chemotherapy protocol combining lomustine and doxorubicin in canine histiocytic sarcoma, including outcomes and toxicity. MATERIALS AND METHODS - Retrospective review of case records for dogs with histiocytic sarcoma treated with lomustine and doxorubicin (± cyclophosphamide) alternating every 2 weeks. Data collected included signalment, clinical signs, clinicopathological abnormalities, extent of disease, response, toxicity, time to tumour progression and survival time. RESULTS - Of 17 dogs, 15 had disseminated or metastatic disease. The median number of chemotherapy cycles (one dose of each drug) received was three; most dogs discontinued therapy due to progressive disease. Dose reductions or delays occurred in 18% of cycles. The overall response rate was 58%, with a median time to tumour progression of 185 (range, 59 to 268) days for responders. The overall median survival time was 185 (18 to 402) days. No significant prognostic factors were identified. CLINICAL SIGNIFICANCE The protocol appeared well-tolerated, had some efficacy against canine histiocytic sarcoma in the study population and could be considered as an alternative to single-agent protocols; prospective comparison may be warranted.

Morphology of congenital portosystemic shunts involving the right gastric vein in dogs.
R. N. White and A. T. Parry

OBJECTIVE - To describe the anatomy of congenital portosystemic shunts involving the right gastric vein in dogs. MATERIALS AND METHODS Retrospective review of a consecutive series of dogs managed for congenital portosystemic shunt. RESULTS Twenty-two dogs met the inclusion criteria of a congenital portosystemic shunt involving the right gastric vein with recorded intraoperative mesenteric portovenography or computed tomography angiography and gross observations at the time of surgery. Of these, 20 (91%) had a shunt that entered the pre-hepatic caudal vena cava at the level of the epiploic foramen and two (9%) had a shunt that entered the post-hepatic caudal vena cava at the level of the diaphragm. Shunts entering the pre-hepatic caudal vena cava could be further classified into three consistent subdivisions. CLINICAL SIGNIFICANCE The morphology of each shunt type described appeared to be a result of an abnormal communication between the left gastric vein and the caudal vena cava, the presence or absence of an abnormal communication between the splenic, left gastric and portal veins and the subsequent development of preferential blood flow through essentially normal portal vessels within the portal venous system. The abnormal communication (shunt) was through the left gastric vein and not the right gastric vein, as might have been expected. This information may help with surgical planning in cases undergoing shunt closure surgery.

Three-dimensional conformal radiation therapy for inoperable massive hepatocellular carcinoma in six dogs.
T. Mori, Y. Ito, M. Kawabe, R. Iwasaki, H. Sakai, M. Murakami and K. Maruo

OBJECTIVES To evaluate the activity and tolerability of three-dimensional conformal radiation therapy (3D-CRT) in dogs with massive hepatocellular carcinoma. MATERIALS AND METHODS Six dogs with massive hepatocellular carcinoma that were ineligible for surgical resection or with owners who declined surgical resection, and underwent 3D-CRT were retrospectively reviewed. 6 to 10 Gy per fraction was prescribed at isocentre of planning target volume to a total dose of 18 to 42 Gy with 1 to 2 fractions per week for a total of 3 to 7 fractions. Follow-up examinations included physical examination, contrast-enhanced CT scan and blood analysis (complete blood count, electrolytes and serum biochemical panel). RESULTS The median follow-up time after 3D-CRT was 534 (range, 281 to 1057) days. An objective response was observed in five of six cases. Radiation-induced liver disease developed in one dog but was asymptomatic and reversible. Toxicity was not noted in any other dog. CLINICAL SIGNIFICANCE 3D-CRT appears to be a viable treatment option for dogs with inoperable massive hepatocellular carcinoma.

Evaluation of an oesophageal Doppler device for monitoring cardiac output in anaesthetised healthy normotensive dogs.
S. Canfrán, R. Cediel, I. Sández, A. Caro-Vadillo and I. A. Gómez de Segura

OBJECTIVES To compare cardiac output measured by oesophageal Doppler and by thermodilution monitoring and to correlate the Doppler cardiac output-generated minute distance with thermodilution cardiac output in healthy anaesthetised beagle dogs. MATERIALS AND METHODS Prospective experimental study. Six healthy adult beagle dogs were pre-medicated with intramuscular acepromazine (0·05 mg/kg) and methadone (0·3 mg/kg). Anaesthesia was induced with intravenous propofol (dose-effect) and maintained with isoflurane in oxygen. Simultaneously, a constant rate infusion of dopamine (3 µg/kg/minute) was administered to the dogs to prevent hypotension. The minute distance, Doppler and thermodilution cardiac outputs were assessed at three
different end-tidal concentrations of isoflurane (1 · 0, 1 · 3 and 2 · 0%). RESULTS Correlation between Doppler and thermodilution cardiac output ($r^2 = 0.582$) and between minute distance and thermodilution cardiac output ($r^2 = 0.658$) were moderately good, but the limits of agreement between Doppler and thermodilution cardiac outputs were above the recommended values ($±39\%$, for a recommended value up to 30%). CLINICAL SIGNIFICANCE Doppler and minute distance cannot be considered as an alternative method to thermodilution to monitor cardiac output in the healthy anaesthetised dog.

**Evaluation of in-hospital electrocardiography versus 24-hour Holter for rate control in dogs with atrial fibrillation.**
A. R. Gelzer, M. S. Kraus and M. Rishniw

Objectives - To determine if the in-clinic ECG-derived heart rate could predict the at-home Holter-derived 24-hour average heart rate (Holter24h), and whether it is useful to identify slow versus fast atrial fibrillation in dogs. Materials and Methods - 82 pairs of 1-minute ECGs and 24-hour Holter recordings were acquired in 34 dogs with atrial fibrillation. The initial 24-hour Holter was used to test if the ECG heart rate can identify dogs with “slow” versus “fast” atrial fibrillation based on a Holter24h threshold value of 140 bpm. Results - ECG heart rate overestimated Holter24h by 26 bpm (95% CI: 3 bpm, 48 bpm; $P < 0.015$) with a 95% limit of agreement of −21 to 83 bpm. The in-clinic ECG-derived heart rate $\leq 155$ bpm had a sensitivity of 73% and a specificity of 100% for identifying a Holter24h HR $\geq 140$ bpm; an in-clinic ECG-derived HR $< 160$ bpm had a sensitivity and specificity of 91% each. Clinical Significance - In-clinic ECG assessment of heart rate in dogs with atrial fibrillation does not reliably predict the heart rate in their home environment. However, an in-clinic heart rate greater than 155 bpm is useful in identifying “fast” atrial fibrillation, allowing clinicians to stratify which case may benefit from antiarrhythmic therapy.

**Health screening to identify opportunities to improve preventive medicine in cats and dogs.**
M. Diez, P. Picavet, R. Ricci, M. Dequenne, M. Renard, A. Bongartz and F. Farnir

OBJECTIVES To describe the results of a prevention campaign in terms of participation and pet health status and to identify opportunities to improve preventive medicine in cats and dogs. METHODS An awareness campaign was designed to highlight the role of veterinarians and emphasise the benefits of a veterinary visit. Owners were invited to make an appointment for a free pet health check in a voluntarily participating veterinary clinic. Observations recorded by the veterinarians were entered in a database and subsequently analysed using simple descriptive statistics. RESULTS - A total of 5305 completed health check forms were analysed. The percentages of overweight and obese dogs and cats were 34 and 36%, respectively; this was the most common finding, followed by dental calculus (31% in dogs, 21% in cats). In total 67% of cats did not undergo flea control and 59% were not vaccinated. CLINICAL SIGNIFICANCE Opportunities for increased quality of care are numerous given the high percentage of intact, unvaccinated or non-permanently identified pets and the low level of worm and flea control. Animal health should benefit from preventive measures, and improved management can be undertaken after early detection of diseases.