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Due to the generosity of Dave Collins, Anna Dengate, Karina Graham, Chris Greenwell, Amy Lam and the ISFM, the CVE is able to offer this resource.

September, 2013

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Effects of Ampicillin/Sublactam and Enrofloxacin on the Blood Pressure of Isoflurane Anesthetized Dogs
Jeremiah D. Moorer, Heather A. Towle-Millard, Marjorie E. Gross, and Mark E. Payton
A blinded, prospective, randomized crossover study was performed to determine the effects of ampicillin Na/sublactam Na and enrofloxacin on the blood pressure (BP) of healthy anesthetized dogs. Eight dogs were anesthetized three different times. They randomly received enrofloxacin, ampicillin Na/sublactam Na, and saline. Systolic, diastolic, and mean arterial BPs (SAP, DAP, and MAP, respectively), heart rate (HR), O2 saturation of hemoglobin, end-tidal CO2 (ETCO2) concentration, inspired isoflurane concentration, end-tidal isoflurane (ETiso) concentration, respiratory rate, electrocardiogram, and body temperature were measured for 20 min prior to administration of treatment, during administration over 30 min, and for 30 min after administration. There was no significant difference in the SAP or ETiso. There was no significant change in the arterial pressure values over time in the enrofloxacin and ampicillin Na/sublactam Na groups. The control group’s MAP increased over time and was increased compared with the enrofloxacin group at times 25, 35, 45, and 55. The statistical difference between the enrofloxacin and the control groups was due to an increase in the MAP in the control group, not a decrease in the enrofloxacin group’s BP. Neither enrofloxacin nor ampicillin Na/sublactam Na caused hypotension in healthy dogs anesthetized with isoflurane and fentanyl.

Comparison of Gravity Collection Versus Suction Collection for Transfusion Purposes in Dogs
Bérénice Converse, Marie-Claude Blais, Lisa Carioto, and Julie Beaudoin
Blood donation is an essential step in transfusion medicine that must take into account the donor’s welfare, collection effectiveness, and blood product quality. This prospective study enrolled 13 canine blood donors, each subjected to both gravity and suction collection methods, in a randomized order. Clinical parameters, including heart rate (HR), respiratory rate (RR), systolic blood pressure (SBP), and rectal temperature (RT), were evaluated at four time points, including when the donor was on the floor and on the collection table, and before and after blood donation. The number of times the donor and needle required repositioning, the duration of the donation, the noise created by the apparatus, and the presence of a hematoma were evaluated. The weight, index of hemolysis, and hematocrit of each unit of blood were recorded. There was no significant difference between collection methods for either the clinical parameters at each time point or the prevalence of hematoma formation, the frequency of needle repositioning, the hemolysis index, or hematocrit. Collection by suction was noisier (P < 0.0001), faster (P = 0.004), and associated with significantly less donor repositioning (P = 0.007). Suction appears to be a safe and cost-effective method that should be considered to optimize blood donation.

Evaluation of a Gelatin Matrix as a Topical Hemostatic Agent for Hepatic Bleeding in the Dog
Daniel P. Polidoro and Philip H. Kass
New generation topical hemostatic agents containing thrombin have been developed for use in surgical procedures when control of bleeding by conventional methods is either ineffective or impractical. The authors compared the safety, hemostatic efficacy, and handling characteristics of a thrombin-containing topical surgical hemostatic agent (a gelatin matrix) to a hemostatic gelatin sponge for treatment of parenchymal bleeding after liver biopsy. Fourteen dogs were enrolled in this prospective clinical study. Paired 1.5 cm × 1.5 cm and 0.5 cm deep liver biopsies were obtained via laparotomy for each dog. One bleeding liver biopsy lesion was treated with the gelatin matrix and the other with a gelatin sponge. The treated liver biopsy sites were compared for bleeding severity, time to hemostasis, cumulative blood loss, and hemostatic agent handling characteristics. Median time to hemostasis was significantly shorter (P = 0.034) and median cumulative blood loss was significantly lower (P = 0.033) for the lesions treated with the gelatin matrix than the gelatin sponge. Adverse reactions were not observed within the first 24 hr postoperatively. When used to control parenchymal bleeding from liver biopsy sites in the dog, the evaluated gelatin matrix was safe and more effective than the gelatin sponge.

Reirradiation of Canine Nasal Carcinomas Treated with Coarsely Fractionated Radiation Protocols: 37 Cases
Tracy Gieger, Sheri Siegel, Kari Rosen, Dorothy Jackson, Kevin Ware, Michael Kiselow, and Keiijro Shiomitsu
Data from 37 dogs with nasal carcinomas treated with two or more coarsely fractionated courses of radiation therapy (RT) were retrospectively reviewed. The median radiation dose for the first course of RT was 24 Gray (Gy). All dogs clinically responded, and 11 had complete resolution of signs for a median of 114 days. Dogs were retreated at relapse, with a median dose of 20 Gy, and 26 of 37 dogs (70%) had clinical responses. The second course of RT was initiated at a median of 150 days following completion of the first course. Side effects
were mild: four dogs had chronic ocular conditions necessitating medication, one of which required enucleation. Median survival time (ST) from the first dose of RT was 453 days and 180 days from the first dose of the second course of RT. The following factors were examined but were not significant for survival: total RT dose, dose of the first course of RT, complete resolution of clinical signs, use of either chemotherapy or nonsteroidal anti-inflammatory drugs (NSAIDs), and stage (T1/T2 versus T3/T4). Dogs responded well to reirradiation with a subset experiencing chronic ocular side effects.

**Methocarbamol CRI for Symptomatic Treatment of Pyrethroid Intoxication: A Report of Three Cases**

William E. Draper, Luiz Bolfer, Emily Cottam, Maureen McMichael, and Thomas Schubert

Pyrethroids are popular for use in companion animals due to their relatively low mammalian toxicity and efficacy against arthropods. Nonetheless, pyrethroid intoxication has been reported in cats and dogs, and cats appear to be more susceptible due to difficulty in biotransformation and excretion of pyrethroids. Pyrethroid intoxications are generally due to either the improper use or accidental ingestion of approved products. Methocarbamol, given as intermittent injections, is a common first-line treatment choice for the tremors associated with pyrethroid intoxication. Two cats and one dog were treated with a methocarbamol continuous rate infusion (CRI) for pyrethroid intoxication. Clinical signs of toxicity resolved within a few hr in all three cases, with no adverse drug effects. A methocarbamol CRI can be considered in animals presenting with pyrethroid intoxication.

**Peritoneal EMH in a Dog with Immune-Mediated Hemolytic Anemia**

Karen Brenner, Lisa Pohlman, Ian Muldowney, Don Petersen, and Thomas Schermerhorn

Extramedullary hematopoiesis (EMH) is the process by which normal blood cells are produced outside the bone marrow. In humans, EMH effusions are rare and are characterized by the presence of megakaryocytes, immature erythrocytes, immature leukocytes, or combinations of those cells. To the authors’ knowledge, this is the first report to describe a case of peritoneal EMH effusion in a dog. A 5 yr old castrated male shorthaired dachshund presented with a 2 day history of pigmenturia and inappetence. A complete blood count revealed regenerative anemia with marked agglutination, spherocytosis, and an acute inflammatory leukogram characterized by a neutrophilia, regenerative left shift, and monocytosis. Ultrasound-guided aspiration of peritoneal effusion yielded a sample of high nucleated cellularity predominantly composed of mature and immature neutrophils and erythroid precursor cells. The patient was diagnosed with primary immune-mediated hemolytic anemia with concurrent EMH peritoneal effusion. The following case description and discussion explore the clinical findings associated with the unusual effusion and outline the possible pathogenesis by which the EMH effusion may have arisen in the dog.

**Zygomatic Salivary Gland Diseases in the Dog: Three Cases Diagnosed by MRI**

Laetitia Boland, Eymeric Gomes, Guillaume Payen, Bernard Bouvy, and Cyrill Poncet

This article describes three original cases of zygomatic gland disease in the dog diagnosed by low-field MRI and treated by a modified lateral orbitotomy with zygomatic osteotomy. Presenting complaints included exophthalmia, protrusion of the third eyelid, and periorbital swelling without any history of trauma. Low-field MRI allowed for adequate diagnosis of zygomatic gland disease in all cases and provided detailed information about both the specific tissue characteristics of each lesion and extension into surrounding structures. MRI findings were also helpful for surgical planning and dictated the choice of a modified lateral orbitotomy without removal of the orbital ligament. Histopathologic diagnosis for each of the three dogs was a mucocele, a malignant mixed salivary tumor, and sialadenitis.

**Supernumerary Kidney with Ipsilateral Cryptorchidism in a Cat**

Danielle Paradise and David Clark

An 8 wk old male domestic longhair was presented with an abdominal mass and cryptorchidism. A 2 cm mass was palpable in the midabdomen. Ultrasonography confirmed a complex, septated, cystic mass adjacent and caudal to the right kidney. A normally appearing left kidney was present. Pathologic examination of the excised abdominal mass revealed it to be a kidney with an attached, normal caliber ureter. At surgery, this kidney was separate from the parenchyma of the second, cranial, right kidney. Subsequently, the second right kidney became hydronephrotic and was removed together with the cryptorchid testis and an apparently hypoplastic ureter. This is the first report of a supernumerary kidney in a cat, adding it to the differential diagnoses of abdominal masses.

**Liver Failure in a Dog Following Suspected Ingestion of Blue-Green Algae (Microcystis spp.): A Case Report and Review of the Toxic**

Lionel Sebbag, Nicole Smee, Deon van der Merwe, and Dustin Schmid
A 2.5 yr old spayed female Weimaraner presented after ingestion of blue-green algae (Microcystis spp.). One day prior to presentation, the patient was swimming at a local lake known to be contaminated with high levels of blue-green algae that was responsible for deaths of several other dogs the same summer. The patient presented 24 hr after exposure with vomiting, inappetence, weakness, and lethargy. Blood work at the time of admission was consistent with acute hepatic failure, characteristic findings of intoxication by Microcystis spp. Diagnosis was suspected by analyzing a water sample from the location where the patient was swimming. Supportive care including fluids, fresh frozen plasma, whole blood, vitamin K, B complex vitamins, S-adenosyl methionine, and Silybum marianum were started. The patient was discharged on supportive medications, and follow-up blood work showed continued improvement. Ingestion is typically fatal for most patients. This is the first canine to be reported in the literature to survive treatment after known exposure.

Use of MRI for the Early Diagnosis of Masticatory Muscle Myositis
Alberto Cauduro, Favole Paolo, Roberto M. Asperio, Valeria Rossini, Maurizio Dondi, Lucia A. Simonetto, Carlo Cantile, and Valentina Lorenzo
The medical records of two dogs that were diagnosed with masticatory muscle myositis (MMM) were reviewed. The reported clinical signs included intense pain when opening the mouth and restricted jaw movement. MRI detected widespread, symmetrical, and inhomogeneously hyperintense areas in the masticatory muscle. Electromyography (EMG) demonstrated severe and spontaneous pathologic activity in the temporal and masseter muscles. With early therapeutic treatment, remission of symptoms occurred within 2 mo, and no relapses were observed for the subsequent 2 yr. The gold standard for the diagnosis of MMM is the 2M antibody test, but the purpose of this study was to evaluate the use of MRI as an accurate and efficient diagnostic tool for the initiation of early therapy for the treatment of muscle myositis.

Brainstem Oligodendroglioma in a Puppy
Isidro Mateo, Rocío Orlandi, Fernando Vazquez, and Alberto Muñoz
A 5 mo old male golden retriever presented for evaluation of an acute onset, progressive neurologic disease. Although computed tomography (CT) was unremarkable, MRI identified an ill-defined mass located in the medulla, which was considered likely responsible for the clinical signs. The imaging features closely resembled the classic features of human brainstem gliomas in the pediatric population. Histopathologic examination confirmed the lesion to be an anaplastic oligodendroglioma.

Veterinary Clinics of North America

Applying Pharmacokinetics to Veterinary Clinical Practice
Lauren A. Trepanier,
KEY POINTS
- Bioavailability can be used to extrapolate dosages between administration routes.
- Cmax:MIC and AUC:MIC ratios can guide treatment with aminoglycosides and fluoroquinolones, respectively.
- Steady-state plasma concentrations for any drug are reached in 5 elimination half-lives. These concentrations may or may not be in the therapeutic range depending on the dosage.
- The time for drug washout is also equal to 5 elimination half-lives, but elimination half-lives for any active metabolites should also be considered.
- Drug dosage adjustments in human patients with renal failure are based on creatinine clearance. Because of insufficient data in dogs and cats, human recommendations can be used a rough guide until more data are available.

Canine Cytochrome P-450 Pharmacogenetics
Michael H. Court
KEY POINTS
- Polymorphisms in genes encoding CYP enzymes could explain adverse drug effects or therapeutic failure in canine patients.
- A premature stop codon mutation in CYP1A2 is commonly found in certain dog breeds, including Beagle and Irish wolfhound.
- Although the CYP1A2 premature stop codon has shown large effects on the pharmacokinetics of some experimental compounds, effects on commonly used clinical drugs is currently unknown.
- Polymorphisms also exist in genes encoding canine CYP2C41, CYP2E1, CYP2D15, and CYP3A12 that have the potential to impact the metabolism of a large number of different drugs.
- Anesthetic drug hypersensitivity in Greyhounds may be the result of a genetic variant affecting canine CYP2B11 expression or function.
Feline Drug Metabolism and Disposition Pharmacokinetic Evidence for Species Differences and Molecular Mechanisms
Michael H. Court

**KEY POINTS**

- Acetaminophen, propofol, carprofen, and aspirin are eliminated more slowly in cats, and are all metabolized by conjugation.
- Cats lack uridine diphosphate glucuronosyltransferase (UGT) 1A6 and UGT1A9, which glucuronidate acetaminophen and propofol, respectively.
- Slower aspirin clearance results mainly from deficient glycine conjugation and not deficient glucuronidation.
- Cats lack N-acetyltransferase 2, which may be the reason they are prone to developing methemoglobinemia rather than hepatotoxicity from acetaminophen.
- Cats have low thiopurine methyltransferase activity, which causes sensitivity to azathioprine toxicity.
- Piroxicam is eliminated more quickly in cats than in humans and dogs, but the reason for this is unknown.

Idiosyncratic Drug Toxicity Affecting the Liver, Skin, and Bone Marrow in Dogs and Cats
Lauren A. Trepanier

**KEY POINTS**

- Idiosyncratic drug toxicity reactions typically occur in the first 1 to 2 months of drug therapy.
- The presence of a new fever, skin eruption, blood dyscrasia, or hepatopathy (with either a cholestatic or hepatocellular pattern) should raise suspicion for idiosyncratic drug toxicity. Proteinuria, uveitis, arthropathy, or mucocutaneous ulceration can also be seen.
- Management involves early drug discontinuation and, depending on the drug involved, treatment with glutathione precursors, short courses of prednisolone, or intravenous immunoglobulin.

Adverse Drug Reactions in Veterinary Patients Associated with Drug Transporters
Katrina L. Mealey

**KEY POINTS**

- Because drug transporters play an important role in drug absorption, distribution, and excretion, alterations in drug transporter function can result in adverse drug reactions.
- The ABCB1 polymorphism in dogs and drug interactions involving P-glycoprotein can enhance the toxicity of many drugs.
- The species-wide ABCG2 defect in cats is responsible for fluoroquinolone-induced retinal toxicity.
- Because drug transporters play an important role in drug disposition, a thorough understanding of drug transporters in companion animals is critical in drug discovery and development.

Antibiotic Treatment of Resistant Infections in Small Animals
Mark G. Papich

**KEY POINTS**

- There are few veterinary clinical studies to support a recommended use and dose for treating drug-resistant infections in small animals and many of these details have been extrapolated from human medicine.
- If the organism is Pseudomonas aeruginosa, Enterobacter species, Klebsiella species, Escherichia coli, or Proteus species, resistance against many common antibiotics is possible and a susceptibility test is advised using Clinical and Laboratory Standards Institute standards.
- Infections caused by *P. aeruginosa* presents a special problem because so few drugs are active against this organism.
- *Staphylococcus* isolated from small animals is most likely to be *Staphylococcus pseudintermedius* rather than *Staphylococcus aureus*.
- The most important resistance mechanism for *Staphylococcus* is meticillin resistance.
Enterococci are gram-positive cocci that have emerged as important causes of infections, especially those that are nosocomial.

Isolation of Enterococcus species from a site does not always indicate that treatment is needed.

After a susceptibility report is available, the only antimicrobials to which some gram negative bacilli are susceptible, including P aeruginosa, may be extended-spectrum cephalosporins, carbapenems (penems), selected penicillin derivatives, amikacin, or tobramycin.

Because susceptibility to non-β-lactam antibiotics is unpredictable, a susceptibility test is needed to identify the most appropriate drug to administer for these infections.

In response to the emergence of resistant gram-positive bacteria in humans (primarily methicillin-resistant Staphylococcus and drug-resistant Enterococcus spp) the pharmaceutical industry has responded with new antibiotics for treating these infections in people, but there has not been an equal response in veterinary medicine.

Outpatient Oral Analgesics in Dogs and Cats Beyond Nonsteroidal Antiinflammatory Drugs: An Evidence-based Approach

Butch KuKanich

KEY POINTS

- Nonsteroidal antiinflammatory drugs are effective analgesics in dogs and cats, but adverse effects, preexisting conditions, and severity of pain may limit their use in some patients.
- Although many recommendations exist for additional analgesic use in dogs and cats, few of these recommendations are supported by controlled clinical trials.
- An injectable formulation of polysulfated glycosaminoglycans that is approved by the US Food and Drug Administration is an effective drug for controlling signs of arthritis in dogs, and amantadine in combination with meloxicam has shown efficacy in dogs with osteoarthritis.
- Oral tramadol was significantly better than placebo in controlling pain in dogs with arthritis, but the power of the study was low.
- Some data support further studies of gabapentin, pregabalin, hydrocodone, codeine, amitriptyline, and venlafaxine as analgesics in dogs and cats, but none of these drugs have shown efficacy in controlled clinical trials.
- Current data do not support the use of the oral opioids morphine, oxycodone, and methadone in dogs and cats because of low oral bioavailability.

Update Seizure Management in Small Animal Practice

Karen R. Muñana

KEY POINTS

- Seizures are the most common neurologic condition encountered in small animal practice and arise from an imbalance of excitatory and inhibitory mechanisms in the brain.
- Epilepsy refers to recurrent seizures of any cause. Successful management of epilepsy requires knowledge of the pharmacologic properties of available antiepileptic medications, regular patient evaluations to assess response to therapy and monitor for adverse effects, and thorough client education to ensure that goals and expectations of therapy are understood.
- Conventional antiepileptic medications used in dogs and cats include phenobarbital and bromide. These drugs are efficacious but have a narrow therapeutic range such that side effects are common.
- Novel antiepileptic drugs used in dogs and cats include gabapentin, zonisamide, levetiracetam, and pregabalin. These drugs tend to have a wide therapeutic range, but little is currently known about their efficacy in dogs and cats.
- The successful management of an epileptic dog should include recommendations for emergency care of seizures at home. This typically consists of administration of a benzodiazepine if prolonged or repetitive seizures occur and can also include pulse therapy with an oral antiepileptic drug.

Update on Immununosuppressive Therapies for Dogs and Cats

Katrina R. Viviano

KEY POINTS

- Understand mechanisms of action, adverse effects, and the clinical limitations of the common drugs (glucocorticoids [GCs], cyclosporine, azathioprine, and chlorambucil) used in the long-term management of immune-mediated diseases.
- Appreciate the clinical situations in which the use of human intravenous immunoglobulin (hIVIG) versus vincristine is most appropriate.
- Recognize the advantages and disadvantages of using mycophenolate and leflunomide in the treatment of immune-mediated disease in dogs and cats.
Nutraceuticals for Canine Liver Disease: Assessing the Evidence
Jean-Michel Vandeweerd, Carole Cambier, PhD, Pascal Gustin

KEY POINTS
- Until greater regulatory oversight of nutritional supplements is required, veterinarians will need to weigh the costs, risks, and potential benefits of nutritional supplements for their patients on an individual basis.
- Veterinarians should strive to maintain a critical view of nonscientific promotional material and rely primarily on scientific evidence.
- Before recommending or administering a nutritional supplement to canine patients with the intent of providing hepatoprotection, veterinarians should obtain informed consent from the owners to ensure they understand that little to no evidence exists to support the use of these products for the treatment or prevention of liver disease.
- Veterinarians also must be aware that lack of adequate regulation of so-called nutraceuticals increases the risk of lack of quality control, labeling inaccuracies, and omission of cautionary statements.
- Although some dietary supplements have shown beneficial effects under limited in vitro conditions or for a very specific hepatotoxin, their general use as global hepatoprotectants remains questionable.

American Journal of Veterinary Research

In vitro effects of meloxicam on metabolism in articular chondrocytes from dogs with naturally occurring osteoarthritis.

Objective—To assess effects of in vitro meloxicam exposure on metabolism in articular chondrocytes from dogs with naturally occurring osteoarthritis Sample—Femoral head cartilage from 16 dogs undergoing total hip replacement. Procedures—Articular cartilage samples were obtained. Tissue sulfated glycosaminoglycan (SGAG), collagen, and DNA concentrations were measured. Collagen, SGAG, chondroitin sulfate 846, NO, prostaglandin E2 (PGE2), and matrix metalloproteinase (MMP)-2, MMP-3, MMP-9, and MMP-13 concentrations in culture medium were analyzed. Aggrecan, collagen II, MMP-2, MMP-3, MMP-9, MMP-13, ADAM metalloproteidase with thrombospondin type 1 motif (ADAMTS)-4, ADAMTS-5, tissue inhibitor of metalloproteinase (TIMP)-1, TIMP-2, TIMP-3, interleukin-1β, tumor necrosis factor-α, cyclooxygenase-1, cyclooxygenase-2, and inducible nitric oxide synthase gene expression were evaluated. Comparisons between tissues cultured without (control) and with meloxicam at concentrations of 0.3, 3.0, and 30.0 µg/mL for up to 30 days were performed by means of repeated-measures analysis. Results—Meloxicam had no effect on chondrocyte SGAG, collagen, or DNA concentrations. Expression of ADAMTS-5 was significantly decreased in all groups on all days, compared with the day 0 value. On day 3, culture medium PGE2 concentrations were significantly lower in all meloxicam-treated groups, compared with values for controls, and values remained low. Culture medium MMP-3 concentrations were significantly lower on day 30 than on day 3 in all meloxicam-treated groups. Conclusions and Clinical Relevance—Results suggested that in vitro meloxicam treatment of osteoarthritic canine cartilage for up to 30 days did not induce matrix degradation or stimulate MMP production. Meloxicam lowered PGE2 release from this tissue, and effects on tissue chondrocyte content and matrix composition were neutral.

Validation of a commercially available enzyme immunoassay for measurement of plasma antidiuretic hormone concentration in healthy dogs and assessment of plasma antidiuretic hormone concentration in dogs with congestive heart failure.
Katherine F. Scollan, Barret J. Bulmer, D. David Sisson.

Objective—To validate the use of a human enzyme immunoassay (EIA) kit for measurement of plasma antidiuretic hormone (ADH) concentration in dogs and evaluate plasma ADH concentrations in dogs with congestive heart failure (CHF) attributable to acquired cardiac disease, compared with findings in healthy dogs. Animals—6 healthy dogs and 12 dogs with CHF as a result of chronic degenerative valve disease or dilated cardiomyopathy. Procedures—Plasma samples from the 6 healthy dogs were pooled and used to validate the EIA kit for measurement of plasma ADH concentration in dogs by assessing intra-assay precision, dilutional linearity, and spiking recovery. Following validation, plasma ADH concentrations were measured in the 6 healthy dogs and in the 12 dogs with CHF for comparison. Results—The EIA kit measured ADH concentrations in canine plasma samples with acceptable intra-assay precision, dilutional linearity, and spiking recovery. The intra-assay coefficient of variation was 11%. By use of this assay, the median plasma concentration of ADH in
dogs with CHF was 6.15 pg/mL (SD, 3.2 pg/mL; range, 4.18 to 15.47 pg/mL), which was significantly higher than the median concentration in healthy dogs (3.67 pg/mL [SD, 0.93 pg/mL; range, 3.49 to 5.45 pg/mL]).

Conclusions and Clinical Relevance—Plasma ADH concentrations in dogs can be measured with the tested EIA kit. Plasma ADH concentrations were higher in dogs with CHF induced by acquired cardiac disease than in healthy dogs. This observation provides a basis for future studies evaluating circulating ADH concentrations in dogs with developing heart failure.

Assessment of left ventricular volumes by use of one-, two-, and three-dimensional echocardiography versus magnetic resonance imaging in healthy dogs.
Judith Meyer; Patrick Wefstaedt, Peter Dziallas; Martin Beyerbach, Ingo Nolte, Stephan O. Hungerbühler. Objectives—To quantify left ventricle (LV) volumes by use of 1-D, 2-D, and 3-D echocardiography versus MRI in dogs. Animals—10 healthy Beagles. Procedures—During anesthesia, each dog underwent an echocardiographic examination via the Teichholz method, performed on the basis of standard M-mode frames (1-D); the monoplane Simpson method of disk (via 2-D loops); real-time triplane echocardiography (RTTPE) with a 3-D probe; and real-time 3-D echocardiography with a 3-D probe. Afterward, cardiac MRI was performed. Values for the LV end-diastolic volume (EDV), end-systolic volume (ESV), and ejection fraction (EF) were compared between each echocardiographic method and the reference method (cardiac MRI). Results—No significant differences for EDV, ESV, and EF were detected between RTTPE and cardiac MRI. Excellent correlations (r = 0.97, 0.98, and 0.95 for EDV, ESV, and EF, respectively) were found between RTTPE and values for cardiac MRI. The other echocardiographic methods yielded values significantly different from cardiac MRI and results correlated less well with results of cardiac MRI for EDV, ESV, and EF. Use of the Teichholz method resulted in LV volume overestimation, whereas the Simpson method of disk and real-time 3-D echocardiography significantly underestimated LV volumes. Conclusions and Clinical Relevance—Use of RTTPE yielded excellent correlations and nonsignificant differences with cardiac MRI and is a suitable method for routine veterinary cardiac examination.

Effects of oxygen insufflation rate, respiratory rate, and tidal volume on fraction of inspired oxygen in cadaveric canine heads attached to a lung model.
Melina E. Zimmerman, David S. Hodgson, Nora M. Bello. Objectives—To assess the effects of oxygen insufflation rate, respiratory rate, and tidal volume on fraction of inspired oxygen (Fio2) in cadaveric canine heads attached to a lung model. Sample—16 heads of canine cadavers. Procedures—Each cadaver head was instrumented with a nasal insufflation catheter through which oxygen was delivered. The trachea was attached to a sample collection port connected by means of corrugated tubing to a lung model. Eight treatment combinations that varied in respiratory rate (10 or 20 breaths/min), tidal volume (10 or 15 mL/kg), and oxygen insufflation rate (50 or 100 mL/kg/min) were applied to each head in a replicated Latin square design. Gas samples were manually collected, and inspired oxygen concentrations were analyzed. The Fio2 and end-tidal CO2 concentration were determined and compared among sample groups. Results—Estimated least squares mean Fio2 for various treatment combinations ranged from 32.2% to 60.6%. The Fio2 was significantly increased at the higher insufflation rate (estimated marginal least squares mean, 48.7% vs 38.6% for 100 and 50 mL/kg/min, respectively), lower respiratory rate (48.9% vs 38.3% for 10 and 20 breaths/min, respectively), and smaller tidal volume (46.8% vs 40.0% for 10 and 15 mL/kg, respectively). Conclusions and Clinical Relevance—Fio2 in the model was affected by oxygen insufflation rate, respiratory rate, and tidal volume. This information may potentially help clinicians interpret results of blood gas analysis and manage canine patients receiving oxygen insufflation via a nasal catheter.

Journal of Small Animal Practice

Pulmonic stenosis in dogs: survival and risk factors in a retrospective cohort of patients.
C. Locatelli, I. Spalla, O. Domenech, E. Sala, P. G. Brambilla and C. Bussadori. Objectives - To assess survival and risk factors in dogs with pulmonic stenosis. Methods - A retrospective review of medical case records of all cases of pulmonic stenosis >50 mmHg, undergoing pulmonary balloon valvuloplasty or not. Survival curves and multivariate analysis were calculated in the overall population and in
subgroups. Results - One hundred and seventy-two cases were included. Factors negatively affecting survival were clinical signs [hazard ratio (HR) 3·44, \(P < 0.001\)], younger age at diagnosis (HR 3·96, \(P = 0.001\)) and valve morphology type B (HR 3·33, \(P = 0.001\)) in the overall population. In those that had pulmonary balloon valvuloplasty group only clinical signs was significant (HR 3·44, \(P < 0.001\)). In cases that did not undergo pulmonary balloon valvuloplasty group Doppler gradient (HR 1·02, \(P < 0.001\)), clinical signs (HR 5·41, \(P = 0.002\)), valve morphology type B (HR 10·20, \(P = 0.001\)) and younger age at diagnosis (HR 12·82, \(P < 0.001\)) negatively affected survival. Dogs with severe pulmonic stenosis undergoing pulmonary balloon valvuloplasty (HR 0·47, \(P = 0.047\)) and asymptomatic dogs with moderate pulmonic stenosis (HR 0·10, \(P = 0.042\)) had a better outcome. Younger age at diagnosis was correlated with poorer outcome in right-sided congestive heart failure dogs (HR 14·02, \(P = 0.01\)). Clinical Significance - Clinical signs, valve morphology type B and age at diagnosis are risk factors in pulmonic stenosis patients. Pulmonary balloon valvuloplasty is a reasonable treatment choice in dogs with severe pulmonic stenosis.

The structure of the small animal consultation.
S. Everitt, A. Pilnick, J. Waring and M. Cobb
Objectives - To analyse the structure of small animal consultations in order to increase understanding of the consultation processes, locate decision-making in the wider practice context and stimulate further research.
Methods - Analysis of 48 video-recorded consultations from first opinion small animal practices. These consultations were time and thematically coded in order to enable analysis. Results - The mean length of the recorded consultations was 11 minutes and 45 seconds with a range of 4–28 minutes. Analysis indicates that both the clinical tasks and communication taking place in the consultation are often performed in an iterative and interactive fashion in contrast to the sequential methods frequently being taught. Clinical Significance - This study shows that the consultation is a complex process that is often performed in an iterative and interactive fashion and that may be difficult to complete within the 10 minutes frequently allocated. This warrants further research.

Morphology of congenital portosystemic shunts emanating from the left gastric vein in dogs and cats.
R. N. White and A. T. Parry
Objective - To describe the anatomy of congenital portosystemic shunts emanating from the left gastric vein in dogs and cats. Methods - A retrospective review of a consecutive series of dogs and cats managed for congenital portosystemic shunts. Results - Forty-six dogs and 27 cats met the inclusion criteria of a congenital portosystemic shunt emanating from the left gastric vein. Of the 46 dogs, 28 (61%) had a shunt that entered the left phrenic vein, 10 (22%) had a shunt that entered the post hepatic caudal vena cava and in 8 (17%) the shunt entered the azygos vein. Of the 27 cats, 19 (70%) had a shunt that entered the left phrenic vein and 8 (30%) had a shunt that entered the post hepatic caudal vena cava. Clinical Significance - The systemic vein into which the shunt entered was consistent showing three common presentations: left gastro-phrenic, left gastro-caval and left gastro-azygos. This information may help with surgical planning in cases undergoing shunt closure surgery.

Sonographic features of gastrointestinal lymphoma in 15 dogs.
M. Frances, A. E. Lane and Z. M. Lenard
Objectives - The purpose of this study is to describe the sonographic appearance of lymphoma of the gastrointestinal tract in dogs. Method - A retrospective review was conducted and patients with gastrointestinal lymphoma diagnosed by histopathology (including immunohistochemistry, where available) or cytology that had an abdominal ultrasound were included. Results - Four of 15 (26–7%) cases with histopathologically confirmed lymphoma exhibited no sonographic abnormalities. In the dogs with sonographic abnormalities, features including intestinal wall thickness and the presence or absence of wall layering were highly variable. Clinical signs pertaining to the gastrointestinal tract were also unreliable markers of gastrointestinal lymphoma, with weight loss, vomiting, and diarrhoea being uncommon presenting complaints; intestinal obstruction was not present in any patient. Clinical Significance - The sonographic appearance of gastrointestinal lymphoma in dogs is non-specific. Gastrointestinal lymphoma in dogs should be maintained as a differential diagnosis despite a sonographically normal appearing bowel.
Enteropathogens in pups from pet shops and breeding facilities.
S. Dupont, P. Butaye, E. Claerebout, S. Theuns, L. Duchateau, I. Van de Maele and S. Daminet

Objectives - To evaluate faecal and clinical scores and presence of several enteropathogens possibly implicated in the development of diarrhoea in pups aged between 6 and 16 weeks independently of their health status. Methods - Pups were selected from pet shops and breeding facilities and assigned a faecal and clinical score. Standard isolation methods were used to determine presence of parasites, viruses and bacteria in faecal samples. For Escherichia coli, virulence genes were assessed by multiplex polymerase chain reaction. Results - Fifty-six pups were included in this study. Eighteen had no diarrhoea, 22 had no significant clinical signs related to gastroenteritis. Samples were positive for Toxocara canis (n=29), Giardia duodenalis (n=35), Cystoisospora (n=22), E. coli (n=47) and Clostridium perfringens (n=20). In four E. coli positive samples, genes were detected that correlate with pathogenicity in other animal species. A significant positive correlation between the presence of T. canis and faecal score was found. Clinical Significance - Puppies obtained from a pet shop or breeding facility have a high risk of gastrointestinal disease. Furthermore, infectious agents may be present independently of faecal or clinical score. The identification of possible pathogenic E. coli strains suggests that their role in diarrhoea warrant further investigation.

Successful transendoscopic oesophageal mass ablation in two dogs with Spirocerca lupi associated oesophageal sarcoma.
E. Yas, G. Kelmer, A. Shipov, J. Ben-Oz and G. Segev.
This report describes two cases of oesophageal tumours managed by transendoscopic neodymium:yttrium-aluminum-garnet laser ablation and polypectomy snare electrocautery. In each dog oesophagoscopy revealed caudal oesophageal masses, suspected to be Spirocerca lupi-induced oesophageal neoplasia. To resect the masses, transendoscopic neodymium:yttrium-aluminum-garnet laser ablation was used in the first case and polypectomy snare electrocautery in the second. Recovery was uneventful. Histopathology was consistent with oesophageal fibrosarcoma and osteosarcoma in each case, respectively. Follow-up oesophagoscopy revealed apparently healthy oesophageal tissue except for focal scar tissue in the first case. Transendoscopic laser ablation and polypectomy snare electrocautery is a potential non-invasive, cost effective alternative for surgical oesophageal mass resection.

Journal of the American Veterinary Medical Journal – Sept 1 2013

Evaluation of calcium, phosphorus, and selected trace mineral status in commercially available dry foods formulated for dogs
Jason W. Gagné, DVM; Joseph J. Wakshlag, DVM, PhD, DACVN, DACVSMR; Sharon A. Center, DVM, DACVIM; Michael A. Rutzke, PhD; Raymond P. Glahn, PhD

Objective—To evaluate concentrations of calcium, phosphorus, zinc, iron, copper, manganese, and selenium in several commercially available dry dog foods and compare these with current Association of American Feed Control Officials (AAFCO) recommendations for maintenance of healthy dogs.

Design—Descriptive study.

Sample—45 over-the-counter dry foods formulated for maintenance of healthy dogs (ie, maintenance foods) and 5 therapeutic dry foods formulated for dogs with hepatic or renal disease.

Procedures—Mineral concentrations were measured via inductively coupled plasma mass spectrometry or inductively coupled plasma atomic emission spectroscopy and compared with AAFCO-recommended minimum and maximum values.

Results—Most (39/45) maintenance foods were in compliance with AAFCO recommendations for all mineral concentrations evaluated. Calcium concentration was > 7.1 g/1,000 kcal of metabolizable energy (ME) in 4 of 45 maintenance foods, and phosphorus concentration was > 4.6 g/1,000 kcal ME in 3 of these; 2 maintenance foods contained < 34 mg of zinc/1,000 kcal ME. These values were not within AAFCO-recommended ranges. Calcium-to-phosphorus ratio in foods formulated for dogs with renal disease was above, and copper concentration in foods formulated for dogs with hepatic disease was below, recommended ranges for healthy dogs.

Conclusions and Clinical Relevance—Calcium concentrations exceeded recommended limits in some maintenance foods labeled for all life stages, underscoring the need to feed diets appropriately formulated for specific life stages, particularly for large- and giant-breed puppies. Studies investigating the bioavailability of minerals are necessary before firm recommendations can be made.
Evaluation of short-term outcome after lung lobectomy for resection of primary lung tumors via video-assisted thoracoscopic surgery or open thoracotomy in medium- to large-breed dogs

Philipp D. Mayhew, BVM&S, DACVS; Geraldine B. Hunt, BVSc, MVetClinStud, PhD; Michele A. Steffey, DVM, DACVS; William T. N. Culp, VMD, DACVS; Kelli N. Mayhew, VMD, DACVS; Mark Fuller, DVM; Lynelle R. Johnson, DVM, PhD, DACVIM; Peter J. Pascoe, BVSc, DACVA

Objective—To describe clinicopathologic features of dogs that underwent lung lobectomy for resection of primary lung tumors between 2004 and 2012 and to compare short-term outcomes for dogs following these procedures.

Design—Retrospective cohort study.

Animals—46 medium- to large-breed dogs with primary lung tumors.

Procedures—Medical records of dogs that underwent a lung lobectomy via VATS (n = 22) or OT (24) for resection of primary lung tumors between 2004 and 2012 were reviewed. Dogs were included if they weighed > 10 kg (22 lb) and resection of a primary lung tumor was confirmed histologically. Tumor volumes were calculated from preoperative CT scans where available. Surgical time, completeness of excision, time in the ICU, indwelling thoracic drain time, postoperative and total hospitalization time, incidence of major complications, and short-term survival rate were evaluated.

Results—VATS was performed with a 3-port (n = 12) or 4-port (10) technique and 1-lung ventilation (22). In 2 of 22 (9%) dogs, VATS was converted to OT. All dogs survived to discharge from the hospital. There were no significant differences between the VATS and OT groups with regard to most variables. Surgery time was significantly longer for VATS than for OT (median, 120 vs 95 minutes, respectively).

Conclusions and Clinical Relevance—In medium- to large-breed dogs, short-term outcomes for dogs that underwent VATS for lung lobectomy were comparable to those of dogs that underwent OT. Further studies are required to evaluate the effects of surgical approach on indices of postoperative pain and long-term outcomes.

Risk factors associated with survival in dogs with nontonsillar oral squamous cell carcinoma 31 cases (1990–2010)

Amy J. Fulton, DVM; Ana Nemec, DVM, PhD, DAVDC; Brian G. Murphy; DVM, PhD, DACVP; Philip H. Kass, DVM, MPVM, PhD, DACVP; Frank J. M. Verstraete, DrMedVet, MMedVet, DAVDC

Objective—To identify risk factors associated with survival in dogs with nontonsillar oral squamous cell carcinoma (OSCC) that were and were not treated with curative-intent surgery.

Design—Retrospective case series.

Animals—31 dogs with OSCC.

Procedures—Medical records for dogs with OSCC that were not treated, or were treated with curative-intent surgery only between January 1990 and December 2010 were reviewed. For each dog, data regarding signalment, clinical stage, treatment, tumor recurrence, and survival time were obtained from the medical record, and archived biopsy specimens were evaluated to identify the histologic subtype of the tumor and extent of tumor-associated inflammation (TAI), perineural invasion (PNI), and lymphovascular invasion (LVI).

Results—Risk of death for the 21 dogs with OSCC that were surgically treated was decreased 91.4% (hazard ratio, 0.086; 95% confidence interval, 0.002 to 0.150), compared with that for the 10 dogs with OSCC that were not treated. The 1-year survival rate was 93.5% and 0% for dogs that were and were not surgically treated, respectively. Risk of death increased significantly with increasing TAI and increasing risk score (combination of TAI, PNI, and LVI). Tumor location, clinical stage, and histologic subtype were not associated with survival time.

Conclusions and Clinical Relevance—Results indicated that the prognosis for dogs with OSCC was excellent following surgical excision of the tumor. Risk of death increased with increasing TAI, and combining TAI, PNI, and LVI into a single risk score may be a useful prognostic indicator for dogs with OSCC.

Evaluation of costs and time required for laparoscopic-assisted versus open cystotomy for urinary cystolith removal in dogs: 43 cases (2009–2012)

Shiara P. Arulpragasam, DVM; J. Brad Case, DVM, MS, DACVS; Gary W. Ellison, DVM, MS, DACVS

Objective—to compare required time and costs of surgery and hospitalization as well as prevalence of incomplete urinary cystolith removal associated with laparoscopic-assisted cystotomy versus open cystotomy in dogs.

Design—Retrospective case series.

Animals—20 dogs with urolithiasis treated by laparoscopic-assisted cystotomy and 23 dogs treated by open cystotomy.

Procedures—Medical records were reviewed. Surgery cost, hospitalization cost, total cost, surgery time, days in hospital, incomplete cystolith removal, and number of doses of analgesic administered IV after surgery were compared between the laparoscopic-assisted cystotomy and open cystotomy groups.
Results—Surgery cost and total cost were significantly higher in the laparoscopic-assisted cystotomy group. Hospitalization cost, days in hospital, and prevalence of incomplete cystolith removal did not differ significantly between groups. Number of doses of analgesic was significantly lower in the laparoscopic-assisted cystotomy group.

Conclusions and Clinical Relevance—Laparoscopic-assisted cystotomy was more time-consuming and expensive but associated with fewer postoperative doses of injectable analgesics, compared with open cystotomy. Laparoscopic-assisted cystotomy is an acceptable, more expensive, and minimally invasive alternative to open cystotomy for the removal of urinary cystoliths in dogs.

Suspected carprofen toxicosis caused by coprophagia in a dog
Rae G. Hutchins, DVM, DACVIM; Kristen M. Messenger, DVM, DACVA; Shelly L. Vaden, DVM, PhD, DACVIM

Case Description—A 1-year-old spayed female mixed-breed dog was evaluated because of urinary incontinence, polyuria, polydipsia, and minimally concentrated urine.

Clinical Findings—Markedly high circulating alanine transaminase activity, mildly high circulating alkaline phosphatase activity, and low urine specific gravity were detected for the dog. Results of ultrasonographic examination of the abdomen and cytologic examination of liver samples were unremarkable. Carprofen was detected in serum and plasma samples obtained from the dog. Exposure to carprofen was attributed to ingestion of feces of another dog in the household that was receiving the drug daily.

Treatment and Outcome—Access to feces of other dogs in the household was prevented; no other treatment was initiated. Urinary incontinence, polyuria, and polydipsia resolved, and urine specific gravity increased within 7 days following discontinuation of consumption of feces. Alanine transaminase activity was substantially lower than the value determined during the initial examination, and alkaline phosphatase activity was within the reference range 5 weeks after discontinuation of consumption of feces by the dog.

Clinical Relevance—Findings for the dog of this report suggested that carprofen toxicosis can be caused by consumption of feces of another dog receiving the drug. This cause of adverse effects should be a differential diagnosis for dogs with clinical signs and clinicopathologic abnormalities consistent with carprofen toxicosis.

Journal of the American Veterinary Medical Association—Sept 15 2013

Sleeping and resting respiratory rates in dogs with subclinical heart disease
Dan G. Ohad, DVM, PhD, DACVIM; Mark Rishniw, BVSc, PhD, DACVIM; Ingrid Ljungvall, DVM, PhD; Francesco Porciello, DVM; Jens Häggström, DVM, PhD

Objective—To characterize sleeping respiratory rates (SRRs) and resting respiratory rates (RRRs), collected in the home environment, of dogs with subclinical heart disease that could result in left-sided congestive heart failure.

Design—Prospective cross-sectional study.

Animals—190 adult dogs with subclinical left-sided heart disease.

Procedures—Most dogs had mitral valve disease or dilated cardiomyopathy of various severities. Clients collected ten 1-minute SRRs or RRRs during a period ranging from 1 week to 6 months. Clinicians provided echocardiographic and medical data on each patient.

Results—The within-dog mean SRR (SRRmean, 16 breaths/min) was significantly lower than the within-dog mean RRR (RRRmean, 21 breaths/min). Seven dogs had SRRmean and 33 dogs had RRRmean > 25 breaths/min; 1 dog had SRRmean and 12 dogs had RRRmean > 30 breaths/min; these dogs mostly had a left atrial (LA)-to-aortic ratio > 1.8. Dogs with moderate LA enlargement had a significantly higher SRRmean than did other dogs. However, median SRRmean for each of 4 levels of LA enlargement was < 20 breaths/min; median RRRmean for each of 4 levels of LA enlargement was < 25 breaths/min. Both within-dog SRR and RRR remained stable for 10 consecutive measurements. Treatment with cardiac medications or presence of pulmonary hypertension was not associated with SRRmean or RRRmean.

Conclusions and Clinical Relevance—Results suggested that dogs with confirmed subclinical left-sided heart disease of various severities generally had SRRmean < 25 breaths/min, which was infrequently exceeded at any time, and that SRR and RRR remained stable, regardless of individual within-dog SRRmean or RRRmean.

Evaluation of an oral electrolyte solution for treatment of mild to moderate dehydration in dogs with hemorrhagic diarrhea
Erica L. Reineke, VMD, DACVECC; Karie Walton, VMD; Cynthia M. Otto, DVM, PhD, DACVECC

Objective—To determine the safety and efficacy of an electrolyte solution for oral administration (OES) for the correction of mild to moderate dehydration associated with hemorrhagic diarrhea in dogs.

Design—Nonrandomized, noncontrolled clinical trial.

Animals—20 dogs that had hemorrhagic diarrhea with < 3 episodes of vomiting.
Procedures—All dogs underwent testing for parvovirus infection, were given maropitant citrate to control emesis, and were offered an OES. Intravenous crystalloid fluid administration was performed when dogs refused the OES or had vomiting, a 5% increase in PCV, 5% decrease in body weight, serum creatinine or BUN concentration higher than at admission, or clinically important alterations in blood electrolyte or serum glucose concentrations.

Results—13 (65%) dogs voluntarily consumed the OES; 7 (35%) dogs refused the OES and received a balanced electrolyte solution IV instead. All 13 dogs in the OES group consumed the solution ≤ 5 hours after hospital admission. Eight and 16 hours after admission, PCV and serum total protein and BUN concentrations were significantly lower than at hospital admission in the OES group, whereas no significant changes were identified in venous blood pH, base excess, and concentrations of sodium, potassium, chloride, ionized calcium, ionized magnesium, and lactate. The cost of treatment was significantly less for the OES group than for the IV treated group.

Conclusions and Clinical Relevance—Rehydration therapy with an OES was effective and safe in dogs with mild to moderate dehydration associated with hemorrhagic diarrhea. Potential benefits of this treatment approach for gastroenteritis in dogs, compared with traditional IV fluid administration, include lower owner-related veterinary costs and decreased staff time associated with treatment.

Red blood cell distribution width in dogs with chronic degenerative valvular disease
Carlo Guglielmini, DVM, PhD; Helen Poser, DVM; Angela Dalla Fria, DVM, PhD; Michele Drigo, DVM, PhD; Elisa Mazzotta, DVM; Michele Berlanda, DVM, PhD; Alessia Luciani, DVM

Objective—To evaluate RBC distribution width (RDW) in dogs with chronic degenerative valvular disease (CDVD) with compensated or decompensated heart failure.

Design—Retrospective case-control study.

Animals—27 healthy dogs and 135 dogs with CDVD (87 dogs with compensated heart failure and 48 dogs with decompensated heart failure).

Procedures—The RDW and various CBC and serum biochemical variables were compared among groups. Correlations between RDW and various echocardiographic variables were evaluated.

Results—Mean ± SD RDW in dogs with CDVD (13.1% ± 1.0%) was not significantly different from that of healthy dogs (12.8% ± 0.8%). The RDW of dogs with CDVD and compensated heart failure (13.0% ± 1.0%) was not significantly different from that of dogs with CDVD and decompensated heart failure (13.2% ± 1.1%). The RDW had a significant, weak, negative correlation with Hct (correlation coefficient, −0.250), hemoglobin concentration (correlation coefficient, −0.219), and mean corpuscular volume (correlation coefficient, −0.211). The RDW had a significant, weak, positive correlation with 1 echocardiographic index of CDVD severity (ie, the left atrium-to-aorta ratio [correlation coefficient, 0.183]).

Conclusions and Clinical Relevance—In this study population, RDW did not seem to be associated with the presence of heart failure or CDVD.

Canadian Veterinary Journal

Inguinal herniation with hydrometra/mucometra in a poodle bitch
B. Hasan Sontas, F.T. Seval Toydemir, Özge Erdogan, Gülbin Sennazli, Hayri Ekici (page 840)

A 5-year-old, sexually intact poodle bitch was presented with a 2-year history of inguinal mass. A tentative diagnosis of hydrometra/mucometra with inguinal herniation was made and ovariohysterectomy with hernia repair was performed. Both fluid-filled uterine horns, both broad ligaments, and the uterine body were observed to be herniated through the inguinal ring. On histopathology, marked edema and diffuse hemorrhage were diagnosed in the uterus.

Hepatocellular carcinoma in a young dog
Takahiro Teshima, Hirotaka Matsumoto, Kae Shigihara, Harumi Sawada, Masaki Michishita, Kimimasa Takahashi, Hidekazu Koyama (page 845)

A 25-month-old Chihuahua dog with no clinical signs was evaluated for high serum liver enzymes. Ultrasonography and computed tomography revealed a mass in the left hepatic medial lobe. The histological diagnosis reached using resected tissues was hepatocellular carcinoma (HCC). To the authors’ knowledge, this is the youngest dog diagnosed with HCC.

Home-care treatment of swimmer syndrome in a miniature schnauzer dog
Sun-A Kim, Ki-Jeong Na, Jong-Ki Cho, Nam-Shik Shin
A 50-day-old, female miniature schnauzer dog was presented for astasia, dorsoventral flattening of the thorax, hypoplasia of hind-limb muscles, stiffness of hind-limb joints, paddling leg motion, and panting. The dog was diagnosed with swimmers syndrome. The dog recovered completely following 40 days of home-care treatment that involved environmental and nutritional management along with intensive physiotherapy.

A case of necrotic migratory erythema managed for 24 months with intravenous amino acid and lipid infusions
Jonathan F. Bach, Seth A. Glasser
A 9-year-old castrated male Shetland sheepdog was diagnosed with necrotic migratory erythema and hepatocutaneous syndrome. Necrotic migratory erythema was treated with intermittent intravenous amino acids as needed to control cutaneous lesions. The addition of lipid infusions extended the treatment interval. The patient had a favorable response for 24 months.

Clinical, hematological, and biochemical findings in puppies with coronavirus and parvovirus enteritis
Tatiana X. Castro, Rita de Cássia N. Cubel Garcia, Luciana P. S. Gonçalves, Erika M. Costa, Gracy C.G. Marcello, Norma V. Labarthe, Flavya Mendes-de-Almeida
The clinical and laboratory findings in puppies naturally infected with canine coronavirus (CCoV) and/or canine parvovirus (CPV) were compared with findings in uninfected puppies. Lymphopenia was the only parameter related to CCoV infection that was statistically significant; vomiting, anorexia, lethargy, hemorrhagic fluid diarrhea, leukopenia, lymphopenia, thrombocytopenia, hypoglycemia, and hypoproteinemia were correlated with CPV infection.

Acquired proximal renal tubulopathy in dogs exposed to a common dried chicken treat: retrospective study of 108 cases (2007-2009).
Thompson M, Fleeman L, Kessell A, Steenhard L, Foster S.
BACKGROUND: Proximal renal tubulopathy was reported in Australian dogs with markedly increased frequency from September 2007.
METHODS: Two veterinarian-completed surveys were launched in response to an increased incidence of acquired proximal renal tubulopathy in dogs. The selection criterion for inclusion was glucosuria with blood glucose <10 mmol/L. Data collected included signalment, presenting signs, history of feeding treats, results of urinalysis and blood tests, treatment and time to resolution of clinical signs.
RESULTS: A total of 108 affected dogs were studied. All had been fed the same brand of dried chicken treats, made in China, for a median of 12 weeks (range, 0.3-78 weeks). Small breeds (<10 kg) accounted for 88% of cases. Common presenting signs included polyuria/polydipsia (76%), lethargy (73%), inappetence (65%) and vomiting (54%). Common biochemical findings included polyuria/polydipsia (76%), lethargy (73%), inappetence (65%) and vomiting (54%). Common biochemical findings included euglycaemia (74%; 71/96), hypoglycaemia (23%; 22/96), acidosis (77%; 20/26), hypokalaemia (45%; 38/84), hypophosphataemia (37%; 28/75) and azotaemia (27%; 23/85). In addition to discontinuation of treats, 64 dogs received medical treatment, including intravenous fluids (52%) and oral electrolyte, amino acid or vitamin supplements. Six dogs died or were euthanased. Two dogs were necropsied. Histopathological findings consisted of proximal tubular necrosis accompanied by regeneration. Time to resolution of clinical signs in 35 survivors available for follow-up was <2 weeks (n = 8), 2-4 weeks (n = 2), 5-7 weeks (n = 5) and 2-6 months (n = 10).
CONCLUSION: Of the 108 dogs with acquired proximal renal tubulopathy contemporaneous with chicken treat consumption, most survived but many required aggressive supportive care. The treats likely contained a toxin targeting the proximal renal tubules. Diet history and urinalysis were vital for diagnosis.

Congenital heart disease: a case series of 135 dogs
Aherne M, Beijerink NJ
The medical records of 135 dogs with congenital cardiac malformations presented from 2001 to 2012 to the University Veterinary Teaching Hospital – Sydney were retrospectively reviewed to determine the frequency of specific malformations and calculate the odds of presentation for breed and gender. Patent ductus arteriosus was identified in 43 dogs, followed by sub-valvular aortic stenosis (n=40), pulmonic stenosis (n=29), ventricular septal defect (n=13), tricuspid valve dysplasia (n=10), mitral valve dysplasia (n=8), atrial septal defect (n=5), valvular aortic stenosis (n=2), aberrant right coronary artery (n=2) and tetralogy of Fallot (n=2). Sixteen dogs had two or more concurrent malformations, emphasising the importance of performing a complete
echocardiographic examination. Compared to being presented to the university for other problems, two previously undescribed breed associations were observed at this institution; border collies with patent ductus arteriosus and whippets with pulmonic stenosis. The study allowed us to characterise the frequency and changes in the frequency of congenital cardiac abnormalities in dogs presented to this institution, and only minor differences were seen when compared with previous studies from other parts of the world. Concurrent cardiac malformations were seen in a substantial proportion of cases.

**Diagnosis of breed specific polymyositis in two Hungarian vizslas**

Hinchy Na, Paul Ab, Tzannes S

Two unrelated Hungarian vizslas were referred to university teaching hospitals in Australia with histories of dysphagia, regurgitation, ptalism, lethargy and weight loss. Physical examinations revealed significant atrophy of the masticatory and skeletal muscles. both dogs had elevated serum creatine kinase activities. Thoracic and abdominal imaging was unremarkable. Serum Toxoplasma gondii and Neospora caninum titres were within normal limits. For both dogs, muscle biopsies were taken from the masticatory and skeletal muscles for light microscopy, and serum was submitted for 2M antibody titres. The 2M antibody titres were negative for masticatory myositis. Light microscopy examination of all muscle biopsy samples identified a generalised inflammatory myopathy consistent with breed specific polymyositis recently identified in Hungarian vizslas in North America and the United Kingdom. The dogs were immunosuppressed with prednisolone and azathioprine. Treatment side effects were seen in both cases and each has been maintained on a single drug with owners reporting the dogs have a good quality of life.

**A case of suspected venom depot syndrome in a dog envenomed by an eastern brown snake (Pseudonaja textilis)**

Judge PR

A case of a dog showing clinical and laboratory evidence of recurrent envenomation by an eastern brown snake (Pseudonaja textilis) is reported. Recurrent clinical signs of envenomation occurred after normalisation of laboratory evidence of envenomation following treatment with antivenom. Recurrent clinical signs occurred approximately 20 hours after the dog was presented to the veterinarian. this syndrome parallels venom depot syndrome reported in people. this case highlights the need for ongoing monitoring of snake-envenomed dogs for signs of re-envenomation for a minimum of 24 hours after envenomation, despite initial resolution of clinical signs after antivenom administration. there is a potential need for antivenom administration beyond the initial period of acute care.

**Locking plates in veterinary orthopaedics**

Beierer LH, Glyde M

Locking bone plates are now being used in veterinary orthopaedics. They reflect an evolution in the principles of application, design and biomechanics from the traditional dynamic compression plate. Locking plates have replaced dynamic compression plates in human orthopaedic surgery as they offer significant biomechanical and biological advantages over standard compression plates. There are multiple locking plate systems available in the veterinary market including several veterinary procedure-specific designs. This paper reviews the biomechanics and application of locking plates relevant to veterinary orthopaedic surgery and compares three of the commonly available veterinary locking plate systems.

**Journal of Feline Medicine and Surgery**

Feline CKD: Pathophysiology and risk factors — what do we know?

Brice S Reynolds, Hervé P Lefebvre

**Practical relevance:** Chronic kidney disease (CKD) is one of the most frequently encountered disorders in cats, having increased in prevalence in recent decades. Although the underlying cause is rarely identified, the common final outcome of feline CKD is tubulointerstitial fibrosis. Knowledge of CKD pathophysiology is necessary for optimal individualised patient management, especially with regard to diagnosis and treatment of extrarenal complications.

**Patient group:** CKD is most common in senior and geriatric cats, but should be considered in any feline patient with ureterolithiasis, hyperthyroidism, retrovirus infection, systemic hypertension, cardiovascular disease or urinary tract infection.

**Evidence base:** Most of our knowledge of the pathogenesis of CKD is extrapolated from human nephrology and experimental animal studies. There is, therefore, a need for further studies in cats. The prevalence of clinical signs in feline CKD is well documented. Several concurrent diseases associated with CKD have also been reported in cats, especially in the geriatric population, but there is no or only limited published evidence demonstrating a cause-and-effect relationship between most of these conditions and CKD. Studies performed
over the past 15 years have nevertheless allowed identification of major risk factors (proteinuria, plasma phosphate and plasma creatinine) influencing the progression of feline CKD.

**Clinical challenges**: Clinical signs occur in the late stages of renal disease, so populations at higher risk of CKD should be screened routinely. CKD-associated complications (systemic hypertension, secondary renal hyperparathyroidism, hypokalaemia, anaemia, metabolic acidosis) must not be overlooked as they may affect the progression of disease. Disease progression is itself unpredictable and renal function may remain stable for extended periods. Most cats with early CKD do not progress to end-stage CKD before they die.

**Audience**: General practitioners play a major role in screening feline patients at risk of development or progression of CKD.

**Feline CKD: Diagnosis, staging and screening – what is recommended?**
Dominique Paepe, Sylvie Daminet

**Practical relevance**: Feline chronic kidney disease (CKD) is frequently encountered by veterinarians. Timely diagnosis and staging may facilitate the initiation of adequate therapy and improve the prognosis for patients.

**Clinical challenges**: Feline CKD is diagnosed based on the presence of compatible clinical signs and renal azotaemia, which implies that urinalysis (particularly urine specific gravity) is mandatory to confirm the diagnosis. Although the diagnosis of advanced feline CKD and associated complications is usually straightforward, based on complete blood and urine examination, all routine blood and urine tests have their limitations in detecting early CKD. Therefore, diagnosing early or non-azotaemic CKD is much more challenging. Although determination of glomerular filtration rate (GFR) would be ideal to identify early kidney dysfunction, practical limitations hamper its routine use in clinical practice.

**Patient group**: CKD is typically a disease of aged cats, but may affect cats of all ages. Conclusive breed and sex predispositions for feline CKD are not reported.

**Audience**: This review is directed at practising veterinarians and provides an overview of the required diagnostic tests, the classification system established by the International Renal Interest Society, and the importance of and possible techniques for early detection of CKD.

**Evidence base**: Staging of cats with CKD is essential as it directs management and provides a prognostic guide. Given that diagnosis at early disease stages is associated with more prolonged survival times, simple, inexpensive and accurate methods for early CKD diagnosis are needed. Techniques currently under investigation include limited sampling strategies to estimate GFR, clearance marker cut-off concentrations to identify cats with low GFR, new indirect GFR markers and urinary biomarkers.

**Feline CKD: Current therapies – what is achievable?**
Rachel M Korman, Joanna D White

**Practical relevance**: Treatment of feline chronic kidney disease (CKD) tends to focus on minimising the adverse effects of reduced renal function, rather than addressing an underlying cause. Despite this, and the progressive nature of CKD, treatment can improve quality of life and enable many cats to have long survival times.

**Evidence base**: Strong evidence supports the provision of renal diets, which are protein and phosphorus restricted; compliance is improved by gradual dietary transition. Additional phosphorus restriction is achieved by the use of phosphate binding agents, although it is unknown if these yield similar survival benefits to those provided by renal diets. Interventions to control hypokalaemia and hypertension in affected cats are important to prevent serious complications. Administration of benazepril to cats with proteinuric kidney disease has been shown to significantly improve their appetite but not their survival. As CKD progresses, many cats will benefit from treatment to control clinical signs of uraemic gastroenteritis and anaemia.

**Feline CKD: New horizons – where do we go from here?**
Samantha Taylor, Andrew H Sparkes

**Practical relevance**: Chronic kidney disease (CKD) is common in humans as well as in cats, and is a significant human health problem. In feline medicine, despite recent research and improvements in our understanding of the condition, management remains limited by late diagnosis and an inadequate ability to prevent progression of disease. Investigation of future treatments that both delay the progression of CKD and manage clinical signs, and that are also easy and cost effective to administer, is desirable. To this end, we may learn from our colleagues in the medical profession.

**Audience**: CKD is commonly encountered in general practice and so all practitioners dealing with cats will benefit from understanding future treatment possibilities and interventions in the management of CKD.

**Evidence base**: Large-scale medical studies have been performed to provide an evidence base for treatment decisions in human CKD. Several studies in cats have looked at various aspects of treatment and prognosis, but large-scale studies are needed to assess the benefits of treatments such as angiotensin-converting enzyme inhibitors and angiotensin receptor blockers.
**Clinical challenges**: Providing treatment that is effective, easy to administer and not cost-prohibitive is the challenge currently faced by clinicians in the management of feline CKD.

**What is a feral cat?: Variation in definitions may be associated with different management strategies**
Lara Gosling, Jenny Stavisky, and Rachel Dean

**Study rationale**: The definition of a true feral cat is an area of much contention, with many variations used worldwide. In this study, opinions were gathered from feral cat rescue workers and veterinary surgeons working in the United Kingdom to identify a practical definition of a feral cat, suitable for use in the field, education and research.

**Protocol**: A mixed methods approach, using questionnaires and focus groups, was used to collect data from feral cat workers and veterinary surgeons.

**Findings**: Conflicts in opinion on the implications of taming feral cats exist. The rescue workers typically felt that most cats could be tamed, whereas the veterinary surgeons felt this was generally inappropriate, except in the case of young kittens. A consistent definition of feral cats would enable better communication regarding the welfare and management of these animals, and would be useful for further research and education of the public.

**Proposed definition**: A feral cat is proposed by this study to be a cat that is unapproachable in its free-roaming environment and is capable of surviving with or without direct human intervention, and may additionally show fearful or defensive behaviour on human contact.

**More Than Just T4 : Diagnostic testing for hyperthyroidism in cats**
Mark E Peterson

**Clinical challenges**: In older cats presenting with clinical features of hyperthyroidism, confirmation of a diagnosis of thyroid disease is usually straightforward. However, the potential for false-negative and false-positive results exists with all thyroid function tests (especially in the context of routine screening of asymptomatic cats) and leads to clinical dilemmas. For example, a high serum T4-value may be found in a cat that lacks clinical signs of hyperthyroidism, or hyperthyroidism may be suspected in a cat with normal total T4 concentrations.

**Practical relevance**: To avoid unnecessary treatment and potentially adverse effects in a euthyroid cat, thyroid function tests must always be interpreted in the light of the cat’s history, clinical signs, physical examination findings and other laboratory findings.

**Evidence base**: In this article the author reviews the use of commonly recommended thyroid function tests, focusing on clinical scenarios that present diagnostic difficulties. In doing so, he draws on the veterinary and comparative literature, his own clinical experience, and data, unpublished to date, obtained from a series of 100 hyperthyroid cats consecutively diagnosed at his clinic.

**Feline Non-Flea Induced Hypersensitivity Dermatitis: Clinical features, diagnosis and treatment**
Claude Favrot

**Practical relevance**: Hypersensitivity dermatitis (HD) is often suspected in cats and is mostly caused by insect bites, food or environmental allergens. Cats with non-flea induced HD are reported to present frequently with one or more of the following cutaneous reaction patterns: miliary dermatitis, eosinophilic dermatitis, self-induced symmetrical alopecia and head and neck excoriations/pruritus.

**Clinical challenges**: None of the above patterns are, however, pathognomonic for non-flea induced HD and the diagnosis of this condition is based on exclusion of diseases presenting similarly and an adequate response to treatment. Therapeutic approaches to affected cats include use of immunomodulatory drugs (ciclosporin, glucocorticoids, antihistamines), hypoallergenic diets and allergen-specific immunotherapy.

**Evidence base**: This review provides an update on the clinical signs, diagnosis and treatment of feline non-flea induced HD. It draws on the findings of a recent large-scale study that described the clinical signs of numerous cats with non-flea HD and has proposed criteria to facilitate the diagnosis of the condition.

**2013 AAFP Feline Vaccination Advisory Panel Report**
Margie A Scherk, Richard B Ford, Rosalind M Gaskell, et al.

Rationale: This Report was developed by the Feline Vaccination Advisory Panel of the American Association of Feline Practitioners (AAFP) to provide practical recommendations to help clinicians select appropriate vaccination schedules for their feline patients based on risk assessment. The recommendations rely on published data as much as possible, as well as consensus of a multidisciplinary panel of experts in immunology, infectious disease, internal medicine and clinical practice.

**ISFM Guidelines on Population Management and Welfare of Unowned Domestic Cats (Felis catus)**
Andrew H Sparkes, Claire Bessant, Kevin Cope et al.
Guidelines rationale: Cats are among the most commonly kept domestic pets, and coexist with humans in a variety of different circumstances. Cats are sentient beings and, as such, humans have a responsibility for cat welfare where humans and cats coexist. Because cats reproduce efficiently, measures to control populations are frequently needed, but these should be based on ethical and humane approaches.

Framework: These consensus guidelines from the International Society of Feline Medicine’s Welfare Advisory Panel provide a framework for the approach to welfare and population control measures, primarily among unowned cats and those going through a homing programme.

Journal of Veterinary Internal Medicine

Urinary Biomarkers for Acute Kidney Injury in Dogs
J. De Loor, S. Daminet, P. Smets, B. Maddens, and E. Meyer

Routinely, kidney dysfunction and decreased glomerular filtration rate (GFR) are diagnosed by the evaluation of changes in the serum creatinine (SCr) and blood urea nitrogen (BUN) concentrations. However, neither of these tests is sensitive or specific enough for the early diagnosis of impaired kidney function because they are both affected by other renal and nonrenal factors. Furthermore, kidney injury can be present in the absence of kidney dysfunction. Renal reserve enables normal GFR even when nephrons are damaged. Renal biomarkers, especially those present in urine, may be useful for the study of both acute and chronic nephropathies. The aim of this review is to describe the current status of urinary biomarkers as diagnostic tools for kidney injury in dogs with particular focus on acute kidney injury (AKI). The International Renal Interest Society (IRIS) canine AKI grading system and the implementation of urinary biomarkers in this system also are discussed. The discovery of novel urinary biomarkers has emerged from hypotheses about the pathophysiology of kidney injury, but few proteomic urine screening approaches have been described in dogs. Lack of standardization of biomarker assays further complicates the comparison of novel canine urinary biomarker validation results among studies. Future research should focus on novel biomarkers of renal origin and evaluate promising biomarkers in different clinical conditions. Validation of selected urinary biomarkers in the diagnosis of canine kidney diseases must include dogs with both renal and nonrenal diseases to evaluate their sensitivity, specificity as well as their negative and positive predictive values.

Systematic Review of Nonsteroidal Anti-Inflammatory Drug-Induced Adverse Effects in Dogs
B.P. Monteiro-Steagall, P.V.M. Steagall, and B.D.X. Lascelles

The aim of this systematic review was to identify, assess, and critically evaluate the quality of evidence of nonsteroidal anti-inflammatory drug (NSAID)-induced adverse effects in dogs. Original prospective studies published in peer-reviewed journals in English (1990–2012) that reported data on the safety of NSAIDs administration in dogs were searched. For each study, design type (I, II, III, or IV) and assessment of quality (+, O, −) were rated. For each drug, quantity and consistency rating (***/**, **/, *) and strength of evidence (high, moderate, low, or extremely low) were identified and evaluated. The strength of evidence was defined in terms of how applicable and relevant the conclusions were to the target population. Sixty-four studies met the inclusion criteria. Thirty-five (55%) research studies and 29 (45%) clinical trials were identified. A high strength of evidence existed for carprofen, firocoxib, and meloxicam; moderate for deracoxib, ketoprofen, and robenacoxib; and low for etodolac. Quality and consistency rating were as follows: carprofen (***/***), deracoxib (**/***), etodolac (unable to rate), firocoxib (**/**), ketoprofen (**/***), meloxicam (**/***), and robenacoxib (**/**), respectively. Adverse effects were detected in 35 studies (55%) and commonly included vomiting, diarrhea, and anorexia. Three studies (5%) reported a power analysis related to adverse effects ≥80%. In randomized, placebo-controlled, blinded studies (n = 25, 39%), the incidence of adverse effects was not statistically different between treated and control dogs. Finally, most studies were not appropriately designed to determine the safety of NSAIDs, and involved a healthy nongeriatric population of research dogs.

Microparticles in Health and Disease
J.M. Herring, M.A. McMichael, and S.A. Smith

Microparticles (MPs), small membrane-derived vesicles, are derived from many cell types and released into the circulation. Microparticles can express antigens, and contain cell surface proteins, cytoplasmic contents, and nuclear components from their cell of origin that determines their composition, characterization, and transfer of biologic information. Certain prompts for this release include shear stress, complement activation, proapoptotic stimulation, cellular damage, or agonist interaction with cell surface receptors. Release can be physiologic or pathologic and is associated with proinflammatory and procoagulant effects and has been implicated in thrombotic states. Microparticles also contribute to systemic inflammation and cardiovascular, hematologic, and oncologic disease states. The study of MPs in human medicine is rapidly advancing and extends into the physiology of health, the pathophysiology of disease, and the role of MPs in transfusion medicine. In veterinary
medicine, published work on MPs has been limited to the area of inherited disorders, blood storage, and leukoreduction (LR). Microparticle research is still in its infancy, and this review should be seen as a snapshot of what is currently known. As research continues important limitations, including variations in preanalytic variables such as collection, storage, or centrifugation, and limitations of quantitation are coming to the forefront. Correlation of quantitation of MPs with assays of activity will hopefully shed light on the true nature of MPs in health and disease. This review will focus on the role of cellular exocytic vesiculation in health, disease, and transfusion medicine.

Migraine-like Episodic Pain Behavior in a Dog: Can Dogs Suffer from Migraines?
I.N. Plessas, H.A. Volk, and P.J. Kenny
Migraines and other primary headache disorders commonly affect people. There is evidence to suggest that migraines can occur in dogs. In this review, we present a dog with paroxysmal episodes that have a striking resemblance to human migraine, and we give an overview of migraine in people. The current classification, clinical signs, and diagnosis in people are discussed, as well as the anatomy of head pain, pathophysiology, pharmacology, and treatment options.

American Cocker Spaniel Chronic Hepatitis in Japan
Background: American Cocker Spaniels are predisposed to chronic hepatitis.
Objective: To describe the clinical and histological features of chronic hepatitis in Japanese American Cocker Spaniels.
Animals: Thirty cases examined from 2003 to 2009.
Methods: Retrospective study. Medical records were searched for American Cocker Spaniels with chronic liver diseases. History, physical examination, clinicopathologic features, hepatic ultrasonographic findings, hepatic histopathology, and immunohistochemistry were evaluated.
Results: The median age was 4.6 (1.9–10.7) years. Clinical signs included inappetence (11/13), ascites (11/13), lethargy (9/13), diarrhea (7/13), and melena (2/13). Only 1/13 dogs was jaundiced. Clinicopathological abnormalities were increased liver enzymes (gamma-glutamyl transpeptidase: 9/12, aspartate aminotransferase: 7/10, alanineaminotransferase: 6/13, alkaline phosphatase: 6/13), increased total serum bile acid concentrations (10/12), and hypoalbuminemia (10/13). The liver had an irregular surface in all dogs and acquired portosystemic collaterals were verified in 11/13 dogs by abdominal ultrasound (2), laparoscopy (4), or both (5). Liver histology revealed severe fibrosis and cirrhosis in all cases, subdivided in lobular dissecting hepatitis (7), periportal fibrosis (1), micronodular cirrhosis (3), and macronodular cirrhosis (2). Inflammatory activity was low to mild. Immunohistochemical stains showed ductular proliferation. The median survival time was 913 (range: 63–1981) days.
Conclusion and Clinical Importance: Hepatitis in Japanese American Cocker Spaniels is clinically silent until an advanced stage and is associated with severe hepatic fibrosis leading to cirrhosis, extensive ductular/putative hepatic progenitor cell proliferation, portal hypertension, and acquired portosystemic collateral shunting, but relatively long survival times. Lobular dissecting hepatitis seems more prevalent than in previously reported cases from other countries.

Amino Acid, Iodine, Selenium, and Coat Color Status among Hyperthyroid, Siamese, and Age-Matched Control Cats
Background: Hyperthyroidism is common among older cats, but its pathogenesis remains poorly understood. Siamese and Himalayan cats have a reduced risk of hyperthyroidism compared with domestic short-hair cat breeds. A mechanism of risk reduction in pointed-coat breeds is unknown.
Objectives: To determine if tyrosine, phenylalanine, iodine, or selenium blood concentrations are altered in hyperthyroid cats and to describe the plasma amino acid profiles of client-owned cats with naturally occurring hyperthyroidism.
Animals: Twenty-seven client-owned cats with (n = 12) and without (n = 15) hyperthyroidism were studied.
Methods: Cross-sectional study. Hyperthyroid cats were prospectively recruited among cats presenting for radioidine therapy. Control cats were recruited among pets of hospital personnel. Blood was collected for total thyroxine, plasma amino acid, selenium, and iodine determination. Coat color (8 white or pointed; 19 dark), breed, and diet history were recorded.
Results: Tyrosine, phenylalanine, iodine, and selenium levels were not significantly different among light or dark cats or cats with or without hyperthyroidism (P > .05). Plasma amino acid profiles of hyperthyroid cats and control cats were similar, and neither group was deficient in any of the amino acids. L-glutamine was
significantly lower in cats with hyperthyroidism (mean _ SD: 648 _ 193) compared with control cats (816 _ 134; P < .05).

Conclusions and Clinical Importance: Altered tyrosine, iodine, and selenium metabolism were not associated with coat color or hyperthyroidism in pointed or light coat–colored cats.

**The Relationship of Serum Cobalamin to Methylmalonic Acid Concentrations and Clinical Variables in Cats**

P. Worhunsky, O. Toulza, M. Rishniw, N. Berghoff, C.G. Ruaux, J.M. Steiner, and K.W. Simpson

Background: Serum cobalamin concentration [CBL] suggests CBL deficiency in cats but serum methylmalonic acid concentration [MMA] more accurately indicates CBL deficiency.

Objective: To examine the ability of [CBL] to predict CBL deficiency defined by increased [MMA], and relationships of [CBL] and [MMA] with select clinical and clinicopathological variables.


Methods: Prospectively collected [CBL] and [MMA] were compared using scatter plots, receiver operating characteristic and correlative analyses with historical [CBL] thresholds and those identified in the study. [CBL] and [MMA] were compared retrospectively to specific clinical and clinicopathological variables.

Results: [CBL] correlated negatively with [MMA] (s = -.334, P < .0001). [MMA] ≥ 1,343 nmol/L identified CBL deficiency. [CBL] = 209 pg/mL optimized sensitivity (0.51), specificity (0.96), PPV (0.89), and NPV (0.74) for detecting [MMA] ≥ 1,343 nmol/L. Prevalence of CBL deficiency was 42% (48/114) when defined by [MMA] ≥ 1,343 nmol/L versus 23% (27/114) by [CBL] ≤ 209 pg/mL. Unexpectedly, 23 and 45% of 48 cats with [MMA] ≥ 1,343 nmol/L had [CBL] > 900 pg/mL and 290 pg/mL (historical thresholds). [CBL] correlated with mean corpuscular volume (s = -.199, P = .013) and [MMA] with hematocrit (s = .28, P = .006).

Conclusions and Clinical Importance: Cobalamin deficiency ([MMA] ≥ 1,343 nmol/L) occurred in 42% of cats and is predicted with high specificity by [CBL] ≤ 209 pg/mL. CBL status correlates with microcytosis and anemia. Discordance between [CBL] and [MMA] cautions against relying on any single marker for determining CBL status.

**Pharmacokinetics and Relative Bioavailability of D-Penicillamine in Fasted and Nonfasted Dogs**


Background: D-Penicillamine is the most commonly used copper-chelating agent in the treatment of copper-associated hepatitis in dogs. Response to therapy can be variable, and there is a lack of pharmacokinetic information available for dogs. Coadministering the drug with food to alleviate vomiting has been recommended for dogs, which contradicts recommendations for drug administration to humans.

Hypothesis: Coadministration of D-penicillamine with food decreases relative bioavailability and maximum plasma drug concentrations (Cmax) in dogs.

Animals: Nine purpose-bred dogs with a median body weight of 17.0 kg.

Methods: Dogs received D-penicillamine (12.5 mg/kg PO) fasted and with food in a randomized, crossover design. Blood samples were collected before and 0.25, 0.5, 1, 2, 3, 4, 8, 12, and 24 hours after dosing. Total D-penicillamine concentrations were measured using liquid chromatography coupled with tandem quadrupole mass spectrometry. Pharmacokinetic parameters were calculated for each dog.

Results: Two fasted dogs (22%) vomited after receiving D-penicillamine. Mean Cmax _ standard deviation (SD) was 8.7 _ 3.1 lg/mL (fasted) and 1.9 _ 1.6 lg/mL (fed). Mean area under the plasma concentration curve _ SD was 16.9 _ 5.9 lg/mL h (fasted) and 4.9 _ 3.4 lg/mL h (fed). There were significant reductions in relative bioavailability and Cmax in fed dogs (P < .001).

Conclusions and Clinical Importance: Coadministration of D-penicillamine with food significantly decreases plasma drug concentrations in dogs. Decreased drug exposure could result in decreased copper chelation efficacy, prolonged therapy, additional cost, and greater disease morbidity. Administration of D-penicillamine with food cannot be categorically recommended without additional studies.

**Agreement of the Serum Spec fPLTM and 1,2-O-Dilauryl-Rac-Glycero-3-Glutaric Acid-(6′-methylresorufin) Ester Lipase Assay for the Determination of Serum Lipase in Cats with Suspicion of Pancreatitis**

S. Oppliger, S. Hartnack, B. Riond, C.E.Reusch, and P.H. Kook

Background: Serum lipase activities measured by catalytic assays are claimed to be of limited utility for diagnosing pancreatitis in cats. The Spec fPL assay currently is believed the most sensitive test; however, studies comparing different lipase assays are lacking. 1,2-o-dilauryl-rac-glycero-3-glutaric acid-(6′-
methylderesorufin) ester (DGGR) assay for the determination of lipase activity has been evaluated in dogs, but no information is available in cats.

Objectives: To investigate the agreement of DGGR-lipase activity and Spec fPL concentration in cats with clinical signs consistent with pancreatitis.

Animals: Two hundred fifty-one client-owned cats.

Methods: DGGR-lipase activity and Spec fPL concentration measured from the same blood sample in cats undergoing investigation for pancreatitis. The agreement between DGGR-lipase and Spec fPL at different cutoffs was assessed using Cohen’s kappa coefficient (j). Sensitivity and specificity were calculated for 31 cases where pancreatic histopathology was available.

Results: DGGR-lipase (cutoff, 26 U/L) and Spec fPL (cutoff, >5.3 lg/L) had a j of 0.68 (standard error [SE] 0.046). DGGR-lipase (cutoff, 26 U/L) and Spec fPL (cutoff, >3.5 lg/L) had a j of 0.60 (SE, 0.05). The maximum j at a Spec fPl cutoff >5.3 lg/L was found when the DGGR-lipase cutoff was set >34 U/L and calculated as 0.755 (SE, 0.042). Sensitivity and specificity were 48% and 63% for DGGR-lipase (cut-off, 26 U/L) and 57% and 63% for Spec fPL (>5.3 lg/L), respectively.

Conclusions and Clinical Importance: Both lipase assays agreed substantially. DGGR assay seems a useful and cost-efficient method compared to the Spec fPL test.

Safety of Spironolactone in Dogs with Chronic Heart Failure because of Degenerative Valvular Disease: A Population-Based, Longitudinal Study

H.P. Lefebvre, E. Ollivier, C.E. Atkins, B. Combes, D. Concordet, V. Kaltsatos, and L. Baduel

Background: Spironolactone treatment in humans is associated with an increased risk of hyperkalemia and renal dysfunction.

Hypothesis: Dogs with cardiac disease treated with spironolactone, in addition to conventional therapy, are not at higher risk for adverse events (AEs) than those receiving solely conventional therapy.

Animals: One hundred and ninety-six client-owned dogs with naturally occurring myxomatous mitral valve disease.

Methods: Prospective, double-blinded field study with dogs randomized to receive either spironolactone (2 mg/kg once a day) or placebo in addition to conventional therapy (angiotensin-converting enzyme inhibitor, plus furosemide and digoxin if needed). Safety was compared between treatment groups, using the frequency of AEs, death caused by cardiac disease, renal disease, or both, and variations in serum sodium, potassium, urea, and creatinine concentrations. For the latter, population-specific reference intervals were established and out of range values (ORV) analyzed.

Results: The number of AEs was similar in the spironolactone and reference groups (188 and 208, respectively), when followed for median duration of 217 days (range [2–1,333]). At each study time point, the percentage of dogs showing ORV was similar between groups. There were a higher number of deaths because of cardiac disease, renal disease or both in the reference group (30.7% versus 13.7%) (P = .0043).

Conclusions and Clinical Importance: Dogs with heart failure receiving spironolactone in addition to conventional treatment are not at a higher risk for AEs, death caused by cardiac disease, renal disease, or both, hyperkalemia, or azotemia.

Comparison of Presumptive Echocardiographic and Definitive Diagnoses of Cardiac Tumors in Dogs

V. Rajagopalan, S.A. Jesty, L.E. Craig, and R. Gompf

Background: Echocardiography is used for identification of cardiac tumors and presumptive diagnoses often are made based on the location of identified masses.

Objectives: To determine the accuracy of echocardiographically based presumptive diagnoses of cardiac tumors when compared with clinicopathologic or histopathologic definitive diagnoses.

Animals: A total of 24 client-owned dogs having a cardiac mass on echocardiogram that was subsequently definitively diagnosed by cytology or histopathology.

Methods: Retrospective study. A Cardiac Veterinary Database search of animals seen at the University of Tennessee John and Ann Tickle Small Animal Hospital from 2006 to 2012 identified 24 dogs that fit the inclusion criteria.

Results: The presumptive diagnosis of chemodectoma, ectopic thyroid carcinoma, or lymphoma in cases with heart base masses was correct in 7/9 cases. The presumptive diagnosis of hemangiosarcoma in cases with right atrial masses was correct in 4/8 cases. Seven cases had an open diagnosis because of the unusual presentation on echocardiogram (ECG); various neoplasms were diagnosed in these animals, but hemangiosarcoma, chemodectoma, ectopic thyroid carcinoma, and lymphoma accounted for 6 of them. Pericardial effusion was seen in 10/24 cases. ECG abnormalities were seen in 8/24 cases. Survival ranged from <1 to >150 days.

Conclusions and Clinical Importance: In this retrospective study, the presumptive diagnosis based on echocardiographic tumor location was only moderately accurate. Cardiac tumors that were considered unusual on echocardiogram were nonetheless frequently found to be the common cardiac tumor types seen in dogs.
**Comparative Effect of Carperitide and Furosemide on Left Atrial Pressure in Dogs with Experimentally Induced Mitral Valve Regurgitation**


**Background:** The effects of carperitide on left atrial pressure (LAP) in dogs with mitral valve disease (mitral regurgitation, MR) have not been documented.

**Objective:** The objective was to compare the short-term effects of carperitide versus furosemide on LAP and neurohumoral factors in MR dogs.

**Animals:** Six healthy Beagle dogs weighing 9.8–12.6 kg (2 males and 4 females; aged 3 years) were used.

**Methods:** Experimental, randomized, cross-over, and interventional study. Carperitide 0.1 lg/kg/min or furosemide 0.17 mg/kg/h (1 mg/kg/6 h) was administered to dogs with surgically induced MR for 6 hours, and after a 14 day washout period, the other drug was administered. LAP, plasma renin activity, plasma aldosterone, and echocardiographic variables were measured.

**Results:** Left atrial pressure was decreased similarly after the administration of carperitide 0.1 lg/kg/min and furosemide 0.17 mg/kg/h (1 mg/kg/6 h) compared with baseline in dogs with MR (Baseline 14.75 ± 3.74 mmHg, carperitide 10.24 ± 4.97 mmHg, P < .01, furosemide 10.77 ± 5.06 mmHg, P < .05). Plasma renin activity and plasma aldosterone were significantly lower after the administration of carperitide than after the administration of furosemide (P < .05, respectively).

**Conclusions and Clinical Importance:** Carperitide significantly decreased LAP in dogs with acute MR caused by experimental chordal rupture. Carperitide can have additional benefits from the viewpoint of minimal activation of neurohumoral factors in the treatment of dogs with MR. Additional studies in dogs with spontaneous disease are warranted.

**Serum Serotonin Concentration Is Associated with Severity of Myxomatous Mitral Valve Disease in Dogs**

I. Ljungvall, K. H€oglund, I. Lillieh€of€ok, M.A. Oyama, A. Tidholm, H. Tvedten, and J. H€aggstr€om

**Background:** The neurotransmitter serotonin (5-hydroxytryptamine, 5-HT) has recently been suggested to play a role in the development of naturally acquired myxomatous mitral valve disease (MMVD) in dogs.

**Aim:** To investigate the association between serum 5-HT concentration and MMVD severity in dogs, and to assess potential associations between serum 5-HT concentrations and dog characteristics, echocardiographic variables, heart rate, systolic blood pressure, presence of macrothrombocytosis, and plateletcrit.

**Animals:** A total of 120 client-owned dogs.

**Material and Methods:** Dogs were prospectively recruited and were classified by standard echocardiography into healthy (dogs of breeds predisposed to MMVD, but without echocardiographic evidence of the disease), mild, moderate, or severe MMVD groups. Serum 5-HT concentrations were analyzed using an ELISA.

**Results:** Dogs with severe MMVD had lower serum 5-HT concentrations than healthy dogs (P = .0025) and dogs with mild MMVD (P = .0011). Unilinear and multiple regression analyses showed that serum 5-HT concentrations decreased with increasing left atrial to aortic root ratio (LA/Ao), were higher in Cavalier King Charles Spaniel (CKCS) dogs compared to dogs of other breeds, and were higher in female dogs than in male dogs. The LA/Ao was the variable most strongly associated with serum 5-HT concentration.

**Conclusions and Clinical Importance:** The finding of higher serum 5-HT concentrations in dogs of breeds predisposed to the early onset of MMVD (CKCS) and dogs with mild MMVD suggests that alterations in 5-HT signaling might play a role in progression of early stages of MMVD.

**Assessment of Coagulation and Potential Biochemical Markers for Hypercoagulability in Canine Hyperadrenocorticism**

S.L. Pace, K.E. Creevy, P.M. Krimer, and B.M. Brainard

**Background:** Anecdotal accounts and limited research suggest that dogs with spontaneous hyperadrenocorticism (HAC) are at risk of developing thromboembolic complications. Detailed description of coagulation status and identification of subsets of dogs at greatest risk would impact therapeutic recommendations for these patients.

**Hypothesis/Objectives:** Hypothesis: A subset of dogs with HAC will have a hypercoagulable tendency as identified by increased procoagulant activity, decreased fibrinolysis, or both. Objective 1: To document the existence of this hypercoagulable tendency in HAC dogs using assays of individual coagulation factors, fibrinolytic activity, and systemic coagulation.

**Objective 2:** To evaluate clinical and biochemical markers in HAC dogs to identify a subset of HAC patients at increased risk of this hypercoagulable tendency.

**Animals:** Seventeen dogs newly diagnosed with HAC.

**Methods:** Prospective study. Medical history, physical examination findings, routine diagnostic tests, and comprehensive coagulation testing were performed at the time of HAC diagnosis. Coagulation parameters were
assessed individually and as panels for each dog. Historical and clinical variables were correlated with coagulation parameters to identify risk factors.

Results: The majority (88.2%) of HAC dogs exhibited a hypercoagulable tendency. Abnormalities in 1 coagulation assay did not predict abnormalities in others. Duration of clinical signs of HAC did not predict hypercoagulability. Comorbid conditions or abnormal clinicopathologic parameters that predicted hypercoagulability were not identified.

Conclusions and Clinical Importance: Although HAC dogs may demonstrate a hypercoagulable tendency individually and as a group, comorbid conditions or biochemical variables that would predict more severe coagulation abnormalities were not identified.

Effect of Dietary Carbohydrate, Fat, and Protein on Postprandial Glycemia and Energy Intake in Cats


Background: Reducing carbohydrate intake is recommended in diabetic cats and might also be useful in some healthy cats to decrease diabetes risk.

Objective: To compare postprandial glucose and insulin concentrations and energy intakes between cats fed diets high in protein, fat, or carbohydrate.

Animals: Twenty-four lean cats with normal glucose tolerance.

Methods: In a prospective randomized study, each of 3 matched groups (n = 8) received a different test diet for 5 weeks. Diets were high in either protein (46% of metabolizable energy [ME]), fat (47% ME), or carbohydrate (47% ME). Glucose and insulin were measured during glucose tolerance, ad libitum, and meal-feeding tests.

Results: During ad libitum feeding, cats fed the high-carbohydrate diet consumed 25% and 18% more carbohydrate than cats fed diets high in fat and protein, respectively, and energy intake was highest when the high-fat and high-protein diets were fed. Regardless of the feeding pattern, cats fed the high-carbohydrate diet had 10–31% higher peak and mean glucose compared with both other diets; peak glucose in some cats reached 10.4 mmol/L (188 mg/dL) in cats fed 47% ME carbohydrate and 9.0 mmol/L (162 mg/dL) in cats fed 23% ME.

Conclusions and Clinical Importance: High-carbohydrate diets increase postprandial glycemia in healthy cats compared with diets high in fat or protein, although energy intake is lower. Avoidance of high- and moderate-carbohydrate diets can be advantageous in cats at risk of diabetes. Maintenance energy requirements should be fed to prevent weight gain when switching to lower carbohydrate diets.

Hypercoagulability and ACTH-Dependent Hyperadrenocorticism in Dogs


Background: Dogs with hyperadrenocorticism are at risk of thromboembolic disease, which might be caused by an underlying hypercoagulable state.

Hypothesis/Objectives: To assess hemostatic function in dogs with ACTH-dependent hyperadrenocorticism (ADHAC) before and after treatment.

Animals: Nineteen dogs with ADHAC and 40 normal dogs.

Methods: Prospective, observational study. Dogs with ADHAC were recruited from the referral hospital patient population; normal dogs were recruited from staff and students at the study’s institution. Hemostasis was assessed before and at 3 and 6 months after treatment with trilostane (T0, T3, T6) by kaolin-activated thrombelastography with platelet mapping (TEGPM), prothrombin time, activated partial thromboplastin time, fibrinogen concentration, and antithrombin activity (AT).

Results: Dogs with ADHAC had statistically significantly increased a-angle (P < .01) and maximum amplitude (MA)thrombin (P < .01) on TEG-PM, and significantly decreased j (P < .005) at T0, T3, and T6. Platelet count (P < .001) and fibrinogen concentration (P < .001), but not AT activity, were increased in dogs with ADHAC at T0, T3, and T6.

Conclusions and Clinical Importance: Dogs with ADHAC have thrombelastographic evidence of hypercoagulability and remained hypercoagulable during treatment. AT deficiency does not appear to be involved in the pathogenesis of hypercoagulability in this population.

Postmortem Evaluation of 435 Cases of Intracranial Neoplasia in Dogs and Relationship of Neoplasm with Breed, Age, and Body Weight

R.B. Song, C.H. Vite, C.W. Bradley, and J.R. Cross

Background: Intracranial neoplasia is frequently encountered in veterinary medicine, but large-scale studies on prevalence are lacking.

Objectives: To determine the prevalence of intracranial neoplasia in a large population of dogs examined postmortem and the relationship between breed, age, and weight with the presence of primary intracranial neoplasms.

Animals: All dogs that underwent postmortem examination from 1986 through 2010 (n = 9,574), including dogs with a histopathologic diagnosis of primary (n = 227) and secondary (n = 208) intracranial neoplasia.
Hypovitaminosis D in Dogs with Spirocercosis

C.T. Rosa, J.P. Schoeman, J.L. Berry, R.J. Mellanby, and E. Dvir

Background: Spirocercosis in dogs is characterized by esophageal nodules that can undergo neoplastic transformation. Hypovitaminosis D has been associated with neoplasia formation. We hypothesized hypovitaminosis D in neoplastic spirocercosis and that it could be a risk factor for neoplastic transformation.

Objective: To measure and compare vitamin D status, assessed by serum 25(OH)D concentrations in non-neoplastic and neoplastic spirocercosis dogs compared to healthy ones (P < .05). Neoplastic and non-neoplastic spirocercosis dogs had similar appetite scores (P = .087) and abnormal (P = .125) appetites within neoplastic and non-neoplastic spirocercosis groups.

Results: Serum 25(OH)D concentrations were significantly different among all groups (P < .001). 25-Hydroxyvitamin D concentrations were significantly lower in neoplastic group (median 30.7 nmol/L [range 14.7–62.2]) compared to nonneoplastic (median 52.7 nmol/L [range 19.1–129.7, P < .05]) and healthy groups (median 74.6 nmol/L [range 37.4–130.5, P < .005]). 25-hydroxyvitamin D concentrations were significantly lower in non-neoplastic spirocercosis dogs compared to healthy ones (P < .05). Neoplastic and non-neoplastic spirocercosis dogs had similar appetite scores (P = 1.0). 25-Hydroxyvitamin D concentrations were not significantly different between dogs with normal (P = .87) and abnormal (P = .125) appetites within neoplastic and non-neoplastic spirocercosis groups.
Applicability of 3T Body MRI in Assessment of Nonfocal Bone Marrow Involvement of Hematopoietic Neoplasia in Dogs


Background: The utility of whole body magnetic resonance imaging (MRI) in detecting bone marrow infiltration in dogs with cancer has not been investigated.

Objectives: To assess the feasibility of 3T body MRI for bone marrow assessment in dogs with hematopoietic neoplasia.

Animals: Seven dogs with B-cell lymphoma, 3 dogs with myelodysplastic syndrome (MDS), and 2 clinically normal dogs.

Methods: A prospective study of dogs with hematopoetic cancer was conducted using T1W, T2W, In-Phase, Out-of-Phase and STIR pulse sequences of the body excluding the head prior to bone marrow sampling. The relative signal intensity of a midlumbar vertebral body and a midshaft femoral bone marrow was compared by visual and point region of interest analysis to regional skeletal muscle.

Results: Similarity of femoral diaphyseal and vertebral body marrow signal intensity to that of skeletal muscle on the Out-of-Phase sequence was useful in distinguishing the 3 dogs with hypercellular marrow because of MDS from the 7 dogs with B-cell lymphoma and from the 2 clinically normal dogs. 1/7 dogs with lymphoma had proven bone marrow involvement but normal cellularity and less than 5% abnormal cells. Unaffected midfemoral marrow had greater signal intensity than skeletal muscle and unaffected vertebral marrow had less signal intensity than skeletal muscle on the Out-of-Phase sequence.

Conclusions and Clinical Importance: 3T, Out-of-Phase MR pulse sequence was useful in distinguishing diffuse bone marrow infiltrate (MDS) from minimally or unaffected marrow using skeletal muscle for signal intensity comparison on whole body MRI.

Markers of Coagulation Activation, Endothelial Stimulation, and Inflammation in Dogs with Babesiosis


Background: Babesia infections in dogs can result in a wide range of clinical and laboratory presentations, including coagulopathy. Expression of intercellular adhesion molecule-1 (ICAM-1) and von Willebrand factor (vWF) in dogs with babesiosis is unknown.

Objectives: Whether inflammation in babesiosis triggers activation of ICAM-1 and the coagulation system.

Animals: Twelve and 10 dogs with naturally occurring babesiosis before and after antiparasitic treatment, respectively, were compared with 10 healthy dogs.

Methods: In this prospective study, diagnosis was made by blood smear examination and confirmed by PCR. C-reactive protein (CRP), soluble intercellular adhesion molecule 1 (sICAM-1), and von Willebrand factor (vWF) levels were measured by a canine ELISA kit, fibrinogen (FIB) and factor VIII activity levels were measured by coagulometric methods, and blood cell counts (WBC, RBC, PLT) were determined with an automatic analyzer.

Results: Compared to healthy dogs, the CRP, sICAM-1, and FIB concentrations were significantly increased before therapy and remained high for 3 days after therapy in dogs with babesiosis. vWF activity was significantly decreased in dogs with babesiosis before treatment. FVIII activity did not differ between dogs with babesiosis and healthy dogs. WBC; RBC and PLT were significantly lower before treatment and normalized by 3 days after treatment.

Conclusion and Clinical Importance: A proinflammatory condition in babesiosis appears to influence endothelial dysfunction and hemostatic activity. Although clearly beneficial for the parasite, sequestered blood cells can obstruct blood flow in small vessels, promote an inflammatory state, and could increase the severity of babesiosis.

Dermatologic Adverse Effect of Subcutaneous Furosemide Administration in a Dog

S.M. Scruggs and M. Rishniw

Infection with Panola Mountain Ehrlichia sp. in a Dog with Atypical Lymphocytes and Clonal T-Cell Expansion


Novel Coronary Artery Anomaly in an English Bulldog with Pulmonic Stenosis

M.I. Waterman, J.A. Abbott
Stomach Gas Analyses in Canine Acute Gastric Dilatation with Volvulus
H.J. Van Kruiningen, C. Gargamelli, J. Havier, S. Frueh, L. Jin, and S. Suib

Background: The origin of the gas in the stomachs of dogs with acute gastric dilatation or gastric dilatation with volvulus (GDV) often is disputed.

Hypothesis: We tested the hypothesis that gaseous distention resulted from aerophagia.

Animals: Ten cases of GDV that were submitted to an emergency clinic were sampled intraoperatively.

Methods: With the abdomen open, the needle of a vacutainer blood collection set was inserted into the distended stomach, and gas was collected into 10 mL glass vacutainer vials with rubber stoppers. These were stored at room temperature for 1–7 days and then analyzed by gas chromatography and mass spectroscopy.

Results: CO2 composition ranged from 13 to 20%. One dog had an H2 concentration of 29%.

Conclusions: Because the CO2 content of atmospheric air is less than 1%, these findings suggest that the gaseous gastric distention in GDV is not the result of aerophagia.

Thromboelastographic Evaluation of Dogs with Congenital Portosystemic Shunts
D. Kelley, C. Lester, A. DeLaforcade, and C.R.L. Webster

Background: On plasma-based assays, dogs with congenital portosystemic shunts (CPSS) have changes in serum concentrations of both pro- and anticoagulant proteins, but how these abnormalities affect whole blood coagulation assays (eg, thromboelastography) are unknown.

Objectives: To conduct kaolin-activated thromboelastography (TEG) analysis in dogs with CPSS and to compare TEG coagulation status with clinical presentation, routine serum biochemistry, and plasma-based coagulation tests.

Animals: Twenty-one client-owned dogs with CPSS confirmed by ultrasound examination or nuclear scintigraphy.

Methods: In a prospective study, signalment, clinical presentation, TEG analysis, CBC, serum biochemistry, and hemostatic tests (platelet count, prothrombin time [PT], activated partial thromboplastin time [aPTT], quantitative fibrinogen, antithrombin [AT] activity, protein C [PC] activity, d-dimers, and factor VIII activity) were analyzed in dogs with CPSS.

Results: Dogs with CPSS had significantly shorter K values and increased angle, maximum amplitude (MA), and G values compared with the reference population. On plasma-based coagulation testing, dogs with CPSS had significantly prolonged PT, lower platelet counts, lower AT and PC activities, and increased d-dimers and factor VIII activity. Evaluation of G value defined 9/21 dogs with CPSS as hypercoagulable. These dogs were more likely to have hepatic encephalopathy (HE) than CPSS dogs that had normal coagulation.

Conclusions and Clinical Importance: TEG analysis detected hemostatic abnormalities consistent with a hypercoagulable state in some dogs with CPSS. The presence of a hypercoagulable state was 40 times more likely in dogs with symptomatic HE.

Evaluation of Hair Cortisol in the Diagnosis of Hypercortisolism in Dogs
S. Corradini, P.A. Accorsi, A. Boari, V. Beghelli, M. Mattioli, P. Famigli-Bergamini, and F. Fracassi

Background: Measurement of hair cortisol is a noninvasive technique used for several purposes in humans and in animals.

Objectives: To measure hair cortisol concentrations (HCC) in dogs with spontaneous hypercortisolism (HC) and determine whether it can represent a useful diagnostic test for this syndrome.

Animals: Twenty-two dogs with spontaneous HC before treatment, 28 sick control dogs (SCD), and 40 healthy dogs.

Methods: In this prospective, observational clinical study, the HCC was measured by an RIA assay after extraction in HC dogs, in dogs with other chronic diseases, and in healthy dogs. The diagnostic accuracy of HCC was evaluated by subjecting data from dogs with HC and dogs with other chronic diseases to receiver operating characteristic (ROC) curve analysis.

Results: Median (range) cortisol concentration in dogs with HC was 4.53 pg/mg (0.32–74.62 pg/mg) and was significantly higher than in SCD (1.49 pg/mg, 0.13–14.19 pg/mg) and healthy dogs (1.28 pg/mg, 0.34–5.38 pg/mg). Within the 3 groups, there was a large overlap of HCC. The area under the ROC curve was 0.80 (95% CI: 0.67–0.92). A cut-off value of HCC of 1.93 pg/mg revealed 91% sensitivity and 61% specificity to diagnose HC.

Conclusions and Clinical Importance: Hair cortisol concentrations are higher in dogs with HC compared to SCD and healthy dogs. It is a noninvasive technique that should be further investigated as a possible diagnostic procedure for the diagnosis of HC in dogs.

Prospectively Recorded versus Medical Record-Derived Spinal Cord Injury Scores in Dogs with Intervertebral Disk Herniation

**Background:** Validated spinal cord injury (SCI) scores have been established for veterinary species but are not uniformly used in practice.

**Hypothesis/objectives:** To determine the level of agreement of SCI scores at the time of admission versus those assigned from reconstructed medical records in a population of dogs with intervertebral disk herniation (IVDH).

**Animals:** Eighty-six client-owned dogs with confirmed IVDH.

**Methods:** Retrospective study. Medical records were reviewed for history, physical examination, neurologic examination, and recorded Modified Frankel score (MFS) and Texas spinal cord injury score (TSCIS) at the time of admission. Three raters, all board-certified neurologists, assigned MFS and TSCIS based on digitized abstracted medical records to each patient. These scores were then compared to the recorded score at the time of admission.

**Results:** Actual agreement for MFS and TSCIS derived from medical records by the 3 raters compared to prospectively derived MFS and TSCIS was 77.9 and 51.2%, respectively. A kappa value of 0.572 (95% CI 0.450, 0.694; P < .001) and an ICC of 0.533 (95% CI 0.410, 0.646; P < .001) were calculated for MFS scores. A kappa value of 0.100 (95% CI 0.000, 0.222; P = .107), and an ICC of 0.503 (95% CI 0.377, 0.620; P < .001) were calculated for TSCIS scores.

**Conclusions and Clinical Importance:** Results showed that SCI scores recorded at the time of admission often do not agree with those retrospectively abstracted from medical records. Agreement was less when using the more complex TSCIS scale and therefore the MFS scale might be more appropriate for use in retrospective studies.

**Expression of Leptin and iNOS in Oral Melanomas in Dogs**

V.R. Greene, H. Wilson, C. Pfent, J. Roethele, J. Carwile, Y. Qin, E. Grimm, and J.A. Ellerhorst

**Background:** Oral melanoma (OM) in dogs is an aggressive malignancy, with clinical behavior resembling cutaneous melanomas in humans. Melanoma in humans is promoted by an inflammatory environment that is contributed to by leptin and inducible nitric oxide synthase (iNOS).

**Objective:** To determine if the patterns of leptin and iNOS expression are similar in OM in dogs and cutaneous melanomas in humans.

**Animals:** Twenty client-owned dogs.

**Methods:** Retrospective case study. Immunostaining of the OM tumors from each dog was scored for percentage and intensity of leptin and iNOS expression. Mitotic index was used as an indicator of tumor aggression.

**Results:** Leptin was detected in ≥75% of the tumor cells in specimens from 11 dogs. One tumor expressed leptin in ≤25% of the cells. The intensity of leptin expression was variable with 6, 9, and 5 cases exhibiting low-, moderate-, and high-intensity staining, respectively. OM with the lowest percentage of iNOS positive cells displayed the highest mitotic indices (P = .006, ANOVA).

**Conclusions and Clinical Importance:** The expression of leptin is a common finding in melanomas in dogs. These data suggest that the possibility of future clinical applications, such as measuring the concentrations of plasma leptin as a screening tool or leptin as a target for therapy. The relevance of iNOS is not as clear in dogs with OM, for which other directed therapeutics might be more appropriate.

**The Veterinary Journal**

**The future of imaging in veterinary oncology: Learning from human medicine**

John S. Mattoon, Jeffrey N. Bryan. Imaging technology is critical for adequate diagnosis and staging in human and veterinary oncology. Sensitive detection of lesions is necessary to determine appropriate local or systemic therapy and to monitor therapeutic results. New technology in digital radiography, ultrasound, and computed tomography (CT) scanning are now widely available in veterinary medicine. Advanced imaging with high-detail CT scans, magnetic resonance imaging (MRI), and positron-emission tomography (PET) are now available in academic centers and some private specialty practices. This review describes the current and future applications of these new imaging systems and modalities in veterinary oncology and how advanced imaging contributes to diagnosis, staging, and monitoring of cancers. The potential of molecular imaging for accurate, minimally invasive diagnosis and monitoring is discussed.

**Development and validation of a survey for quality of life assessment by owners of healthy dogs**

R.P. Lavan. Assessing and maintaining quality of life (QOL) is a growing concern in companion animal practice, as improved nutrition and healthcare have extended canine longevity. The objective of this study was to develop a validated survey for evaluating QOL in healthy dogs for use in clinical and research settings. A total of 174 dog owners completed an initial QOL survey containing 21 items grouped into seven domains (CHQLS-21). After factor analysis of the responses, a final survey was constructed containing 15 items grouped.
into four domains (happiness, physical functioning, hygiene and mental status), plus two questions on general health and an item asking for a direct QOL assessment (CHQLS-15). Psychometric analysis indicated that the CHQLS-15 had good validity, reliability, and internal consistency and was able to detect QOL changes affecting several domains across age groups in healthy dogs. The CHQLS-15 therefore provides a basis for dialog between clinicians and dog owners regarding the health of their pets, particularly in tracking changes in health status, evaluating response to treatment, and guiding end-of-life decisions. A validated QOL survey could be particularly useful in recognizing and managing functional decline as the healthy canine patient ages.

**Classification of primary hepatic tumours in the dog**

Renée G.H.M. van Sprundel, Ted S.G.A.M. van den Ingh, Franco Guscetti, Olivia Kershaw, Hideyuki Kanemoto, Henrika M. van Gils, Jan Rothuizen, Tania Roskams, Bart Spee

Many advances have been made in the characterisation of primary liver tumours in humans, in particular relating to the identification and role of hepatic progenitor cells, resulting in a new classification. The aim of the present study was to investigate the presence and relative frequency of morphological types of canine primary hepatic neoplasms and to determine whether a classification similar to the human scheme can be applied to these canine neoplasms. Canine primary liver tumours (n = 106) were examined histologically and with the immunohistochemical markers keratin 19, HepPar-1, epithelial membrane antigen/mucin-1, CD10, neuron-specific enolase and chromogranin-A. Eleven nodular hyperplasias and 82 tumours of hepatocellular origin were diagnosed. The latter were subdivided in hepatocellular tumours with 0–5% positivity for K19 (n = 62), which were well differentiated and had no evidence of metastasis, tumours with >5% positivity for K19 (n = 17), which were poorly differentiated and had intrahepatic and/or distant metastasis, and a scirrhous subgroup (n = 3) with an intermediate position with regard to K19 staining and malignancy. Ten cholangiocellular tumours (nine cholangiocellular carcinomas and one cholangiolocarcinoma) were diagnosed and all had intrahepatic and/or distant metastases. Three neuroendocrine carcinomas were also diagnosed. Histopathological and immunohistochemical examination of canine primary hepatic neoplasms can differentiate hepatocellular, cholangiocellular and neuroendocrine tumours, in accordance with the most recent human classification system.

**Evaluation of cartilage, synovium and adipose tissue as cellular sources for osteochondral repair**

J.F. Innes, C. Gordon, A. Vaughan-Thomas, N.P. Rhodes, P.D. Clegg. Osteochondral lesions are a major cause of pain and disability in several species including dogs, horses and human beings. The objective of this study was to assess three potential sources of canine cells for their osteochondral regenerative potential. Cartilage, synovium and adipose tissue cells were grown in pellet culture in chondrogenic or osteogenic media. Cartilage-derived pellets displayed the best chondrogenic differentiation as indicated by significantly higher COL2A1 and SOX9 mRNA expression, greater glycosaminoglycan content, and higher retention of Safranin-O stain compared to the synovium and adipose-derived cells. Following application of the osteogenic media, all three cell sources exhibited small areas of positive alizarin red staining. Poor intracellular alkaline phosphatase activity was found in all three cell types when stimulated although osteocalcin and RUNX2 expression were significantly increased. Cells isolated and cultured from canine articular cartilage retained their specific chondrocytic phenotype. Furthermore, canine adipocytes and synovial cells did not undergo chondrogenic differentiation and did not exhibit evidence of multipotency. Although osteogenic differentiation was initiated at a genomic level, phenotypic osteoblastic differentiation was not observed. The findings of this study suggest that cells isolated from canine adipose tissue and synovium are sub-optimal substitutes for chondrocytes when engineering articular cartilage in vitro.

**Foraminal and paraspinal extraforaminal attachments of the sixth and seventh lumbar spinal nerves in large breed dogs**

S. Breit, F. Giebels, S. Kneissl. Fresh cadaveric lumbar spines of 20 adult large breed dogs were used to study the sixth and seventh lumbar spinal nerves along their course through their respective intervertebral foramen. The relationship between the peristeum lining the vertebral canal (endorhachis; peridural membrane) and the vessels inside the vertebral canal, and the relationship between the nerves and the wall of the intervertebral foramen and the extraspinal suspensory apparatus were investigated. Each intervertebral foramen contained a fibrous septum that divided it into two sub-compartments by connecting the fibrous capsule of the facet joints with the intervertebral disc and the adjoining vertebral body. The lumbar nerves and the main artery passed through the cranial sub-compartment and the main vein passed through the caudal sub-compartment. In all cases, there was a circumneural sleeve that connected the ventral branches of the lumbar nerves extraspinally with the fibrous capsule of the facet joints dorsally, the fibrous septum caudally, and the caudal vertebral notch and accessory process cranioventrally. The deep layer of the circumneural sleeve was formed by the peristeum lining the vertebral canal pouching laterally through the intervertebral foramen; the superficial (lateral) layer was formed by the deep sheet of the thoracolumbar fascia. The deep sheet of the thoracolumbar fascia continued cranially and caudally to the circumneural sleeve to attach it to the vertebral
body and the intervertebral disc. Regional and individual differences were noted in the composition and length of the circumneural sleeve. The potential biomechanical and clinical roles of these variations are discussed.

**Left atrial volume and phasic function in clinically healthy dogs of 12 different breeds** M. Höllmer, J.L. Willesen, A. Tolver, J. Koch. The left atrium (LA) of the heart is a validated marker of clinical and subclinical cardiovascular disease. Since the LA is a three-dimensional structure, volume-based methods of chamber quantification might be more accurate than linear methods. The aims of this study were to establish the feasibility and reproducibility of biplane two-dimensional echocardiographic LA volume measurements and to provide reference ranges for LA volume and phasic function in adult dogs (n = 237) without cardiovascular disease. The study also assessed the effects of bodyweight (BW), breed, sex, age and heart rate (HR) on LA volume and function. The biplane area–length method was used to calculate LA volumes from the left apical four- and two-chamber views. LA volume and function were correlated with body size and there were significant breed differences. For dogs of all sizes and breeds, LA maximal volume had a 95th percentile of 0.92 mL/kg. There was no correlation between age or sex and LA volume or LA reservoir function, but conduit function decreased and booster pump function increased with age. LA volume and function varied with HR. LA size was calculated using the biplane area–length method, with good reproducibility and little inter-observer variability. The reference ranges presented for LA volume and function in healthy dogs could be used to refine the diagnostic criteria for the assessment of LA enlargement and altered function by conventional echocardiography.

**Mirtazapine as an appetite stimulant and anti-emetic in cats with chronic kidney disease: A masked placebo-controlled crossover clinical trial.** J.M. Quimby, K.F. Lunn. Cats with chronic kidney disease (CKD) often experience inappetence and vomiting and might benefit from the administration of mirtazapine, a medication with appetite stimulant and anti-nausea properties. The aim of this placebo-controlled, double-masked crossover clinical trial was to evaluate the effects of mirtazapine on bodyweight, appetite and vomiting in cats with CKD. Eleven cats with stable CKD were randomized to receive 1.88 mg mirtazapine or placebo orally every other day for 3 weeks. After a 4 day washout period, each cat crossed over to the alternate treatment for 3 weeks. Physical examinations and serum biochemistry profiles were performed before and after each treatment period and owners kept daily logs of appetite, activity, behavior, and vomiting episodes. Compared to placebo, mirtazapine administration resulted in a statistically significant increase in appetite (P = 0.02) and activity (P = 0.02) and a statistically significant decrease in vomiting (P = 0.047), as determined by Wilcoxon matched pairs analysis. Cats treated with mirtazapine also gained significant bodyweight compared with placebo-treated cats (P = 0.002) as determined by linear mixed model analysis. Median weight gain during mirtazapine administration was 0.18 kg (range 0–0.45 kg). Median weight loss during placebo administration was 0.07 kg (range 0–0.34 kg). Mirtazapine is an effective appetite stimulant and anti-emetic for cats with CKD and could be a useful adjunct to the nutritional management of these cases.

**Prednisolone inclusion in a first-line multidrug cytostatic protocol for the treatment of canine lymphoma does not affect therapy results.** M. Zandvliet, G.R. Rutteman, E. Teske. Chemotherapy protocols for canine lymphoma include the routine use of glucocorticoids for their lympholytic effect. However, glucocorticoids are associated with side effects (e.g. polyphagia, polyuria, and weight gain), limit the use of non-steroidal anti-inflammatory drugs, and can induce drug transporter expression that could lead to drug resistance. Despite these negative effects, there are no data to support the use of glucocorticoids as part of a multidrug chemotherapy protocol for the treatment of canine lymphoma. A prospective, randomized clinical trial was conducted in 81 dogs with multicentric lymphoma and no history of recent glucocorticoid use. All dogs were staged and treated with the same chemotherapy protocol (L-asparaginase, cyclophosphamide, doxorubicin, vincristine, and prednisolone) with half of the dogs receiving prednisolone. Both treatment groups were similar with respect to demographics, immunophenotype, and clinical stage, except for a higher number of substage b patients in the prednisolone group (5 vs. 14; P = 0.015). Treatment results obtained with the initial treatment (complete response rate 75%, disease-free period 176 days) and rescue treatment (complete response rate 45%, disease-free period 133 days), overall survival (283 days) and adverse events (number and grade) were similar for both groups. In conclusion, prednisolone, as part of a multidrug chemotherapy protocol, has no additional effect on
treatment results and can be omitted from first-line multidrug protocols used for the treatment of canine lymphoma.

**Immunocompromised patients and their pets: Still best friends?** Daniel Elad. The emergence of immunosuppressive human diseases and therapies in the last decades has raised the question of the risks and benefits for this group of patients deriving from their interaction with pets and the necessity to balance them in the best interest of the pet owner. Risks are related to the possibility of contracting zoonotic infections that are more severe and occasionally lethal in immunocompromised patients. To mitigate the risks and allow the owner to keep the pet, guidelines have been devised. The cooperation and communication between the owner, the physician and the veterinarian are fundamental for a rational approach in evaluating the potential health risks associated with pets as sources of zoonotic diseases. The final decision should, however, be made by the owner, who alone will enjoy the benefits of the relationship but also be the one to bear the consequences.

**The effect of dioestrus on the racing performance of Greyhounds.** Richard M. Payne. The degree of performance change during the dioestrus of racing Greyhounds has long been the subject of debate. Assessments have previously been on a qualitative basis. The analyses in this paper are unique and produce a quantitative assessment of the change in performance during dioestrus. By accessing a large dataset, race form and oestrous data were analysed using a longitudinal observational study design. The performance changes in dioestrus were modelled with a series of multilevel linear regressions revealing a pattern such that the performance loss varied from 0.031 to 0.733 s (90% confidence interval) between 41 and 56 days since oestrus over 450 m, returning to the baseline (anoestral) performance level after about 80–100 days. The changes in performance formed a temporal match with the changes in serum progesterone concentration noted by other workers. Whilst serum hormone concentrations were not measured, it is suggested that the performance changes are linked with the changes in serum progesterone concentrations rather than prolactin. It is therefore proposed that a minimum time off of 70 days could be set, which would capture the majority of females with a genuine change in performance, and with a caution regarding the use of entire female Greyhounds for performance studies.

**Characterization of thrombelastography over time in dogs with hyperadrenocorticism.** A. Kol, R.W. Nelson, R.C. Gosselin, D.L. Borjesson. Canine hyperadrenocorticism (HAC) is a common endocrinopathy often associated with hypercoagulability, thrombosis and thromboembolism and it can contribute to increased morbidity and mortality. The condition results in increased, unregulated secretion of glucocorticoids (GCs). While prospective identification of hypercoagulability is challenging, thrombelastography (TEG) is a diagnostic tool that enables the detection of hypercoagulability in a clinical setting. The objective of this prospective cohort study was to serially assess coagulation in dogs with HAC using TEG to test the hypothesis that dogs with HAC have increased TEG maximal amplitude (MA) and that the MA would normalize once clinical control was achieved. Twenty-three dogs with naturally occurring HAC were enrolled and hemostatic (including TEG, platelet function, thrombin–antithrombin complexes and coagulation panel) and hematological variables were measured at presentation. TEG was serially monitored until clinical resolution of HAC was attained. At presentation, most dogs with HAC had increased MA values, increased thrombin–antithrombin complexes and many were hyperfibrinogenemic. Platelet function analyzer-100 (PFA-100) closure times were significantly prolonged. TEG tracings did not normalize in either medically- or surgically-managed dogs, but fibrinogen concentrations decreased. It seems that dogs with HAC have a complex coagulopathy in which hypercoagulability and platelet hyporeactivity or dysfunction might occur simultaneously. As TEG tracings did not normalize in well-controlled dogs, it is unlikely that increased blood GCs are solely responsible for TEG alterations seen in dogs with HAC.

**Differential expression of circulating microRNAs in diabetic and healthy lean cats.** Stefanie N. Fleischhacker, Stefan Bauersachs, Astrid Wehner, Katrin Hartmann, Karin WeberMicroRNAs (miRNAs) regulate gene expression and play a role in the pathogenesis of human type 2 diabetes mellitus. This study investigated whether miRNA expression profiles differ between healthy and diabetic cats. Total RNA was extracted from sera of healthy lean cats, newly diagnosed diabetic cats and cats in diabetic remission. Microarrays representing 1079 mouse miRNA targets were used to measure miRNA expression in serum
samples from eight healthy lean and seven newly diagnosed diabetic cats; 227 distinct miRNAs could be detected. Nineteen miRNAs were differentially expressed in newly diagnosed diabetic cats compared to healthy lean cats, with a false discovery rate of 10%. Hierarchical cluster analysis of these 19 miRNAs grouped healthy lean and newly diagnosed diabetic cats into separate clusters. After correction for multiple testing, only miR-122 and miR-193b reached statistical significance (P < 0.05), with a false discovery rate of 1%. Specific quantitative real-time PCR assays for three target miRNAs (miR-122, miR-193b and miR-483*) were applied to four samples from each of the three groups. miR-122 expression was >40-fold higher in newly diagnosed diabetic cats compared to healthy lean cats and cats in diabetic remission, whereas miR-193b showed >14-fold higher expression. MiR-483* was expressed sixfold higher in newly diagnosed diabetic cats compared to both other groups.

Is the prevalence of Clostridium difficile in animals underestimated? José L. Blanco, Sergio Álvarez-Pérez, Marta E. García. Reported prevalence rates of Clostridium difficile infection in animals differ considerably depending on the nature of the study and the population surveyed. The methods used to recover this organism from faecal samples may account for some of the prevalence variation. The objective of this study was to assess the performance of two different methods of detecting C. difficile in animal faeces in comparison with a conventional isolation procedure (‘ethanol shock’ of faecal samples followed by culture on a single plate of solid selective medium). Samples were obtained from two populations of pigs where the expected prevalence rate of C. difficile infection was anticipated to differ, namely, ‘high prevalence’ (<7-day old piglets) and ‘low prevalence’ (2–3-month old pigs). The first alternative detection method required culturing faecal samples on 10 (instead of one) plate of solid selective medium after ethanol shock, while the second method included an intermediate enrichment step in selective broth prior to ethanol shock and subsequent plating. Both alternative methods considerably increased bacterial recovery in tested samples from both surveyed populations and highlighted the existence of a considerable proportion (≥22%) of false negatives. The results confirm previous suggestions that the procedure used to isolate C. difficile can have a significant impact on prevalence data for this pathogen.

Effect of two sedative protocols and hepatosplenic disease on Doppler indices of splenic arteries in dogs: A preliminary study Inma Ferrandis, Samuel Jakovljevic, Francesco Aprea, Federico Corletto. Doppler flow indices (DFIs), such as the resistive index (RI) and the pulsatility index (PI), are commonly used to characterize blood flow. Parenchymal infiltration of an organ and administration of sedative and anaesthetic drugs can affect DFIs by altering resistance to blood flow. In this prospective study, the effect on DFIs of two sedative protocols (acepromazine or dexmedetomidine, each combined with butorphanol) and the presence or absence of hepatic and/or splenic disease, was investigated in the splenic arteries of 75 dogs. The RI and PI in splenic arteries of dogs sedated with dexmedetomidine and butorphanol were lower than those of dogs sedated with acepromazine and butorphanol. PI in splenic arteries was higher in animals with hepatosplenic disease than in healthy animals. Receiver Operating Characteristic (ROC) curves suggested that PI measured in canine splenic arteries could be useful in predicting the presence of hepatosplenic disease in the absence of other abdominal disease.

The early development of medial coronoid disease in growing Labrador retrievers: Radiographic, computed tomographic, necropsy and micro-computed tomographic findings S.F. Lau, C.F. Wolschrijn, H.A.W. Hazewinkel, M. Siebelt, G. Voorhout. Medial coronoid disease (MCD) encompasses lesions of the entire medial coronoid process (MCP), both of the articular cartilage and the subchondral bone. To detect the earliest signs of MCD, radiography and computed tomography were used to monitor the development of MCD in 14 Labrador retrievers, from 6 to 7 weeks of age until euthanasia. The definitive diagnosis of MCD was based on necropsy and micro-computed tomography findings. The frequency of MCD in the dogs studied was 50%. Radiographic findings did not provide evidence of MCD, ulnar subtrochlear sclerosis or blunting of the cranial edge of the MCP. Computed tomography was more sensitive (30.8%) than radiography (0%) in detecting early MCD, with the earliest signs detectable at 14 weeks of age. A combination of the necropsy and micro-computed tomography findings of the MCP showed that MCD was manifested as a lesion of only the subchondral bone in dogs <18 weeks of age. In all dogs (affected and unaffected), there was close contact between the base of the MCP and the proximal radial head in the congruent joints. Computed tomography and micro-computed tomography findings indicated that the lesions of MCD probably originated at the base of the MCP.
Molecular cloning and tumour suppressor function analysis of canine REIC/Dkk-3 in mammary gland tumours
Kazuhiyo Ochiai, Masami Watanabe, Daigo Azakami, Masaki Michishita, Yasunaga Yoshikawa, Chihiro Udagawa, Pormphon Metheneukul, Thippayarat Chahomchueng, Hiroshi Aoki, Hiromi Kumon, Masami Morimatsu, Toshinori Omi. REIC/Dkk-3, a member of the human Dickkopf (Dkk) family, plays a role as a suppressor of growth in several human cancers. In this study, the tumour suppression function of canine REIC/Dkk-3 was investigated. The full-length open reading frame of the canine REIC/Dkk-3 homologue was cloned and the tissue distribution of REIC/Dkk-3 mRNA was determined, along with the subcellular localisation of the REIC/Dkk-3 protein in canine cancer cell lines. Expression of REIC/Dkk-3 was lower in mammary gland tumours and in canine mammary carcinoma cell lines than in normal mammary gland tissue. Overexpression of REIC/Dkk-3 induced apoptosis in canine mammary carcinoma cell lines. These results show that expression of REIC/Dkk-3 is downregulated in canine mammary tumours and that one of the functions of this gene is induction of apoptosis.

Assessment of bone marrow infiltration diagnosed by flow cytometry in canine large B cell lymphoma: Prognostic significance and proposal of a cut-off value. Laura Marconato, Valeria Martini, Luca Aresu, Michele Sampaolo, Fabio Valentini, Valentina Rinaldi, Stefano Comazzi. The aims of this study were to assess the prognostic significance of bone marrow (BM) infiltration in canine large B cell lymphoma (LBCL) and to establish cut-off values for designating the BM as infiltrated by lymphoid blasts. The degree of BM infiltration by large CD21 positive cells in dogs with LBCL was assessed by flow cytometry (FC) and related to time to progression (TTP) and lymphoma-specific survival (LSS). Forty-six dogs were prospectively enrolled, staged and treated with a dose-intense chemotherapeutic protocol. BM infiltration was directly correlated with peripheral blood infiltration (P = 0.001), high lactate dehydrogenase activity (P = 0.0024) and substage b disease (P < 0.001). In the univariate analysis, there was a significant association between BM infiltration diagnosed by FC and both TTP (P = 0.001) and LSS (P < 0.001). Substage was the only factor associated with TTP in the multivariate analysis (P = 0.002), whereas substage (P < 0.001) and anaemia (P = 0.008) were associated with LSS. A cut-off of 3% BM infiltration had the strongest prognostic value, since it discriminated between dogs with a poorer prognosis (median TTP 69 days; median LSS 155 days) and dogs with a better prognosis (median TTP 149 days; median LSS 322 days). BM analysis is an essential step in the staging of LBCL. The presence of BM infiltration by FC at diagnosis is a negative prognostic indicator in canine LBCL.

COX-2 expression in canine anal sac adenocarcinomas and in non-neoplastic canine anal sacs. C.S. Knudsen, A. Williams, M.J. Brearley, J.L. Demetriou. Anal sac adenocarcinoma (ASAC) is a clinically significant canine neoplasm characterized by early lymphatic invasion. Up-regulation of cyclooxygenase isoform 2 (COX-2) has been confirmed in several animal and human neoplastic tissues. The aim of the current study was primarily to evaluate COX-2 expression in canine ASAC and compare it to COX-2 expression in non-neoplastic canine anal sac tissue using immunohistochemistry with scoring for percentage positivity and intensity. Twenty-five ASAC samples and 22 normal anal sacs were available for evaluation. All canine ASAC samples and the normal anal sac tissues stained positively for COX-2. However, while normal anal sac tissue showed strong staining of the ductal epithelial cells, ASAC samples showed staining of the neoplastic glandular epithelial cells, with varying percentage positivity and intensity between ASAC samples. COX-2 immunoreactivity of ASAC samples was of low intensity in 52% and high in 12% of the cases; the remaining samples were of intermediate intensity. Seventy-six per cent of the ASAC had over 50% of the neoplastic glandular cells staining positive. These results confirm that COX-2 is expressed in the neoplastic glandular epithelial cells in canine ASAC and suggest a potential role for COX-2 inhibitors in the management of ASAC. Furthermore, the results indicate that COX-2 is expressed in ductal epithelial cells of the normal anal sac.

Comparison of intrarectal ozone, ozone administered in acupoints and meloxicam for postoperative analgesia in bitches undergoing ovariohysterectomy. L.R. Teixeira, S.P.L. Luna, M.O. Taffarel, A.F.M. Lima, N.R. Sousa, J.G.F. Joaquim, P.M.C. Freitas. Since all analgesics currently available for use in dogs have been associated with some adverse effects, the search for an effective analgesic that does not cause harm is important. This study investigated the postoperative analgesic effects of ozone administered either intrarectally or into acupoints in bitches undergoing ovariohysterectomy (OH). Twenty-four healthy adult bitches were randomly assigned to one of the three treatments 10 min after sedation, as follows: 0.2 mg/kg of intramuscular (IM)
meloxicam (M); rectal insufflation of 10 mL of 30 µg/mL ozone (OI), or acupoint injection of 0.5 mL ozone (30 µg/mL; OA). Following sedation with dexmedetomidine, anaesthesia was induced with propofol and fentanyl and maintained with isoflurane/O2. Pain was assessed using the modified Glasgow pain scale (MGPS) and the visual analogue scale (VAS) on the day before surgery, before anaesthesia, and at 1, 2, 4, 6, 8, 12 and 24 h after surgery. Rescue analgesia was performed using 0.5 mg/kg of morphine IM if MGPS was >3.33 points. No statistically significant differences in pain scales were found among the three analgesic protocols or the time points in each group (P > 0.05). Two dogs treated with OA required rescue analgesia. Meloxicam, rectal insufflation of ozone and ozone injected into acupoints provided satisfactory analgesia for 24 h in bitches undergoing elective OH. Ozone had no measurable adverse effects and is an alternative option to promote pain relief.

**Effects of fluid load on cardiovascular function during stepwise lung recruitment manoeuvre in healthy dogs**

S. Canfrán, I.A. Gómez de Segura, R. Cediel, J. García-Fernández

The objective of this prospective observational study was to assess the effects of a stepwise lung recruitment manoeuvre (RM) on cardiac output (CO) in mechanically ventilated dogs, with or without a previous fluid load. Eight healthy adult Beagle dogs were enrolled in a prospective crossover study. Following sedation with dexmedetomidine and methadone, anaesthesia was induced with propofol and maintained with isoflurane. CO (thermodilution method) and direct arterial blood pressure were monitored. The dogs were mechanically ventilated in a volume-controlled mode (tidal volume, VT = 10 mL/kg; positive end-expiratory pressure [PEEP] = 0 cm H2O) until normocapnia was achieved (end tidal CO2 35–45 mmHg). The RM was then performed in a pressure-controlled mode, with progressive increases of the PEEP and end-inspiratory pressure of 5 cm H2O, until 15 cm H2O and 30 cm H2O were reached, respectively. After the RM, the ventilatory mode was returned to volume-control, and the PEEP was sequentially decreased to 10, 5 and 0 cm H2O. Baseline ventilation was maintained for 30 min. Next, 10 mL/kg of lactated Ringer’s solution was administered within 10 min, prior to a second RM. The CO was determined before each RM (baseline) and at each pressure step. A repeated measures ANOVA test was used to compare data. Compared to baseline, CO decreased during the RM in both groups. However, there was a significantly higher CO during the second RM at the highest pressure step (P < 0.05) and during all decreasing pressure steps (P < 0.05). In conclusion, a previous crystalloid fluid load could impact the effect of a RM on CO in healthy dogs.


A.M. Petit, V. Gouni, R. Tissier, E. Trehiou-Sechi, C. Misbach, J.-L. Pouchelon, H.P. Lefebvre, V. Chetboul

The objective of this prospective observational study was to assess systolic arterial blood pressure (SABP) in small-breed dogs with degenerative mitral valve disease (MVD) from different International Small Animal Cardiac Health Council (ISACHC) heart failure classes. For this purpose, 103 client-owned dogs weighing <20 kg (mean ± standard deviation, 8.5 ± 3.0 kg; aged 9.8 ± 2.9 years) and presenting with MVD diagnosed by echo-Doppler examination were enrolled. Nineteen healthy dogs (9.9 ± 2.3 years; 8.7 ± 4.2 kg) were concurrently recruited as controls. SABP was measured in unsedated dogs using the Doppler method according to the recommendations in the American College of Veterinary Medicine consensus statement. SABP was significantly increased in dogs in ISACHC class 1 (n = 53; median, interquartile range 140 mmHg, 130–150 mmHg) and class 2 (n = 21; 140 mmHg, 130–150 mmHg), compared to the control group (n = 19; 130 mmHg, 120–140 mmHg; P < 0.01 and P < 0.05, respectively), but remained within the reference interval (<160 mmHg). Conversely, dogs in ISACHC class 3 showed a significantly lower SABP (n = 29, 120 mmHg, 110–130 mmHg) than those from all other ISACHC classes (P < 0.001) and the controls (P < 0.05). Additionally, SABP < 120 mmHg was recorded in 13/103 dogs (13%). The 13 dogs were all ISACHC class 3 (3a or 3b) and were under medical treatment for heart failure. In conclusion, MVD was often associated with SABP values that were within the reference interval, but at its upper end. However, a significant decrease in SABP was observed in dogs with ISACHC heart failure class 3. Whether such low SABP values resulted from an MVD-related decrease in cardiac output, an afterload reduction owing to cardiac treatment, or both, remains to be determined.

**A protocol for the management of canine cerebrospinal fluid for the proteomic assessment of putative biomarkers**

Intan N.F. Shafie, Thomas J. Anderson, Jacques Penderis, Peter D. Eckersall, Mark McLaughlin

Cerebrospinal fluid (CSF) is a potential source for disease-specific biomarkers that may assist in the
staging and determining the prognosis of neurodegenerative conditions in animals. However, the validity of such putative biomarkers may be influenced by pre-analytical variables, including the procedures adopted to collect and store the CSF. This study assessed the effect of three handling practices on the stability of a panel of CSF proteins: clusterin (also known as apolipoprotein J), haptoglobin, cystatin C, and transthyretin (TTR). The three handling procedures for canine CSF were mimicked in the laboratory as follows: (1) storage in a refrigerator overnight (4 °C for 18 h); (2) carrying a sample in the pocket of a clinician (37 °C for 4 h); and (3) mailing a sample to a remote laboratory for analysis (room temp for 48 h). The impact of these three scenarios on the concentrations of the selected proteins was assessed using Western blotting and compared to an aliquot of CSF that had been kept frozen. The level of clusterin was significantly reduced following 48 h at room temperature (P < 0.05), while the concentration of the dimeric form of TTR increased following this handling procedure and also when held at 37 °C for 4 h. A reducing agent prevented this increase at 37 °C. In conclusion, exposing CSF samples to various environmental conditions can significantly alter their protein content, a factor that must be considered in studies assessing potential biomarkers in canine CSF.

High levels of inactive thymidine kinase 1 polypeptide detected in sera from dogs with solid tumours by immunoaffinity methods: Implications for in vitro diagnostics

J. Kiran Kumar, H. Sharif, S. Westberg, H. von Euler, S. Eriksson

Determination of serum thymidine kinase 1 (STK1) activity has been used as a proliferation marker for neoplastic diseases in both human and veterinary medicine. The purpose of this study was to determine STK1 activity and enzyme levels in different dog tumours. Serum samples from three dogs with leukaemia, five with lymphoma, 21 with solid tumours and 18 healthy dogs were analyzed for STK1 activity, using an optimized [3H]-deoxythymidine (dThd) phosphorylation assay, and for STK1 protein levels using an immunoaffinity/western blot assay. STK1 activity in dogs with haematological tumours was significantly higher than in the solid tumour and healthy dog groups (mean ± standard deviation [SD] = 65 ± 79, 1.1 ± 0.5, and 1.0 ± 0.4 pmol/min/mL, respectively). Serum samples were analyzed after immunoaffinity isolation by western blot and the TK1 26 kDa band intensities quantified revealing that concentrations were significantly higher in dogs with haematological tumours and solid tumours compared to healthy dogs (mean ± SD = 33 ± 12, 30 ± 13, and 10 ± 5 ng/mL, respectively). Pre-incubation with the reducing agent dithioerythritol (DTE) showed a decrease in STK1 activity and protein levels in most samples, but an increase of about 20% in sera from healthy dogs and from those with haematological malignancies. Compared to animals with solid tumours, the specific STK1 activity (nmol [3H]-deoxythymidine monophosphate (dTMP)/min/mg of TK1 protein of 26 kDa) was 30-fold higher in haematological malignancies and 2.5-fold higher in healthy dogs, respectively. The results demonstrate that there is a large fraction of inactive TK1 protein, particularly in sera from dogs with solid tumours. The findings are important in the use of STK1 as a biomarker.

New Zealand Veterinary Journal (no relevant articles)

Compendium (No journal published)