Small Animal Article Summaries – FELINE MEDICINE & SURGERY

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The International Society of Feline Medicine (ISFM) was established in 1996 as the veterinary focus for the work of the charity and, together with the American Society of Feline Practitioners, it publishes the Journal of Feline Medicine and Surgery.
Computed tomographic findings in 57 cats with primary pulmonary neoplasia.


Primary pulmonary neoplasia is relatively uncommon in cats and generally has a poor prognosis. In this multicenter, retrospective study of 57 cats with pulmonary neoplasia, the most frequent presenting signs were anorexia/inappetence (39%) and cough (37%). The pulmonary tumors were considered to be incidental findings in 9% cats. In computed tomographic (CT) images, primary pulmonary tumors appeared as a pulmonary mass in 55 (96%) cats and as a disseminated pulmonary lesion without a defined mass in two (4%) cats. Most pulmonary tumors were in the caudal lobes, with 28 (49%) in the right caudal lobe and 17 (30%) in the left caudal lobe. CT features associated with pulmonary tumors included mass in contact with visceral pleura (96%), irregular margins (83%), well-defined borders (79%), bronchial compression (74%), gas-containing cavities (63%), foci of mineral attenuation (56%), and bronchial invasion (19%). The mean (range) maximal dimension of the pulmonary masses was 3.5 cm (1.1-11.5 cm). Additional foci of pulmonary disease compatible with metastasis were observed in 53% cats. Pleural fluid was evident in 30% cats and pulmonary thrombosis in 12% cats. The histologic diagnoses were 47 (82%) adenocarcinomas, six (11%) tumors of bronchial origin, three (5%) adenosquamous cell carcinomas, and one (2%) squamous cell carcinoma. In this series, adenocarcinoma was the predominant tumor type, but shared many features with less common tumor types. No associations were identified between tumor type and CT features. Prevalence of suspected intrapulmonary metastasis was higher than in previous radiographic studies of cats with lung tumors.

Length of tick repellency depends on formulation of the repellent compound (icaridin = Saltidin®): tests on Ixodes persulcatus and Ixodes ricinus placed on hands and clothes.


The present study had the aim to test the repellent potential of the compound icaridin = Saltidin® against the tick species Ixodes ricinus and Ixodes persulcatus using different formulations of the compound. Tests were done on backs of impregnated human hands, on impregnated linen cloth and versus impregnated dog hair. It was found that I. Ixodes persulcatus-the common Eastern European, Russian Ixodes species is significantly sensitive to icaridin = Saltidin® as I. ricinus protecting for the test period of 5 h. This is an important finding, since I. persulcatus is the vector of agents of the severe Eastern meningoencephalitis; 2. that this repellent compound acts similarly on both I. ricinus and I. persulcatus, when sprayed either on naked skin or on cloths; 3. that there are only slight differences in duration of the repellency when using different formulations containing icaridin = Saltidin®; 4. that icaridin = Saltidin® sprayed on dog hair has identical repellent effects like those seen on human skin and cloths; thus, this compound can also be used to protect animals such as dogs, cats, horses; and 5. that the icaridin = Saltidin® did not induce a bad sensation on skin, nor bad smells; furthermore, it was not sticky and did not leave residuals neither on clothes nor on dog’s hair.

A Novel and Likely Inherited Lymphoproliferative Disease in British Shorthair Kittens.


An unusual lymphoproliferative disease was identified in multiple closely related British Shorthair (BSH) kittens, suggesting an inherited predisposition to disease. Affected kittens typically developed
rapidly progressive and marked generalized lymphadenopathy, moderate splenomegaly, and regenerative and likely hemolytic anemia from 6 weeks of age. Microscopic findings were suggestive of multicentric T-cell lymphoma, but additional testing revealed a polyclonal population of CD3+/CD4-/CD8- “double negative” T cells (DNT cells). This is a novel disease presentation with similarities to the human disorder autoimmune lymphoproliferative syndrome (ALPS), a rare inherited disease causing lymphoproliferation and variable manifestations of autoimmunity. The human disease is most commonly due to the presence of Fas gene mutations causing defective lymphocyte apoptosis, and further investigations of both the mode of inheritance and genetic basis for disease in affected cats are currently in progress.

Metaphyseal osteopathy in a British Shorthair cat.

Metaphyseal osteopathy, otherwise known as hypertrophic osteodystrophy, is a disease that causes pyrexia and lethargy accompanied by pain in the thoracic and pelvic limbs of rapidly growing large-breed dogs. While metaphyseal osteopathy has been described in association with slipped capital femoral epiphysis in cats, it has not previously been reported as a cause of limb pain and pyrexia in this species. A 7-month-old British Shorthair cat presented with a 1 month history of pyrexia, lethargy and pain in all limbs. Investigation included radiographs of the limbs and chest, abdominal ultrasound, serum biochemical analysis, haematology, bone biopsy, joint fluid aspiration and cytology. Findings were consistent with a diagnosis of metaphyseal osteopathy. The cat’s clinical signs resolved following the administration of prednisolone. Symptoms recurred 1 month after the cessation of prednisolone therapy, but resolved when administration was resumed.

Evaluation of thyroid-stimulating hormone, total thyroxine, and free thyroxine concentrations in hyperthyroid cats receiving methimazole treatment.

BACKGROUND: Iatrogenic hypothyroidism (IH) after treatment of hyperthyroidism can impair renal function. No study compared the efficacy of measurement of serum free thyroxine by equilibrium dialysis (fT4ed) or thyroid-stimulating hormone (TSH) concentrations for monitoring cats receiving methimazole. OBJECTIVES: To (1) compare the ability of total T4 and fT4ed concentrations in conjunction with TSH to define thyroid function in hyperthyroid cats receiving methimazole, (2) determine the prevalence of IH in cats receiving methimazole, and (3) examine the relationship between thyroid axis hormones and serum creatinine concentration. ANIMALS: One hundred and twenty-five serum samples from hyperthyroid cats receiving methimazole and total T4 concentrations ≤3.9 µg/dL. METHODS: Total T4, fT4ed, and TSH concentrations were measured to evaluate thyroid status and serum creatinine concentration was measured to assess renal function. A low total T4 or fT4ed concentration in combination with an increased TSH concentration defined IH. RESULTS: Forty-one cats (33%) had increased TSH concentrations. Of cats with total T4 and fT4ed concentrations below the reference range, 68% and 73%, respectively, had TSH concentrations above the reference range. Only 18% of cats with a normal TSH concentration had an increased serum creatinine concentrations as compared to 39% of those with increased TSH concentrations (P < .001). CONCLUSIONS: Free T4ed does not identify more cats with potential IH as compared to total T4. The
IH prevalence was approximately 20%. Measurement of TSH may be more helpful in indicating that azotemia, if present, is at least in part related to IH. Investigation is needed to define TSH assay utility in identifying possible subclinical IH.

**Stress in owned cats: behavioural changes and welfare implications.**


Domestic cats are exposed to a variety of stressful stimuli, which may have a negative effect on the cats’ welfare and trigger a number of behavioural changes. Some of the stressors most commonly encountered by cats include changes in environment, inter-cat conflict, a poor human-cat relationship and the cat’s inability to perform highly motivated behaviour patterns. Stress is very likely to reduce feed intake, and stress-related anorexia may contribute to the development of potentially serious medical conditions. Stress also increases the risk of cats showing urine marking and some forms of aggression, including redirected aggression. A number of compulsive disorders such as over-grooming may also develop as a consequence of stressful environments. Some of the main strategies to prevent or reduce stress-related behavioural problems in cats are environmental enrichment, appropriate management techniques to introduce unfamiliar cats to each other and the use of the synthetic analogue of the feline facial pheromone. As the stress response in cats depends, to a large extent, on the temperament of the animal, breeding and husbandry strategies that contribute to the cat developing a well-balanced temperament are also very useful.

**Comparison of two techniques for ultrasound-guided axillary brachial plexus blockade in cats.**


Axillary blockade of the brachial plexus (BP) is advocated in humans and dogs for surgical procedures carried out on the foot, carpus and elbow as it provides complete analgesia distally from above the elbow joint. The aim of this study was to develop an ultrasound (US)-guided approach to block the BP in cats. Two groups of 12 feline cadavers each were used to compare two different techniques to block the BP at the axillary level. The reliability of the techniques was assessed by anatomical and computed tomography (CT) studies. Cadavers of the first group were positioned in dorsal recumbency with the forelimb to be blocked adducted (thoracic limbs flexed and orientated caudally) (FAD technique). The second group was positioned in dorsal recumbency with the forelimb abducted 90° (FAB technique). The accuracy of the techniques was determined by US after injecting 1 ml blue ink along the BP nerves, and by CT after injecting 1 ml of an iodinated contrast medium. The anatomical and CT studies confirmed the accuracy of the US location of the BP nerves. Staining of the axillaris, musculocutaneous, radialis, medianus and ulnaris nerves was observed in 100% of cats using the FAB technique and in 66% of the cats using the FAD technique. Rate of complications was higher in the FAD technique. In conclusion, a US-guided axillary approach to the BP by the use of a FAB technique is a safe and feasible procedure to block the BP in the cat. Further studies are needed to ascertain whether the technique can be applied in a clinical setting.

**Peripheral pulmonary artery stenosis in three cats.**

Case 1 involved a 4-month-old intact male Somali cat in which peripheral pulmonary artery stenosis (PPS) was recognized after a cardiac murmur remained following patent ductus arteriosus ligation. Case 2, which involved a 1-year-old neutered male Norwegian Forest cat, and Case 3, which involved a 6-month-old intact female American Curl cat, were referred, because of cardiac murmurs. Grades III to IV/VI systolic heart murmurs were auscultated at the left heart base in all 3 cats. All cases showed bilateral pulmonary artery stenosis, although there were no associated clinical signs. In Cases 1 and 2, the pressure gradient through the stenosis decreased after treatment with atenolol.

The objective of this study was to characterize clinical, radiologic, and histologic patterns of alveolar bone expansion and osteomyelitis in cats. Based on case materials submitted as surgical biopsy specimens, alveolar bone pathology was diagnosed in 28 cats. These cats had a total of 37 oral lesions with clinical and radiologic changes that involved bone and/or teeth, including periodontitis, bone expansion, tooth resorption, and/or chronic osteomyelitis; 32 lesions were evaluated by histopathology. Canine teeth were affected in 19 cats (27 affected teeth), with bilateral lesions in 5 (26.3%) cats. The caudal premolar and/or molar regions were affected in 10 cats (10 affected sites). All biopsy sites evaluated by a review of clinical images and/or radiographs had evidence of periodontitis. Clinical photographs showed expansion of alveolar bone in 13 of 16 (81%) biopsy sites evaluated. Radiologically, rarifying osseous proliferation of alveolar bone was seen at 26 of 27 (96%) biopsy sites, and tooth resorption occurred at 15 of 18 (83%) sites. Histologically, the tissue samples from canine sites had compressed trabeculae of mature remodeled bone, loose fibrous stroma with paucicellular inflammation, and mild proliferation of woven bone. Tissue samples from the premolar/molar biopsy sites were often highly cellular with mixed lymphoplasmacytic and chronic suppurative inflammation, ulceration with granulation tissue, and robust proliferation of woven bone. Alveolar bone expansion and osteomyelitis in cats occurs in conjunction with periodontal inflammation and frequently with tooth resorption.

Magnetic Resonance Imaging Features and Outcome for Solitary Central Nervous System Coccidioides Granulomas in 11 Dogs and Cats.
Little published information is available to guide therapy for canine and feline patients with Coccidioides infections involving the central nervous system (CNS). The purpose of this cross-sectional retrospective study was to describe magnetic resonance imaging (MRI) features and outcome for a group of dogs and cats with solitary CNS Coccidioides granulomas. Nine canine and two feline cases met inclusion criteria; four diagnosed and treated with surgery and fluconazole and seven diagnosed by serology or cytology and treated medically. Three cases had left Coccidioides endemic areas long before developing neurological disease. The MRI lesions shared many features with neoplastic masses. The extra-axial granulomas often had a lack of a distinct border between the mass and neural parenchyma. Four cases were extra-axial and seven were intra-axial, but distinguishing between extra-axial and intra-axial locations was sometimes challenging. The surgical cases had good
outcomes and histology allowed definitive diagnosis. Medically managed patients also had generally good outcomes, with resolution of clinical signs in most cases. Findings indicated that distinction between neoplasia and focal Coccidioides granulomas based on MRI features is likely to be imprecise. Demonstration of the organism by cytology or histology is required for definitive diagnosis. The role of surgery for improving the outcome of brain or spinal coccidiomycosis granulomas warrants further study.

**Analgesia in the Perioperative Period.**


Untreated or undermanaged perioperative pain has systemic effects that may negatively impact a patient’s welfare and return to function. A consistent analgesic plan that assesses a patient’s pain and comfort at regular intervals during the perioperative period should be incorporated into practice. Validated pain assessment tools are available for use in dogs and cats. Multimodal analgesic plans should be created for individual patients and modified according to pain assessments. These plans, based on a thorough history, physical examination, and knowledge of the expected pain, should be combinations of an opioid, a nonsteroidal anti-inflammatory drug, a local anesthetic, and nonpharmacologic analgesic techniques.

**Changes in Systolic Blood Pressure over Time in Healthy Cats and Cats with Chronic Kidney Disease.**


BACKGROUND: Hypertension is a common problem in older cats, most often associated with chronic kidney disease (CKD). Cross-sectional studies have suggested that blood pressure in cats increases with age. HYPOTHESIS/OBJECTIVES: To determine whether blood pressure in cats increases with age and whether this occurs independently of the presence of CKD. To investigate risk factors for developing hypertension. ANIMALS/SUBJECTS: Two hundred and sixty-five cats with CKD and 133 healthy cats ≥9 years were retrospectively identified. METHODS: Four groups were created according to status at initial evaluation (CKD or healthy) and blood pressure at the last included visit (normotensive [NT] or developed hypertension [DH]): Healthy-NT, Healthy-DH, CKD-NT and CKD-DH. Systolic blood pressure (SBP) over time slopes were compared with 0 and between groups. Risk factors for the development of hypertension were investigated, and associations of biochemical and clinical variables with SBP were examined. RESULTS: Cats that were hypertensive at CKD diagnosis (n = 105) were not included in further analyses. Twenty-seven cats with CKD and 9 healthy cats developed hypertension ≥3 months after diagnosis of CKD or their first visit. Systolic blood pressure significantly increased with age in all cats (P < .001). Healthy cats were at less risk than cats with CKD to become hypertensive (hazard ratio 0.2, P < .001), with creatinine being an independent risk factor for the development of hypertension. CONCLUSIONS AND CLINICAL IMPORTANCE: The high prevalence of hypertension in azotemic cats in this study shows the importance of monitoring of SBP in elderly cats, and in particular in cats with CKD.

**Feline non-regenerative immune-mediated anaemia: features and outcome in 15 cases.**

OBJECTIVES: Pure red cell aplasia (PRCA) and non-regenerative immune-mediated haemolytic anaemia (NRIMHA) are uncommon causes of non-regenerative anaemia affecting the bone marrow in the cat. This retrospective study aimed to describe the clinical features, treatment and outcome (remission and survival) of cats with these disorders. METHODS: Cases of PRCA and NRIMHA presenting between 2009 and 2013 were retrieved. Clinical features including signalment, history, clinical signs and diagnostic investigations were recorded, as well as treatment(s) used and outcome (remission and survival). Outcome was compared for PRCA and NRIMHA. RESULTS: Fifteen cats met inclusion criteria: seven with PRCA and eight with NRIMHA. The majority (12/15) were younger than 3 years of age. Volume overload was common (8/11). Treatment with whole blood transfusions with or without Oxyglobin were necessary in most cats (14/15) and resulted in congestive heart failure in one cat. Most cats (11/15) achieved remission 12–42 days after starting immunosuppressive treatment. Treatment protocols associated with remission were glucocorticoids alone (remission in 6/7 cats), glucocorticoids and chlorambucil (remission in 3/6 treated cats), glucocorticoids and ciclosporin (one cat only) and ciclosporin alone (one cat only). Relapse was observed in 3/11 cats, and 8/11 cats were still receiving treatment at the time of follow-up. Outcome (remission and survival) did not differ between PRCA and NRIMHA. CONCLUSIONS AND RELEVANCE: PRCA and NRIMHA are uncommon causes of anaemia in predominantly young cats. The prognosis is reasonable, with a mortality rate of 27%, and it can take at least 6 weeks before remission is observed. Following clinical remission, gradual withdrawal of immunosuppressive treatments should be attempted with close monitoring for relapse; some cats may require long-term treatment. This study is the first to report the use of chlorambucil as an adjunctive immunosuppressant in these cases. Outcome did not differ for PRCA and NRIMHA.

Circulating concentrations of a marker of type I collagen metabolism are associated with hypertrophic cardiomyopathy mutation status in ragdoll cats.


OBJECTIVES: Human carriers of hypertrophic cardiomyopathy associated sarcomeric mutations have abnormal collagen metabolism before overt left ventricular hypertrophy is detectable. This study investigated whether differences in collagen biomarkers were present in blood samples of ragdoll cats positive for the MYBPC3:R820W mutation compared with negative controls. MATERIALS AND METHODS: Cats were recruited for hypertrophic cardiomyopathy screening using echocardiography and genotyping. Circulating markers of collagen turnover (C-terminal telopeptide of type I collagen [CITP; type I collagen degradation] and N-terminal propeptide of type III procollagen [type III collagen synthesis]) and cardiac biomarkers (N-terminal B-type natriuretic peptide and cardiac troponin I) were measured. Correlation between concentrations of collagen biomarkers and echocardiographic variables was analysed, and collagen biomarker concentrations were compared between MYBPC3 mutation positive and negative cats, without left ventricular hypertrophy. RESULTS: Linear regression analyses showed that genotype was independently associated with CITP concentration. CITP was higher in mutation carriers (25.4 µg/L, interquartile range 16.0-29.2 µg/L) than non-carriers (14.6 µg/L, interquartile range 9.38-19.2 µg/L; P = 0.024). CLINICAL SIGNIFICANCE: Circulating CITP was higher in MYBPC3-positive ragdoll cats than negative controls and may indicate altered collagen metabolism. Further studies are necessary to determine whether alterations in circulating collagen biomarker concentration relate to an early stage of hypertrophic cardiomyopathy.
Practical use of opioids in cats: a state-of-the-art, evidence-based review.


RATIONALE: Recent recognition of the need to improve pain management in cats has led to the investigation of the pharmacokinetics and efficacy of opioid analgesic drugs in this species. The results of these studies may be difficult to interpret because the effect of these drugs varies with dose, route of administration and the method used to assess them. As equipotency of different opioids is not known, it is hard to compare their effects. Animals do not verbalise the pain they feel and, in cats, it may be more difficult to recognise signs of pain in comparison with other species such as dogs. AIM: This article reviews the use of opioid analgesics in cats. It must be remembered that not all drugs are licensed for use in cats, and that marketing authorisations vary between different countries.

Correlation of gross urine color with diagnostic findings in male cats with naturally occurring urethral obstruction.


Seventy-five male cats with urethral obstruction were prospectively enrolled to evaluate gross urine color at urinary catheter placement for correlation with diagnostic findings. Cats with darker red urine were more likely to be azotemic (serum creatinine concentration >2.0 mg/dl [177 µmol/l]), and urine color correlated well with serum creatinine and serum potassium concentrations. Darker urine color was negatively correlated with urine specific gravity. Urine color was not associated with the presence or absence of lower urinary tract stones on radiographs or ultrasound. Cats with darker red urine at the time of urinary catheter placement are likely to have more significant metabolic derangements and may require more aggressive supportive care.

Molecular detection of Bartonella clarridgeiae in domestic cats from Midwest Brazil.


A retrospective study of the use of active suction wound drains in dogs and cats.


OBJECTIVES: To report indications for use and complications associated with commonly used closed active suction wound drains in a large number of clinical cases. METHODS: Retrospective review of medical case records (from 2004 to 2010) for dogs and cats that had a closed active suction drain placed into a wound. Only the four most common drain types were included: Mini Redovac®, Redovac®, Jackson Pratt® and Wound Evac®. RESULTS: Two hundred and fifty-three drains were placed in 33 cats and 195 dogs. Mini Redovac drains were used most frequently in cats (76 · 5%) and Redovac drains in dogs (54 · 3%). The infection rate for clean surgeries in dogs was 15 · 6% (unattainable in cats). Major complications occurred in four dogs; minor complications occurred in 12 drains in cats (35 · 3%), and in 74 drains in dogs (33 · 8%). There was no statistically significant association between the type of drain and complication rate for either species. CLINICAL SIGNIFICANCE: Although closed active suction drains can be used with low risk of major complications, they lead to a high rate of infection in clean surgeries in dogs. It is recommended that
such drains are kept in place for the shortest time possible and that strict asepsis is adhered to both during placement and management.

Laparoscopic-assisted cryptorchidectomy in a cat.
Brückner M. (2015) Tierarztl Prax Ausg K Kleintiere Heimtiere 43:
A 21-month-old male castrated domestic short hair cat was presented due to suspected unilateral abdominal cryptorchidism. Unilateral abdominal cryptorchidism was confirmed with ultrasonography and laparoscopic-assisted cryptorchidectomy was performed. Laparoscopic-assisted cryptorchidectomy is a simple, fast and safe method for the treatment of abdominal cryptorchidism in dogs and cats, offering the benefits of minimal invasive surgery, which is still underreported in the veterinary literature.

Effects of ketamine and alfaxalone on application of a feline pain assessment scale.
OBJECTIVES: The objective of this study was to compare the effects of ketamine and alfaxalone on the application of a validated feline-specific multidimensional composite pain scale (UNESP-Botucatu MCPS). METHODS: In a prospective, randomized, blinded, crossover trial, 11 adult cats (weight 4.4 ± 0.6 kg) were given dexmedetomidine (15 µg/kg) and hydromorphone (0.05 mg/kg) with either alfaxalone (2 mg/kg) or ketamine (5 mg/kg) as a single intramuscular injection for the induction of general anesthesia. After orotracheal intubation, general anesthesia (without surgery) was maintained for 32 mins with isoflurane, followed by atipamezole. The following parameters were recorded at baseline, 1-8 h and 24 h post-extubation: pain (pain expression and psychomotor subscales) and sedation scale scores. Alfaxalone treatment injection sites were examined for inflammation at baseline, postinjection, and 8 h and 24 h post-extubation. RESULTS: Psychomotor scores were higher with ketamine at hours 1 (3.5 [0-5.0], P <0.0001), 2 (2.5 [0-4.0], P <0.0001) and 3 (0.5 [0-4.0], P = 0.009) post-extubation compared with alfaxalone (hour 1, 0 [0-2]; hour 2, 0 [0-0]; hour 3, 0 [0-0]). Six cats in the ketamine group crossed the analgesic intervention threshold. In contrast, pain expression scores did not differ significantly between treatments at any time (P >0.05); one cat from each group crossed the analgesic intervention threshold. Sedation was greater with ketamine (1 [0-3], P = 0.02) than alfaxalone (0 [0-1]) 1 h post-extubation. No cats had visible inflammation at the injection sites at any time.
CONCLUSIONS AND RELEVANCE: Ketamine has a confounding effect on the psychomotor subscale of the pain scale studied, which may lead to erroneous administration of rescue analgesia. In contrast, alfaxalone was not associated with significant increases in either pain subscale. These effects of ketamine should be considered when evaluating acute postoperative pain in cats.

Owned dog and cat populations in remote Indigenous communities in the Northern Territory: a retrospective study.
OBJECTIVE: To determine the population of owned dogs and cats in Indigenous communities in the Northern Territory (NT), and compare the data with those for the average Australian household. METHODS: Results of 20 Indigenous community animal health programs were analysed for species
present and dog and cat numbers. The female breeding and puppy populations were also identified.

RESULTS: The average dog population density was significantly higher than the average Australian household, with an average of 24.4 dogs per 10 households, but the average cat population density was similar (3.3 cats per 10 households). Numbers of other species were not determined. The average percentage of puppies in these communities was 17.6% of the treated canine population, the average percentage of breeding canine females was 18.6% of the treated canine population, and the average percentage of breeding feline females was 19.7% of the total feline population. CONCLUSIONS: Dog populations in NT Indigenous communities were at least 6.3-fold higher per household compared with data for the rest of Australia. Cat populations per household were similar to the overall population. Factors contributing to the relatively high dog populations in remote Indigenous communities include a lack of veterinary presence, community remoteness, poor socioeconomic factors, poor house and yard designs, cultural reasons, communal beliefs, lack of community animal management and a lack of funding. We believe that animal health programs are an important way of addressing a number of these issues. Other elements that should be addressed include improving house and yard design, increasing education regarding animal health, care and welfare, and increasing the training and presence of health and animal professionals.

Rapid evolution of the env gene leader sequence in cats naturally infected with feline immunodeficiency virus.


Analysing the evolution of feline immunodeficiency virus (FIV) at the intra-host level is important in order to address whether the diversity and composition of viral quasispecies affect disease progression. We examined the intra-host diversity and the evolutionary rates of the entire env and structural fragments of the env sequences obtained from sequential blood samples in 43 naturally infected domestic cats that displayed different clinical outcomes. We observed in the majority of cats that FIV env showed very low levels of intra-host diversity. We estimated that env evolved at a rate of 1.16×10(-3) substitutions per site per year and demonstrated that recombinant sequences evolved faster than non-recombinant sequences. It was evident that the V3-V5 fragment of FIV env displayed higher evolutionary rates in healthy cats than in those with terminal illness. Our study provided the first evidence that the leader sequence of env, rather than the V3-V5 sequence, had the highest intra-host diversity and the highest evolutionary rate of all env fragments, consistent with this region being under a strong selective pressure for genetic variation. Overall, FIV env displayed relatively low intra-host diversity and evolved slowly in naturally infected cats. The maximum evolutionary rate was observed in the leader sequence of env. Although genetic stability is not necessarily a prerequisite for clinical stability, the higher genetic stability of FIV compared with human immunodeficiency virus might explain why many naturally infected cats do not progress rapidly to AIDS.


OBJECTIVE: To report clinical features and outcomes of cats undergoing excision of intracranial meningiomas. STUDY DESIGN: Retrospective, multicenter case series. SAMPLE POPULATION:
One hundred and twenty-one cats. METHODS: Signalment, clinical signs, duration of clinical signs, preoperative drug therapy, diagnostic imaging reports, surgery, histopathology, and outcome were collected from records of cats undergoing excision of intracranial meningiomas. Survival estimates were made using Kaplan-Meier analysis. RESULTS: There were 76/121 neutered males and 83/121 domestic short-hairs. Body weight ranged from 1.5-8.7 kg (median 5.0 kg). Age at diagnosis ranged from 3-18 years (median 12 years). Clinical signs included changes in behavior, ataxia, seizures, visual deficits, circling, and paresis. Duration of neurologic signs ranged from <1-23 months (median 1.25 months). At the time of writing, 13 cats were alive, 54 were dead or euthanatized, and 54 were lost to followup. Seven cats (13% of cats that died; 6% of all cats) died or were euthanatized in the immediate postoperative period (<1 month post-surgery) and 9 cats (17% of all cats that died; 7% of all cats) died from causes related to the meningioma but outside the immediate perioperative period. The median survival time for all cats was 37 months (95% confidence interval 28-54 months). CONCLUSION: Cats undergoing excision of intracranial meningiomas had a low perioperative mortality and a long-term prognosis of more than 3 years.

Clinical Signs, Treatment, and Outcome in Cats with Myeloma-Related Disorder Receiving Systemic Therapy.
Myeloma-related disorder (MRD) is an uncommon disease in cats, for which there is no established standard of care. In this retrospective study, we evaluated presentation, response to treatment, and toxicity in cats with MRD receiving systemic treatment. Previously reported prognostic factors were evaluated for their impact on survival in cats receiving chemotherapy. Of fifteen cases identified, thirteen received melphalan or cyclophosphamide +/- corticosteroids as first-line therapy. Chlorambucil was commonly used as rescue therapy in cats with progressive disease, or in cases of chemotherapy-related toxicity with first line agents. Overall response rates were 71% and 83% for melphalan- and cyclophosphamide-treated cats, respectively. Discontinuation of melphalan due to toxicity was common. Survival times for cats initially treated with melphalan or cyclophosphamide were not significantly different (median 252 and 394 days, respectively), and no statistically significant prognostic factors were identified. This study suggests that the combination of cyclophosphamide and corticosteroids is well tolerated and may be considered as first-line therapy for cats with systemic MRD.

Bilateral calcaneal stress fractures in two cats.
Two cats that developed bilateral calcaneal stress fractures are reported. One cat developed lameness associated with incomplete fractures at the base of both calcanei, both of which progressed to acute, complete fractures 2 months later. The second cat presented with acute complete calcaneal fracture, with evidence of remodelling of the contralateral calcaneus, which subsequently fractured two years later. The calcaneal fractures were successfully stabilised with lateral bone plates in each case. Stress fractures were suspected because of the bilateral nature, the simple and similar configuration, the consistent location of the fractures, the absence of other signs of trauma in both cases and the suspected insidious onset of the lameness. The feline calcaneus is susceptible to stress fracture, and cats
presenting with calcaneal fractures without evidence of trauma should be evaluated for concurrent skeletal pathology.

**Histologic effect of a postnatal slow-release GnRH agonist on feline gonads.**


In postnatal domestic cats, GnRH agonists suppressed fecal concentrations of sexual steroids and delayed puberty. The aim of this study was to describe the gross and microscopic morphometric effects of a single administration of the GnRH agonist, deslorelin acetate, on the gonads of postnatally treated cats. Twenty-seven postnatal male (n = 14) and female (n = 13) kittens were randomly assigned to one of the following treatment groups within the first 24 hours of birth: deslorelin acetate (1.6 mg, subcutaneous; DA, n = 16) or control that remained untreated (CO, n = 11) and spayed or castrated immediately after the onset of puberty. After surgical removal, the gonads were gross and histologically assessed. Sertoli cells also were examined immunohistochemically. Comparisons between the treatments were carried out by the Student t test. Gross gonadal wet weight and volume as well as gonadosomatic index were significantly lower in the DA than those in the CO males; these same parameters were not different in females. Primordial (461.4 ± 3.0 vs. 1074.3 ± 117.5; P < 0.01), primary (59.1 ± 13.5 vs. 165.4 ± 24.6; P < 0.01), and secondary (17.5 ± 2.6 vs. 31.17 ± 8.1; P < 0.05) follicles per mm(2) were decreased in DA than in CO gonads. Epididymal sperm motility and morphology were normal in all but two DA cats that had too few sperm to be evaluated. Germinal epithelial height (µm; 39.68 ± 0.92 vs. 72.7 ± 1.2; P < 0.01) and most of their cellular components as well as the Sertoli (cm(3); 0.1 ± 0.02 vs. 0.24 ± 0.05; P < 0.01) cells were diminished in the DA cats.

**Pectus excavatum: computed tomography and medium-term surgical outcome in a prospective cohort of 10 kittens.**


**OBJECTIVES:** The objective of this study was to report the use of computed tomography (CT) in conjunction with clinical signs to assess the severity of pectus excavatum (PE) in kittens and to guide surgical decision making; and to report medium-term outcome in a prospective cohort of kittens undergoing surgical correction. **METHODS:** This was a prospective study of 10-15-week-old kittens (n = 10) diagnosed with moderate/severe PE. **RESULTS:** CT provides additional information that is useful for selecting patients for surgical correction and for planning the surgery. Traditional radiographic indices (vertebral, frontosagittal) provide reasonable approximations of the CT-determined dimensions but these seem to correlate poorly with the severity of clinical signs. Kittens commonly have lateralised deformities, which are associated with less severe clinical symptoms, while those with midline deformities are associated with more severe clinical signs. Six of seven kittens with severe PE that had a ventral splint applied for 4 weeks had excellent medium-term outcomes. **CONCLUSIONS AND RELEVANCE:** Restriction of diastolic filling by midline sternal deviation may be an important cause of exercise intolerance in cats with PE. CT can be used to assess affected kittens and to plan surgery when indicated.
Ease of intravenous catheterisation in dogs and cats: a comparative study of two peripheral catheters.


OBJECTIVES: To evaluate animal comfort and ease of placement of a veterinary-specific intravenous catheter compared with a catheter manufactured for human use. METHODS: Fifty-nine veterinary undergraduates were recruited to perform intravenous catheterisations with two brands of over-the-needle catheter [Smiths Medical Jelco® (human use) and Abbott Animal Health catheter® (veterinary use)] in 69 healthy cats (n = 28) and dogs (n = 41) requiring general anaesthesia. After a standardised pre-anaesthetic medication, each animal was randomly allocated to have one of the two brands of catheter placed. Each student was allowed a maximum of three attempts to achieve cephalic vein catheterisation. The student and a single experienced observer evaluated each attempt. Observations related to ease of placement and to the animal’s reaction were recorded. RESULTS: Human use catheters were placed in 34 and veterinary use in 35 animals. There was no difference in weight, sex or sedation score between the two groups. The number of failed attempts was similar between the two groups. There was no difference between groups for the number of animals reacting to catheter insertion. CLINICAL SIGNIFICANCE: The two types of catheters evaluated are equally suitable for intravenous catheterisation of sedated animals by veterinary undergraduate students.

Detection of indoxyl sulfate levels in dogs and cats suffering from naturally occurring kidney diseases.


Indoxyl sulfate (IS), a protein-bound uraemic toxin, has been found to accumulate in the serum of people with renal diseases and is associated with free radical induction, nephrotoxicity cardiovascular toxicity, and osteoblast cytotoxicity. Although IS has been studied in humans and in experimental models, the role of IS in dogs and cats with kidney disease has not been investigated. A high performance liquid chromatography system was applied to detect plasma IS concentrations in non-azotaemic animals (63 dogs, 16 cats) and in animals with renal azotaemia (66 dogs, 69 cats). The IS levels of azotaemic animals were significantly higher (P <0.01) than those of non-azotaemic animals (median [IQR] 20.4 (9.5) mg/L vs. 7.2 (8.8) mg/L for dogs; median [IQR] 21 (18.9) mg/L vs. 14.8 (12.3) mg/L for cats). The IS level was significantly correlated with blood urea nitrogen, serum creatinine and phosphate concentrations. Dogs with acute kidney injury had significantly higher IS levels (P <0.01) than those with chronic kidney diseases (CKD) (median [IQR] 57.7 (40.8) mg/L vs. 17.7 (25.1) mg/L). When CKD was graded using the International Renal Interest Society (IRIS) staging system, IS levels were correlated with CKD severity in both dogs and cats. The IS concentration is directly related to loss of renal function. Further studies are necessary to determine whether measurement of IS provides any additional diagnostic or prognostic information in dogs and cats with kidney disease.

Retrospective evaluation of corneal reconstruction using ACell Vet(TM) alone in dogs and cats: 82 cases.

OBJECTIVES: To retrospectively evaluate the complications, graft clarity, and outcomes associated with the use of commercially available porcine urinary bladder submucosa (ACell Vet™) alone for corneal reconstruction in dogs and cats. PROCEDURES: Dogs or cats receiving an ACell Vet™ graft for corneal reconstruction due to severe ulcerative keratitis or after a keratectomy to remove a corneal sequestrum were included. All received a single layer of ACell Vet™, bandage contact lens, and temporary tarsorrhaphy. Bandage contact lens and temporary tarsorrhaphy were removed after graft vascularization or epithelialization. Topical steroids, cyclosporine, tacrolimus were started after epithelialization. Based on their last examination, outcomes were categorized into five groups based on the presence of corneal vessels, appearance of the scar, and the ability to visualize the posterior and/or the anterior segment through the grafted area. RESULTS: There were 82 eyes included in the study, with 68 eyes with sufficient follow-up time for final assessment. Scarring was minimal in 47 eyes, moderate but not enough to obscure visualization of the posterior segment in 12, and severe in nine. There were five eyes that developed phthisis bulbi, glaucoma or were enucleated and nine that were lost to follow up. Graft dehiscence occurred in 19 eyes. Twelve healed without additional surgical intervention while three required a second graft, two became phthisical, and two were enucleated. CONCLUSIONS AND CLINICAL RELEVANCE: Corneal reconstruction with ACell Vet™ alone is a viable alternative and results in minimal scarring and complications in cats. In dogs, scarring is more pronounced than in cats and graft dehiscence rate is higher compared to conventional techniques.

Inadvertent Perianesthetic Hypothermia in Small Animal Patients.

Inadvertent perianesthetic hypothermia is one of the most common complications in anesthesia of dogs and cats. Hypothermia during anesthesia can lead to altered pharmacokinetics of anesthetic and analgesic drugs, dysfunction of organ systems, increased patient susceptibility to infection, reduced wound healing, altered coagulation, hypotension, and delayed recovery. An understanding of the pathophysiology, complications, and techniques to minimize hypothermia during anesthesia can help veterinarians optimize care of patients. This article provides an overview of inadvertent perianesthetic hypothermia.


CHOP-based (cyclophosphamide, doxorubicin, vinca alkaloid, prednisolone) chemotherapy protocols are often recommended for treatment of feline lymphoma. While maintenance-free CHOP-based protocols have been published and readily used in dogs, there is limited literature regarding similar maintenance-free protocols in cats. The purpose of this study was to describe the outcome of cats with intermediate- to high-grade lymphoma that were prescribed a modified 25-week University of Wisconsin-Madison (UW-25) chemotherapy protocol. A secondary objective was examination of potential prognostic factors. One hundred and nineteen cats from five institutions treated with a UW-25-based protocol were included. The Kaplan-Meier median progression-free interval (PFI) and survival time (MST) were 56 and 97 (range 2-2019) days, respectively. Cats assessed as having a complete response (CR) to therapy had significantly longer PFI and MST than those with partial or no
response (PFI 205 versus 54 versus 21 days, respectively, P < 0.0001 and MST 318 versus 85 versus 27 days, respectively, P < 0.0001).

Coagulation abnormalities in 5 cats with naturally occurring cytauxzoonosis.

OBJECTIVE: To characterize hemostasis and determine if disseminated intravascular coagulation (DIC) is present in cats with cytauxzoonosis. DESIGN: Cross-sectional study. SETTING: University teaching hospital. ANIMALS: Five client-owned cats with cytologic and PCR-confirmed cytauxzoonosis. INTERVENTIONS: None. MEASUREMENTS AND MAIN RESULTS: Admission samples were collected for hemostasis testing including platelet count, activated partial thromboplastin time, prothrombin time, fibrinogen, antithrombin (AT), d-dimer, protein C, plasminogen, antiplasmin, factors VII, VIII, IX, X, and XI, von Willebrand factor, and thromboelastography. Results were compiled for combined criteria used to define DIC, and all 5 cats satisfied criteria using a previously described modified scoring system for DIC in cats. The abnormalities found in all 5 cats included thrombocytopenia, low protein C activity, and prolonged prothrombin time; however, none of the cats had low AT activity. None of the cats had clinical signs of hemorrhage despite thrombocytopenia, coagulation factor deficiency (5/5 cats), and thromboelastographic evidence of hypocoagulability (2/5 cats). Three of 5 cats survived to hospital discharge. The nonsurvivors had disseminated cytauxzoonosis with schizont-laden macrophages in vessels of various organs. CONCLUSIONS: This is the first report that comprehensively describes the hemostatic status of cats with naturally occurring infection with *Cytauxzoon felis*. All 5 cats had laboratory evidence of overt DIC. Unlike human and canine models of sepsis-induced DIC, AT deficiency was not found in this series of cats. Further research is warranted to investigate therapeutic strategies targeting thrombotic DIC to improve survival in cats with cytauxzoonosis.

Management of incidentally detected heart murmurs in dogs and cats.


The close contact between household pets and people offers favourable conditions for bacterial transmission. In this article, the aetiology, prevalence, transmission, impact on human health and preventative measures are summarized for selected bacterial zoonoses transmissible by household pets. Six zoonoses representing distinct transmission routes were selected arbitrarily based on the available information on incidence and severity of pet-associated disease caused by zoonotic bacteria: bite
infections and cat scratch disease (physical injuries), psittacosis (inhalation), leptospirosis (contact with urine), and campylobacteriosis and salmonellosis (faecal-oral ingestion). Antimicrobial resistance was also included due to the recent emergence of multidrug-resistant bacteria of zoonotic potential in dogs and cats. There is a general lack of data on pathogen prevalence in the relevant pet population and on the incidence of human infections attributable to pets. In order to address these gaps in knowledge, and to minimize the risk of human infection, actions at several levels are recommended, including: (1) coordinated surveillance of zoonotic pathogens and antimicrobial resistance in household pets, (2) studies to estimate the burden of human disease attributable to pets and to identify risk behaviours facilitating transmission, and (3) education of those in charge of pets, animal caretakers, veterinarians and human medical healthcare practitioners on the potential zoonotic risks associated with exposure to pets. Disease-specific recommendations include incentives to undertake research aimed at the development of new diagnostic tests, veterinary-specific antimicrobial products and vaccines, as well as initiatives to promote best practices in veterinary diagnostic laboratories and prudent antimicrobial usage.

**Patellar ligament rupture in the cat: repair methods and patient outcomes in seven cases.**


The medical records of cats receiving surgical treatment for unilateral patellar ligament rupture between 1999 and 2012 at 12 referral centres in the UK and Ireland were reviewed. Seven cases were identified: six were caused by trauma and one was iatrogenic, occurring as a complication following surgical stabilisation of a tibial fracture. All cases were treated by sutured anastomosis of the ruptured ligament, with six of the repairs protected by a circumpatellar and/or transpatellar loop of suture. The stifle was immobilised by transarticular external skeletal fixation in three cases. No cases required revision surgery. No complications were reported. Final evaluation, performed at a median time of 31 days, determined five patients to have returned to acceptable or good limb function; two cases were lost to follow-up. The data suggest that, in cats, the current surgical techniques extrapolated from their canine counterparts for repair of a completely or partially ruptured patellar ligament are successfully used and result in acceptable limb function.

**Doppler and Contrast-Enhanced Ultrasonography of Testicles in Adult Domestic Felines.**


The objective was to characterise the vascular patterns of testicular blood flow of adult cats, measuring the systolic velocity (SV), diastolic velocity (DV), resistance index (RI), gate time (wash-in) peak enhancement and output time (wash-out) of the contrast and addition of tissue fill characteristics. Forty-five adult cats were selected, and the echotexture, echogenicity, size, contours and margins of testicles were assessed via ultrasound. By Doppler were evaluated the blood flow and determined of vascular index in testicular artery (SV, DV and RI) and via contrast-enhanced ultrasonography determine the time for phases: wash-in, wash-out and peak enhancement. Sonographic findings presented normal. Testicular artery was observed in the spermatic cord with tortuous patter and showed monophasic-patterned waves and low vascular resistance and with systolic peak evident. Values of indices vascular were as follows: \( SV = 6.73 \text{ cm/s}, \ DV = 2.8 \text{ cm/s} \) and \( RI = 0.54 \) for left testicles; and
SV = 6.23 cm/s, DV = 2.77 cm/s and RI = 0.53 for right testicles. Contrast filled the subcapsular vascular structures and after a few seconds, a homogeneous moderate enhancement of the parenchyma, with parenchymal vessels still distinguishable and after the peak phase, a rapid homogeneous decrease in echogenicity. Values of time for contrast-enhanced ultrasonography were as follows: wash-in = 8.78 s, peak enhancement = 21.62 s and wash-out = 75.36 s for left testicles; and wash-in = 10.76 s, peak enhancement = 21.50 s and wash-out = 81.81 s for right testicles. Doppler and contrast-enhanced ultrasonography of the testicles in healthy adult cats was easily implemented and may provide baseline data for this organ to allow the use of these techniques as a diagnostic tool for evaluating testicular abnormalities in sick cats.

Feeding frequency, but not dietary water content, affects voluntary physical activity in young lean adult female cats.


The objective of this study was to investigate whether increased dietary water content and feeding frequency increased voluntary physical activity of young, lean adult female cats. A replicated 4 × 4 Latin square design with a 2 × 2 factorial treatment arrangement (feeding frequency and water content) was used. The 4 treatments consisted of 1 meal daily dry pet food without added water (1D; 12% moisture as is), 1 meal daily dry pet food with added water (1W; 70% total water content), 4 meals daily dry pet food without added water (4D; 12% moisture as is), and 4 meals daily dry pet food with added water (4W; 70% total water content). Eight healthy adult, lean, intact, young, female domestic shorthair cats were used in this experiment. Voluntary physical activity was evaluated using Actical activity monitors placed on collars and worn around the cats’ necks for the last 7 d of each experimental period of 14 d. Food anticipatory activity (FAA) was calculated based on 2 h prior to feeding periods and expressed as a percentage of total daily voluntary physical activity. Increased feeding frequency (4 vs. 1 meal daily) resulted in greater average daily activity (= 0.0147), activity during the light period (= 0.0023), and light:dark activity ratio (= 0.0002). In contrast, physical activity during the dark period was not altered by feeding frequency (> 0.05). Cats fed 4 meals daily had increased afternoon FAA (= 0.0029) compared with cats fed once daily. Dietary water content did not affect any measure of voluntary physical activity. Increased feeding frequency is an effective strategy to increase the voluntary physical activity of cats. Thus, it may assist in the prevention and management of obesity.

Follow-up on long-term antiretroviral therapy for cats infected with feline immunodeficiency virus.


OBJECTIVES: Feline immunodeficiency virus (FIV) is a lentivirus that induces AIDS-like disease in cats. Some of the antiretroviral drugs available to treat patients with HIV type 1 are used to treat FIV-infected cats; however, antiretroviral therapy (ART) is not used in cats as a long-term treatment. In this study, the effects of long-term ART were evaluated in domestic cats treated initially with the nucleoside transcriptase reverse inhibitor (NTRI) zidovudine (AZT) over a period ranging from 5-6 years, followed by a regimen of the NTRI lamivudine (3TC) plus AZT over 3 years. METHODS: Viral
load, sequencing of pol (reverse transcriptase [RT]) region and CD4:CD8 lymphocyte ratio were evaluated during and after treatment. Untreated cats were evaluated as a control group. RESULTS: CD4:CD8 ratios were lower, and uncharacterized resistance mutations were found in the RT region in the group of treated cats. A slight increase in viral load was observed in some cats after discontinuing treatment. CONCLUSIONS AND RELEVANCE: The data strongly suggest that treated cats were resistant to therapy, and uncharacterized resistance mutations in the RT gene of FIV were selected for by AZT. Few studies have been conducted to evaluate the effect of long-term antiretroviral therapy in cats. To date, resistance mutations have not been described in vivo.

Third eyelid gland neoplasms of dogs and cats: a retrospective histopathologic study of 145 cases.


PURPOSE: To describe the various types of primary neoplasms affecting the third eyelid (TEL) gland of dogs and cats. METHODS: A retrospective search of the Comparative Ocular Pathology Laboratory of Wisconsin (COPLow) database was performed. Veterinary ophthalmologists, primary care veterinarians, and, when appropriate, owners were contacted for patient follow-up information. Patient data points collected included species, age, sex, breed, laterality, tumor type, surgical margins, recurrence, metastasis, and length of follow-up. RESULTS: A total of 127 canine and 18 feline cases met the inclusion criteria. The most common canine TEL gland tumor was adenocarcinoma (n = 108; 85.0%) followed by adenoma (n = 18; 14.2%) and squamous cell carcinoma (SCC) (n = 1; 0.8%). For canine cases with follow-up information available (n = 62), 8.1% had confirmed or suspected metastasis and 11.3% had confirmed or suspected local recurrence of disease. The most common feline TEL gland tumor was adenocarcinoma (n = 15; 83.3%) followed by SCC (n = 3; 16.7%). For feline cases with follow-up information available (n = 9), 40.0% had confirmed or suspected metastasis and 30.0% had confirmed or suspected local recurrence of disease. CONCLUSIONS: This study determined that adenocarcinoma was the most common third eyelid gland tumor in both dogs and cats. The overall survival times were less, and metastatic occurrence and recurrence rates appeared to be higher for feline tumors as compared to those diagnosed in dogs. This is the first report of SCC originating from glandular ductular epithelium.

Therapeutic serum phenobarbital concentrations obtained using chronic transdermal administration of phenobarbital in healthy cats.


Seizures are a common cause of neurologic disease, and phenobarbital (PB) is the most commonly used antiepileptic drug. Chronic oral dosing can be challenging for cat owners, leading to poor compliance. The purpose of this study was to determine if the transdermal administration of PB could achieve serum PB concentrations of between 15 and 45 µg/ml in healthy cats. Nineteen healthy cats were enrolled in three groups. Transdermal PB in pluronic lecithin organogel (PLO) was applied to the pinnae for 14 days at a dosage of 3 mg/kg q12h in group 1 (n = 6 cats) and 9 mg/kg q12h in group 2 (n = 7 cats). Transdermal PB in Lipoderm Activemax was similarly applied at 9 mg/kg q12h for 14 days in group 3 (n = 6 cats). Steady-state serum PB concentrations were measured at trough, and at 2, 4 and 6 h after the morning dose on day 15. In group 1, median concentrations ranged from 6.0-7.5 µg/ml throughout the day (observed range 0-11 µg/ml). Group 2 median concentrations were 26.0 µg/ml...
(observed range 18.0-37.0 µg/ml). For group 3, median concentrations ranged from 15.0-17.0 µg/ml throughout the day (range 5-29 µg/ml). Side effects were mild. One cat was withdrawn from group 2 owing to ataxia and sedation. These results show therapeutic serum PB concentrations can be achieved in cats following chronic transdermal administration of PB in PLO at a dosage of 9 mg/kg q12h. More individual variation was noted using Lipoderm Activemax. Transdermal administration may be an alternative for cats that are difficult to medicate orally.

**Efficacy of intravesical pentosan polysulfate sodium in cats with obstructive feline idiopathic cystitis.**


**OBJECTIVES:** Obstructive feline idiopathic cystitis is a common emergency in small animal practice. There is evidence for a defective glycosaminoglycan layer in the urinary bladder of affected cats. The aim of this study was to investigate the effect of intravesical pentosan polysulfate sodium (PPS) in cats with obstructive feline idiopathic cystitis in a randomised, placebo-controlled, blinded clinical study.

**METHODS:** Thirty-five cats with obstructive feline idiopathic cystitis were enrolled into the study. On day 0, cats were randomised to receive either 30 mg PPS in saline (18 cats) or saline alone as placebo (17 cats) at the time of indwelling urinary catheter placement and then after 24 and 48 h. The catheter was clamped for 30 mins after administration before connecting it to a sterile urine collection system. The procedure was repeated after 24 and 48 h, and then the indwelling catheter was removed. Treatment success was assessed via the incidence of recurrent urethral obstruction, results of a scoring system for physical examination and daily urinalysis from day 0 to 5. **RESULTS:** Recurrent urethral obstruction occurred in 3/18 cats of the verum group and 3/17 of the placebo group (P = 1.000). The verum group showed a significantly lower degree of microscopic haematuria between day 5 and day 0 (P \(\leq\) 0.05). The placebo group showed a significantly lower degree of dipstick haematuria between day 5 and day 0 (P = 0.05). There was no difference in the clinical score between the groups in the investigated time period. **CONCLUSIONS AND RELEVANCE:** Intravesical instillation of PPS three times within 48 h in the chosen dose had no influence on the incidence of recurrent urethral obstruction and clinical signs in cats with obstructive feline idiopathic cystitis.

**Characterization of pica and chewing behaviors in privately owned cats: a case-control study.**


**OBJECTIVES:** The aim of this study was to characterize pica behavior in cats. **METHODS:** Cat owners were recruited to participate in a questionnaire survey on pica behavior exhibited by their cats. Emphasis was put on the type of item ingested. Questions on early history and environment, as well as general health and gastrointestinal signs, were asked. Owners of healthy cats not showing pica were also recruited into a control group. Associations between variables and groups were statistically tested. **RESULTS:** Pica was directed most commonly at shoelaces or threads, followed by plastic, fabric, other items, rubber, paper or cardboard and wood. Some cats ingested specific items but only chewed others. A significant positive association was found between sucking and ingesting fabric (P = 0.002). Ad libitum feeding was significantly lower in the pica group than the control group (P = 0.01). Prevalence of self-sucking behavior was significantly higher in the pica group than the control group (P = 0.001). **CONCLUSIONS AND RELEVANCE:** Pica, the ingestion of inedible items, does not seem to be the consequence of a
suboptimal environment or early weaning. Cats with pica were less commonly fed ad libitum than healthy cats. As frequently reported, pica and vomiting were related, but the causative association is not well established and thus warrants further investigation.

**Influence of dietary protein level on body composition and energy expenditure in calorically restricted overweight cats.**


High-protein (HP) diets help prevent loss of lean mass in calorie-restricted (CR) cats. However, it is not entirely known whether these diets also induce changes of energy expenditure during periods of CR. To investigate this issue, sixteen overweight cats were fed either a high-protein [(HP), 54.2% of metabolizable energy (ME)] or a moderate-protein [(MP), 31.5% of ME] diet at 70% of their maintenance energy intakes for 8 weeks, and energy expenditure, energy intake, body weight and composition, and serum metabolites and hormones were measured. While both groups of cats lost weight at a similar rate, only cats eating the HP diet maintained lean mass during weight loss. Indirect respiration calorimetry measurements revealed that both total and resting energy expenditure (kcal/d) significantly decreased during weight loss for both treatment groups. However, only cats eating the MP diet exhibited significant decreases of total and resting energy expenditures after energy expenditure was normalized for body weight or lean mass. Results from this study suggest that in addition to sparing the loss of lean mass, feeding HP diets to overweight cats in restricted amounts may be beneficial for preventing or minimizing decreases of mass-adjusted energy expenditure during weight loss.

**Novel molecular assay for the simultaneous identification of neglected lungworms and heartworms affecting cats.**


Feline lungworms and heartworms are recently stimulating the interest of the Scientific Community due to their clinical impact and apparent geographical expansion. Diagnosis of the infections caused by these nematodes is indeed challenging. This report describes a novel multiplex-PCR able to identify simultaneously major lungworms and heartworms affecting cats. Epidemiological and clinical perspectives are discussed.

**Health screening to identify opportunities to improve preventive medicine in cats and dogs.**


OBJECTIVES: To describe the results of a prevention campaign in terms of participation and pet health status and to identify opportunities to improve preventive medicine in cats and dogs.

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

**Molecular detection of haemotropic Mycoplasma species in urban and rural cats from Portugal.**


OBJECTIVES: The aim of the present study was to evaluate the prevalence of haemoplasma infection in cats in Portugal and to assess risk factors for infection. METHODS: Real-time polymerase chain reaction techniques were used to assess 236 urban and rural cats from central and southern Portugal. RESULTS: The overall prevalence of haemoplasma in the target population was 27.1% (64/236), with individual species’ prevalences as follows: 17.8% (42/236) ‘Candidatus Mycoplasma haemominutum’ (CMhm), 14.4% (34/236) Mycoplasma haemofelis (Mhf) and only 5.9% (14/236) ‘Candidatus Mycoplasma turicensis’ (CMt). Multiple infections were detected in 8.1% (19/236) of the samples, with triple and double infections with Mhf and CMhm being most commonly detected (5.9% [14/236] of cats). Haemoplasma infection was significantly higher in shelter cats (P = 0.015) than in cats with other lifestyles (eg, free-roaming/house pet/blood donors). Haemoplasma prevalence was also higher in cats with feline immunodeficiency virus infection (FIV; P = 0.011). Although sex was not significantly associated with haemoplasma infection (P = 0.050), CMt was predominantly found in males (P = 0.032). Also, the presence of haemoplasma multiple infections was statistically associated with being in a shelter (P = 0.021), male (P = 0.057) and with FIV co-infection (P = 0.004). No evidence of an association between haemoplasma infection and geographical location, age or feline leukaemia virus co-infection was found. CONCLUSIONS AND RELEVANCE: The results obtained in our study are consistent with the documented worldwide prevalence of feline haemoplasma infections, suggesting that the three main feline haemoplasma species are common in Portugal.

**Experimental transmission of Cystoisospora felis-like coccidium from bobcat (Lynx rufus) to the domestic cat (Felis catus).**


Cystoisospora felis is an ubiquitous coccidian of cats. The domestic cat (Felis catus) is its definitive host and several mammalian and avian species are its optional intermediate/transport hosts. Nothing is known if it is transmissible to wild felids. In the present study C. felis-like oocysts were found in two naturally infected bobcats (Lynx rufus) from Pennsylvania. To study transmission of C. felis-like parasite from bobcats to domestic cats, sporulated oocysts of C. felis-like from one bobcat were orally inoculated into interferon gamma gene knockout (KO) mice, and 56 days later tissues of KO mice were fed to two coccidian-free cats; two littermate cats were uninoculated controls. The inoculated cats and controls were euthanized five and seven days later, and their small intestines were studied
histologically. One inoculated cat excreted C. felis-like oocysts seven days post inoculation (p.i.) and was immediately euthanized. Mature schizonts, mature male and female gamonts, and unsporulated oocysts were found in the lamina propria of small intestine; these stages were morphologically similar to C. felis of domestic cats. No parasites were seen in histological sections of small intestines of the remaining three cats. The experiment was terminated at seven days p.i. (minimum prepatent period for C. felis) to minimize spread of this highly infectious parasite to other cats. Although oocysts of the parasite in bobcats were morphologically similar to C. felis of domestic cats, the endogenous stages differed in their location of development. The bobcat derived parasite was located in the lamina propria of ileum whereas all endogenous stages of C. felis of domestic cats are always located in enterocytes of intestinal epithelium. Characterization of DNA isolated from C. felis-like oocysts from the donor bobcat revealed that sequences of the ITS1 region was only 87% similar to the ITS1 region of C. felis from domestic cats. These results indicate that the parasite in bobcat is likely different than C. felis of cats.

**Life Cycle of Hammondia hammondi (Apicomplexa: Sarcocystidae) in Cats.**

Hammondia hammondi and Toxoplasma gondii are feline coccidians that are morphologically, antigenically, and phylogenetically related. Both parasites multiply asexually and sexually in feline intestinal enterocytes, but H. hammondi remains confined to enterocytes whereas T. gondii also parasitizes extra-intestinal tissues of the cat. Here, we studied multiplication of H. hammondi in feline intestine and compared with T. gondii cycle. Five parasite-free cats were inoculated orally with tissue cysts and free bradyzoites from skeletal muscles of gamma interferon gene knockout mice and killed at 1, 3, 4, 6, and 7 d later. At 1 and 3 d post inoculation (DPI), numerous individual intracellular bradyzoites were detected in histological sections of small intestine. At 4 DPI only schizonts were found and they were located in enterocyte cytoplasm above the host cell nucleus. At 6 and 7 DPI both schizonts and gamonts were seen and they were located in enterocytes. Ultrastucturally, schizogonic and gametogonic development of H. hammondi was similar to T. gondii. However, in H. hammondi merozoites rhoptries were longer, and coiled and contained more micronemes than in T. gondii. Ultrastructural development is illustrated in detail.

**Reference intervals for thromboelastometry with the ROTEM®delta in cats.**

This study aimed to assess precision of viscoelastic measurements of feline blood using the ROTEM® delta analyser and to establish reference intervals. Intra-assay-variability was evaluated by analysing samples of two cats in quadruplicate. Reference intervals were established based on 55 clinically healthy European shorthair cats including different sexes and age groups. Analyses were performed without activation and after activation with different reagents (kaolin, in-tem, ex-tem). For the majority of parameters, coefficient of variation was <10%. The activating reagent containing tissue factor (ex-tem) produced the shortest clotting times (reference interval: 44.0-98.7 s) and highest maximum lyses. Reference values of many parameters revealed a wide inter-individual variation. Only sporadically, differences between the individual age groups were found. In conclusion, analysis of feline blood using the ROTEM analyser showed acceptable reproducibility. The established reference
intervals may be a useful orientation for measurements of feline blood using the ROTEM® delta analyser.

**Ticks on dogs and cats: a pet owner-based survey in a rural town in northeastern Switzerland.**


Changes in the endemic foci of tick populations and invasions of tick species to new areas have become evident in Europe, leading to changes in the epidemiology of tick-transmitted diseases. However, data about tick infestations of pet animals are limited. Following the recent identification of a new focus of canine babesiosis in northeastern Switzerland, we investigated the occurrence of tick vectors in this region by using a pet owner-based sampling strategy. All dog owners in a rural town were sent postal requests to send ticks from their dogs and cats over two consecutive years, beginning in April 2012. In total 3003 ticks were submitted for identification from 249 dogs (approximately 20% of the resident dog population) and from 117 cats. *Ixodes ricinus* was the most abundant species identified in 96.8% (n=2124) and 74.3% (n=601) of the individual samples submitted from dogs and cats, respectively. Two other tick species, *I. hexagonus* and *Dermacentor reticulatus*, were recorded on both host species, with host infestation prevalences below 2%. On cats (but not on dogs), as many as 24.0% (n=194) of the specimens were identified as a fourth tick species, *I. trianguliceps*. Overall, 93.5% of the ticks were adults (93.8% and 93.0% in dogs and cats), 4.4% nymphs (5.7% in dogs and 1% in cats) and 2% larvae (0.5% and 6.0% in dogs and cats), respectively. The highest infestation intensity was 49 *I. ricinus* ticks from an individual dog. However, 55.6% of the submissions from dogs and 24.8% from cats contained only one tick. This survey demonstrated that pet owners can contribute to a cost-effective tick surveillance and identified a new tick focus of *D. reticulatus*. The finding of *I. trianguliceps* exclusively on cats might be related to behavioural traits of the cats or to a more readily detection of these very small ticks during petting by their owners.

**Ultrasonographic percutaneous anatomy of the atlanto-occipital region and indirect ultrasound-guided cisternal puncture in the dog and the cat.**


Cisternal puncture in dogs and cats is commonly carried out. This article describes the percutaneous ultrasound anatomy of the cisternal region in the dog and the cat and an indirect technique for ultrasound-guided cisternal puncture. Ultrasound images obtained ex vivo and in vivo were compared with anatomic sections and used to identify the landmarks for ultrasound-guided cisternal puncture. The ultrasound-guided procedure was established in cadavers and then applied in vivo in seven dogs and two cats. The anatomic landmarks for the ultrasound-guided puncture are the cisterna magna, the spinal cord, the two occipital condyles on transverse images, the external occipital crest and the dorsal arch of the first cervical vertebra on longitudinal images. Using these ultrasound anatomic landmarks, an indirect ultrasound-guided technique for cisternal puncture is applicable in the dog and the cat.

**Clinical effect of four different ointment bases on healthy cat eyes.**

OBJECTIVE: To describe the effects of long-term treatment with four different eye ointment bases (OBs) in cats. ANIMALS STUDIED: Ten healthy cats. PROCEDURES: The study was performed in two periods. Four different OBs were tested. Hundred grams of OB contained the following: OB-A: 35.17 g liquid paraffin (lp), 64.83 g white petrolatum (wp); OB-B: 10.03 g lp, 84.95 g wp 5.02 g lanolin; OB-C: 18.34 g lp, 51.40 g wp, 25.00 mg KH2 PO4, 57.00 mg K2 HPO4, 18.90 g eucerinum anhydricum, 11.28 g water for injections; and OB-D: 70 g unguentum lanalcoli, 20 g lp, 10 g aqua conservans. One eye was treated, and the other served as a negative control. Cats received the OBs TID for 28 days. The two study periods were separated by a 4-month washout phase. Samples for conjunctival impression cytology, swabs for bacteriologic and mycologic examination, and cytobrush samples for FHV-1 and Chlamyphila felis PCR detection were obtained. Both eyes were examined daily. Severity of ocular symptoms was scored using a modified Draize eye irritation test. A total of five eyes were treated with OB-A, five with OB-B, four with OB-C, and five with OB-D. RESULTS: Treated eyes had significantly higher clinical scores. Eyes receiving OB-A had the highest overall clinical score. The results of bacteriologic and mycologic examination concur with the previously published data. All samples tested were negative for FHV-1 and Chlamydophila felis. There was no significant difference between treated and control eyes upon cytological examination. CONCLUSION: The application of OBs resulted in clinical symptoms in treated eyes. The long-term use of ointments is not well tolerated in cats and may lead to ocular irritation.

The effect of chronic kidney disease on the urine proteome in the domestic cat (Felis catus).


Chronic kidney disease (CKD) is a major cause of mortality in cats, but sensitive and specific biomarkers for early prediction and monitoring of CKD are currently lacking. The present study aimed to apply proteomic techniques to map the urine proteome of the healthy cat and compare it with the proteome of cats with CKD. Urine samples were collected by cystocentesis from 23 healthy young cats and 17 cats with CKD. One-dimensional sodium-dodecyl-sulfate polyacrylamide gel electrophoresis (1D-SDS-PAGE) was conducted on 4-12% gels. Two-dimensional electrophoresis (2DE) was applied to pooled urine samples from healthy cats (n = 4) and cats with CKD (n = 4), respectively. Sixteen protein bands and 36 spots were cut, trypsin-digested and identified by mass spectrometry. 1D-SDS-PAGE yielded an overall view of the protein profile and the separation of 32 ± 6 protein bands in the urine of healthy cats, while CKD cats showed significantly fewer bands (P < 0.01). 2-DE was essential in fractionation of the complex urine proteome, producing a reference map that included 20 proteins. Cauxin was the most abundant protein in urine of healthy cats. Several protease inhibitors and transport proteins that derive from plasma were also identified, including alpha-2-macroglobulin, albumin, transferrin, haemopexin and haptoglobin. There was differential expression of 27 spots between healthy and CKD samples (P < 0.05) and 13 proteins were unambiguously identified. In particular, increased expression of retinol-binding protein, cystatin M and apolipoprotein-H associated with decreased expression of uromodulin and cauxin confirmed tubular damage in CKD cats suggesting that these proteins are candidate biomarkers.

Cats indoors and out.

Evaluation of associations among Coxiella burnetii and reproductive abnormalities in cats.
OBJECTIVES: Coxiella burnetii is an obligate intracellular bacterium that is found worldwide, is associated or suggested to be associated with reproductive abnormalities in a number of species including cats, and is the cause of Q fever in humans. In a previous study, C burnetii DNA was amplified from the uterine tissues of 8.5% of client-owned cats in the USA but reproductive history was unknown and histopathological examination was not performed. In this study, uterine tissues of 26 normal cats and 11 cats with histopathological evidence of uterine disease or other reproductive abnormalities were evaluated for the presence of C burnetii. METHODS: A PCR assay that amplifies the repetitive transposon-like region (Trans 1 and 2) and a PCR assay that amplifies the IS-1111 insertion sequence (IS-1111) were optimised and applied to the DNA extracts. The sensitivity threshold of both PCR assays was 12 pg/µl. Positive samples were evaluated for the presence of the organism using immunohistochemistry performed on paraffin-embedded tissue. RESULTS: Amplicons of the expected size developed in three samples (one from a cat with reproductive abnormalities) in the IS-1111 assay; however, there was not enough DNA for sequence analysis. Immunohistochemical analysis was used to further evaluate these three samples and was negative for C burnetii. While C burnetii could not be confirmed by sequence analysis or immunohistochemistry, the PCR positive prevalence rate (8.1%) was similar to that published previously. CONCLUSIONS AND RELEVANCE: Biosafety precautions should be taken when working with cats that are aborting or parturient. Further research should be performed to evaluate the role that C burnetii may play in reproductive abnormalities in cats.

An evaluation of fresh gas flow rates for spontaneously breathing cats and small dogs on the Humphrey ADE semi-closed breathing system.
OBJECTIVE: To evaluate the fresh gas flow (FGF) rate requirements for the Humphrey ADE semi-closed breathing system in the Mapleson A mode; to determine the FGF at which rebreathing occurs, and compare the efficiency of this system to the Bain (Mapleson D) system in spontaneously breathing cats and small dogs. STUDY DESIGN: Prospective clinical study. ANIMALS: Twenty-five healthy (ASA score I or II) client-owned cats and dogs (mean ± SD age 4.7 ± 5.0 years, and body weight 5.64 ± 3.26 kg) undergoing elective surgery or minor procedures. METHODS: Anaesthesia was maintained with isoflurane delivered via the Humphrey ADE system in the A mode using an oxygen FGF of 100 mL kg(-1) minute(-1). The FGF was then reduced incrementally by 5-10 mL kg(-1) minute(-1) at approximately five-minute intervals, until rebreathing (inspired CO(2) >5 mmHg (0.7 kPa)) was observed, after which flow rates were increased. In six animals, once the minimum FGF at which rebreathing occurred was found, the breathing system was changed to the Bain, and the effects of this FGF delivery examined, before FGF was increased. RESULTS: Rebreathing did not occur at the FGF recommended by the manufacturer for the ADE. The mean ± SD FGF that resulted in rebreathing was 60 ± 20 mL kg(-1) minute(-1). The mean minimum FGF at which rebreathing did not occur with the ADE was 87 ± 39 mL kg(-1) minute(-1). This FGF resulted in significant rebreathing (inspired CO(2) 8.8 ± 2.6 mmHg (1.2 ± 0.3 kPa)) on the Bain system. CONCLUSIONS: The FGF rates recommended for the Humphrey ADE are adequate to prevent rebreathing in spontaneously breathing cats and dogs.
<15 kg. CLINICAL RELEVANCE: The Humphrey ADE system used in the A mode is a more efficient alternative to the Bain system, for maintenance of gaseous anaesthesia in spontaneously breathing cats and small dogs.

Effect of urethral infusion of atracurium besylate on manual bladder expression in dogs and cats with spinal cord injuries: a randomised trial.


The aim of this randomised trial was to assess the effect of urethral infusion of atracurium besylate in dogs and cats with signs of urinary retention secondary to lesions affecting spinal cord segments T3-L3. Eighteen dogs and six cats with urinary retention were examined and scored before treatment on the degree of difficulty of inducing bladder emptying by manual bladder compression. Animals were subsequently treated in a blinded fashion by the same operator with urethral infusion of 2-4 ml of either a solution of 0.5 mg/ml of atracurium (treatment group) or placebo (control group) and, after five minutes, a second attempt was made to induce bladder emptying by manual compression and a post-treatment score assigned. Pretreatment scores did not differ between the treatment and control groups (5.6±0.8 v 6.2±0.7, respectively; P=0.22); however, post-treatment scores were significantly lower in the treatment group compared with the control group (2.9±0.4 v 5.9±0.3; P<0.05). Urethral infusion of atracurium facilitates manual bladder expression in dogs and cats with urinary retention secondary to spinal cord injuries. No side effects were recognised.

Investigation of inherited diseases in cats: genetic and genomic strategies over three decades.


PRACTICAL RELEVANCE: The health of the cat mirrors a complex interaction between its environment (nurture) and its genetics (nature). To date, over 70 genetic mutations (variants) have been defined in the cat; many involve diseases, structural anomalies, coat color and texture, including numerous that are clinically relevant. This trend will continue as more of the feline genome is deciphered. Genetic testing, and eventually whole-genome sequencing, should become routine diagnostic tools in feline healthcare within the foreseeable future. GLOBAL IMPORTANCE: Cat breeds have dispersed around the world. Thus, feline medicine clinicians should be aware of breeds common to their region and common mutations found within those regional populations. Random-bred populations of domestic cats can also have defined genetic characteristics and mutations, which are equally worthy of understanding by feline medicine clinicians. OUTLINE: This article reviews the chronology and evolution of genetic and genomic tools pertinent to feline medicine. Possible strategies for mapping genetic traits and defects, and how these impact on feline health, are also discussed. The focus is on three historical periods: (1) research conducted before the availability of the cat genome; (2) research performed immediately after the availability of sequences of the cat genome; and (3) current research that goes beyond one cat genome and utilizes the genome sequences of many cats. EVIDENCE BASE: The data presented are extracted from peer-reviewed publications pertaining to mutation identification, and relevant articles concerning heritable traits and/or diseases. The authors draw upon their personal experience and expertise in feline genetics.

Pulmonary function in obese vs non-obese cats.
Obesity is a risk factor in the development of several respiratory diseases. Lung volumes tend to be decreased, especially expiratory reserve volume, increasing expiratory flow limitation during tidal breathing. Barometric whole-body plethysmography is a non-invasive pulmonary function test that allows a dynamic study of breathing patterns. The objective of this study was to compare pulmonary function variables between obese and non-obese cats through the use of barometric whole-body plethysmography. Nine normal-weight and six obese cats were placed in the plethysmograph chamber, and different respiratory variables were measured. There was a significant decrease in tidal volume per kilogram ($P = 0.003$), minute volume per kilogram ($P = 0.001$) and peak inspiratory and expiratory flows per kilogram ($P = 0.001$) in obese cats compared with non-obese cats. Obesity failed to demonstrate a significant increase in bronchoconstriction index variable enhanced pause (Penh), as previously reported in humans and dogs. The results show that feline obesity impairs pulmonary function in cats, although a significant increase in bronchoconstriction indexes was not observed. Non-invasive barometric whole-body plethysmography can help characterise mechanical dysfunction of the airways in obese cats.

Assessment of Postoperative Pain in Cats After Ovariectomy by Laparoscopy, Median Celiotomy, or Flank Laparotomy.


OBJECTIVE: To compare postoperative pain, duration of surgery, and duration of anesthesia for 3 methods of ovariectomy in cats: (1) conventional ventral median open approach (Midline), (2) right flank approach (Flank), and (3) median 2-portal laparoscopic procedure (Lap). STUDY DESIGN: Randomized, prospective clinical trial. ANIMALS: Healthy, sexually intact female cats ($n = 60$). METHODS: Cats were randomly assigned to 1 of 3 groups: Midline ($n = 20$), Flank ($20$), and Lap ($20$) were evaluated 1, 2, 4, 6, and 12 hours after endotracheal extubation. Postoperative pain was scored using the 4A-vet pain scale that combines a subjective numerical pain rating and objective scoring of physiologic and behavioral variables including the response to stimulation of the surgical site. Pain scores (PS) were compared between groups. RESULTS: There was a significant difference in the PS between groups. PS for Midline and Flank were not significantly different but were both significantly higher compared with Lap. Depending on time, 5-20% of the cats had intense postoperative pain in both Midline and Flank groups. None of the Lap cats had intense postoperative pain. CONCLUSIONS: Laparoscopic ovariectomy, although slower, appeared less painful compared with conventional ventral midline and flank ovariectomy. Postoperative pain did not differ significantly between midline and flank groups.

Biological validation of feline serum cystatin C: The effect of breed, age and sex and establishment of a reference interval.


Chronic kidney disease (CKD) is common in cats, but the routine renal markers, serum creatinine (sCr) and urea, are not sensitive or specific enough to detect early CKD. Serum cystatin C (sCysC) has
advantages over sCr, both in humans and dogs, and sCysC concentration is significantly higher in cats with CKD than in healthy cats. The objective of this study was to determine the effect of age, sex and breed on feline sCysC and to establish a reference interval for feline sCysC. In total, 130 healthy cats aged 1-16 years were included. sCysC was determined using a validated particle-enhanced nephelometric immunoassay. sCr, urea, urine specific gravity, urinary protein:creatinine ratio (UPC) and systolic blood pressure (SBP) were also measured. No significant differences in sCysC concentration were observed among young, middle-aged and geriatric cats, female intact, female neutered cats, male intact and male neutered cats, or among purebred and domestic short- or longhaired cats. The 95% reference interval for feline sCysC was determined to be 0.58-1.95 mg/L. sCr was significantly higher in geriatric cats than young cats. Serum urea in geriatric cats was significantly higher than in middle-aged and young cats (P = 0.004 and P <0.001, respectively). SBP in geriatric cats was significantly higher than in both middle-aged and young cats (P = 0.004 and P = 0.040, respectively). Male neutered and female neutered cats had significantly higher serum urea concentrations than female intact cats (P = 0.003 and P = 0.006, respectively). Male intact cats had a significantly higher UPC than female intact and female neutered cats (P = 0.02 for each comparison). There were no significant differences among sex groups for USG. It is of concern that sCysC in the majority of cats with CKD in previous studies falls within the reference interval calculated in this study. Further studies are warranted to evaluate the diagnostic value of sCysC as a renal marker in cats.

**Serum and urinary cystatin C in cats with feline immunodeficiency virus infection and cats with hyperthyroidism.**


OBJECTIVES: The objective of this study was to investigate serum cystatin C (sCysC) and urinary cystatin C (uCysC) in cats with hyperthyroidism and cats with feline immunodeficiency virus (FIV).

METHODS: Thirty cats with FIV, 26 hyperthyroid cats and 28 healthy cats were included. sCysC and uCysC:creatinine (uCysC/uCr) ratio were measured with a human particle-enhanced nephelometric immunoassay, previously validated for feline CysC measurement. Routine renal variables (serum creatinine [sCr], urine specific gravity, urinary protein:creatinine ratio [UPC]) were also measured in the three groups. RESULTS: Cats with hyperthyroidism had significantly higher sCysC and higher uCysC/uCr ratio, lower sCr and a higher UPC than healthy cats. Cats with FIV infection did not show a significantly higher sCysC concentration but had a significantly higher sCr and UPC than healthy cats. uCysC could be detected in only four of them. CONCLUSIONS AND RELEVANCE: This study demonstrated that sCysC is increased in cats with hyperthyroidism, in contrast with sCr, but not in cats with FIV. Many hyperthyroid cats, but only four cats with FIV had an elevated uCysC/uCr ratio. Further studies may reveal if uCysC might be a valuable marker for tubular dysfunction in cats.

**Survey of Campylobacter spp. in owned and unowned dogs and cats in Northern Italy.**


Campylobacteriosis is among the most common bacterial causes of human gastroenteritis worldwide and pet ownership has been identified as a risk factor for Campylobacter infection in humans. Since canine and feline prevalence data are scarce in Italy, the present study was carried out to assess the prevalence, species distribution and risk factors for Campylobacter infection in dogs and cats under
different husbandry conditions. Rectal swabs were collected from 171 dogs (household pets, n = 100; shelter-housed dogs, n = 50; dogs from breeding kennels, n = 21) and 102 cats (household pets, n = 52; shelter-housed cats, n = 21; free-roaming cats n = 29) in Northern Italy. Campylobacter was isolated from 17% (n = 29) of dogs and 14.7% (n = 15) of cats. C. jejuni was the most common isolate in both species (Campylobacter spp.-positive dogs, 55.2%; Campylobacter spp.-positive cats, 53.3%), followed by C. upsaliensis (Campylobacter spp.-positive dogs, 27.6%; Campylobacter spp.-positive cats, 40%). Other Campylobacter species were rarely detected, but included C. hyointestinalis subsp. hyointestinalis, C. lari and C. coli in dogs and C. coli and C. helveticus in cats. Among considered variables (sex, age, origin, diarrhoea, season of sampling), origin was identified as a risk factor for dogs, with shelter-housed dogs at higher risk than household dogs (odds ratio, 2.84; 95% CI 1.17, 6.92; P = 0.021). The results of this study, particularly the high prevalence of C. jejuni in Campylobacter-positive animals, demonstrated that household and stray dogs and cats in Northern Italy might pose a zoonotic risk for humans. Moreover, biosecurity measures should be improved in dog shelters.

**Efficacy of Broadline® spot-on against Aelurostrongylus abstrusus and Troglostrongylus brevior lungworms in naturally infected cats from Italy.**


The increasing reports of Aelurostrongylus abstrusus infection and the new information on Troglostrongylus brevior breviar have spurred the interest of the scientific community towards the research of pharmaceutical compounds effective against both pathogens. A novel topical combination of fipronil, (S)-methoprene, eprinomectin and praziquantel (Broadline®, Merial) has been released for the treatment of a variety of feline parasitic infections. The present study reports the efficacy of this spot-on in treating cats naturally infected by feline lungworms. Client owned cats (n=191) were enrolled from three geographical areas of Italy and faecal samples were examined by floatation and Baermann techniques. Twenty-three individuals were positive for L1 of A. abstrusus (n=18) or T. brevior (n=3) or for both species (n=2) and they were topically treated with Broadline®. Seventeen of them were also concomitantly infected by other parasites. Four weeks after treatment, faecal samples were collected and examined to assess the efficacy of a single administration of the product. Based on lungworm larvae counts, the efficacy of the treatment was 90.5% or 100% for A. abstrusus or T. brevior, respectively. Cats released significantly lower amounts of lungworm larvae after treatment compared to pre-treatment (p<0.0001). All but three cats were negative for other nematodes after treatment and all cats recovered from respiratory signs. Results of this study indicate that a single administration of the topical combination fipronil, (S)-methoprene, eprinomectin and praziquantel is effective and safe for the treatment of A. abstrusus and/or T. brevior infections in cats living under field conditions.

**High diagnostic accuracy of the Sysmex XT-2000iV delta total nucleated cells on effusions for feline infectious peritonitis.**


BACKGROUND: The ΔWBC (the ratio between DIFF and BASO counts of the Sysmex XT-2000iV), hereafter defined as ΔTNC (total nucleated cells), is high in effusions due to feline infectious peritonitis (FIP), as cells are entrapped in fibrin clots formed in the BASO reagent. Similar clots form in the Rivalta’s test, a method with high diagnostic accuracy for FIP. OBJECTIVES: The objective of this
study was to determine the diagnostic accuracy for FIP and the optimal cutoff of \( \Delta TNC \). METHODS: After a retrospective search of our database, DIFF and BASO counts, and the \( \Delta TNC \) from cats with and without FIP were compared to each other. Sensitivity, specificity, and positive and negative likelihood ratios (LR+, LR-) were calculated. A ROC curve was designed to determine the cutoff for best sensitivity and specificity. RESULTS: Effusions from 20 FIP and 31 non-FIP cats were analyzed. The \( \Delta TNC \) was higher (\( P < .001 \)), and BASO and DIFF counts were lower (\( P < .001 \) and \( P < .05 \)) in FIP than in non-FIP cats. Only 2 FIP cats with atypical effusions had a \( \Delta TNC < 3.0 \). The cutoff identified by the ROC curve (area under curve: 0.94; \( P < .001 \)) was 1.7 (Sensitivity = 90.0\%; Specificity = 93.53\%; LR+ = 13.9; LR- = 0.1). A \( \Delta TNC > 2.5 \) had 100% specificity. CONCLUSIONS: The \( \Delta TNC \) has a high diagnostic accuracy for FIP-related effusions by providing an estimate of precipitable proteins, as the Rivalta’s test, in addition to the cell count. As fibrin clots result in false lower BASO counts, the \( \Delta TNC \) is preferable to the WBC count generated by the BASO channel alone in suspected FIP effusions.

Caudal mucogingival lesions secondary to traumatic dental occlusion in 27 cats: macroscopic and microscopic description, treatment and follow-up.


The main aim of this retrospective study was to describe clinical and histopathological findings in cats with mucogingival lesions developed at the contact point of the premolar and molar teeth of the opposite quadrant. Cases were retrieved following manual review of the medical records, dental records and photographic documentation of all feline dental patients visited in the period between February 2001 and August 2011. Cats showing different lesions at different times were calculated as multiple cases. A total of 27 cats (31 cases) with 44 lesions (26 proliferations [59\%], 11 clefts [25\%] and seven foveae [16\%]) were included. Mean age at the time of the first visit was 6.6 years. The lesion object of the study was the main reason for presentation in only five cases (16\%). Proliferations showed two different histopathological patterns and had characteristics in common with human oral pyogenic granuloma. Successful treatment was achieved in all cases by removing the occlusal contact by dental extraction or coronal reduction, possibly associated with lesion excision. This study underlines the need for a thorough oral examination and evaluation of dental occlusion in all patients. Causes for the development of traumatic occlusion may include an acquired overbite (possibly secondary to selective dental extraction), congenital or post-traumatic malocclusion, abnormal latero-lateral mobility of the mandible, occlusal drift of the premolar and molar teeth, and/or alveolar bone expansion.

Biphenotypic B-cell lymphoma in 2 cats.


The clinical and pathologic features of biphenotypic B-cell lymphoma in 2 cats are reported. Clinical presentation varied from multiple cutaneous masses identified on the thigh in one cat to signs of lethargy from acute hemorrhage due to neoplastic infiltration of one kidney in the other. Cytology and histopathology confirmed round cell neoplasia in both cats and immunochemical staining demonstrated expression of both B- and T-lymphocyte markers by the neoplastic cells in both animals. In PCR analysis of antigen receptor gene rearrangement, clonal rearrangement of B-cell receptor genes and polyclonal T-cell receptor gene rearrangement were demonstrated in both lymphomas. These findings
were consistent with a diagnosis of B-cell lymphoma with aberrant CD3 expression in both cases. Clinical progression of disease post diagnosis was rapid in both cats, suggesting a poor prognosis for this lymphoma type. Although bigenotypic receptor rearrangement of lymphoma cells appears relatively common, this is the first known report of actual biphenotypic lymphoma in cats.

**Acute neurokinin-1 receptor antagonism fails to dampen airflow limitation or airway eosinophilia in an experimental model of feline asthma.**


**OBJECTIVES:** Feline allergic asthma is a chronic inflammatory disorder of the lower airways that may manifest with acute, life-threatening clinical signs. Tachykinins released from sensory nerves and immune cells binding neurokinin (NK)-1, NK-2 and NK-3 receptors have been implicated in asthma pathogenesis. Maropitant, an NK-1 receptor antagonist, blocks neuroimmune pathways and may be a viable treatment option for cats in asthmatic crisis. Using an experimental chronic allergic feline asthma model, we hypothesized that a single dose of maropitant given immediately after allergen challenge would blunt clinical signs, airflow hyper-responsiveness (AHR) and airway eosinophilia.

**METHODS:** Cats (*n* = 7) induced to have an asthmatic phenotype using Bermuda grass allergen (BGA) were enrolled in a prospective, placebo-controlled crossover design study. Cats randomly received maropitant (2 mg/kg SC) or placebo (saline SC) immediately post-BGA challenge, followed 12 h later by pulmonary mechanics testing and measurement of airway eosinophils. After a 2 week washout, cats were crossed-over to the alternate treatment. Study endpoints included subjective clinical scoring systems post-BGA challenge, ventilator-acquired pulmonary mechanics to assess AHR after bronchoprovocation with methacholine and collection of bronchoalveolar lavage fluid to quantify airway eosinophilia. Data were analyzed using a Mann-Whitney rank sum test with *P* <0.05 considered significant.

**RESULTS:** A single injection of maropitant failed to diminish clinical composite score (*P* = 0.902), visual analogue scale scoring (*P* = 0.710), AHR (*P* = 0.456) or airway eosinophilia (*P* = 0.165) compared with placebo. **CONCLUSIONS AND RELEVANCE:** A single injection of maropitant given immediately post-allergen challenge was ineffective at blunting clinical signs, AHR and airway eosinophilia, and cannot be recommended as treatment for feline status asthmaticus.

**Chronic neurokinin-1 receptor antagonism fails to ameliorate clinical signs, airway hyper-responsiveness or airway eosinophilia in an experimental model of feline asthma.**


**OBJECTIVES:** Feline allergic asthma is a common chronic lower airway disease characterized by clinical signs attributed to eosinophilic inflammation, airway hyper-responsiveness (AHR) and airway remodeling. Tachykinins released from sensory nerves and immune cells bind neurokinin-1 (NK-1) receptors in the lung. The resultant neurogenic airway inflammation has been implicated in asthma pathogenesis. In mouse models and spontaneous human asthma, NK receptor antagonists reduce bronchospasm and inflammation. We hypothesized that chronic administration of maropitant, an NK-1 receptor antagonist, would decrease clinical signs of asthma, AHR and eosinophilic inflammation in experimentally asthmatic cats. **METHODS:** Cats (*n* = 6) induced to have asthma using Bermuda grass allergen (BGA) were enrolled in a randomized, prospective, placebo-controlled crossover design study. Cats received either oral maropitant (2 mg/kg) or placebo q48h for 4 weeks; following a 2 week washout, cats were crossed-over to the alternate treatment. Study endpoints included subjective clinical
scoring systems after BGA challenge, ventilator-acquired pulmonary mechanics to assess AHR after bronchoprovocation with methacholine, and collection of bronchoalveolar lavage fluid to quantify airway eosinophilia. Statistical analysis was performed using a Mann-Whitney rank sum test with \( P < 0.05 \) considered significant. RESULTS: One month administration of maropitant in experimentally asthmatic cats produced no significant difference in clinical scoring scheme (\( P = 0.589 \) and \( P = 1.0 \)), AHR (\( P = 0.818 \)) or airway eosinophilia (\( P = 0.669 \)) compared with placebo. CONCLUSIONS AND RELEVANCE: Chronic administration of maropitant was ineffective at blunting clinical signs, AHR and airway eosinophilia in experimental feline asthma and thus cannot be recommended as a novel treatment for this disorder.

**Microbiota and probiotics in canine and feline welfare.**

Dogs and cats have been cohabiting with us for thousands of years. They are the major human companions. Today, dogs and cats live in urban areas. Cats and most dogs are on high carbohydrate diets and face similar life-style challenges as the human beings. The health and well-being of companion animals, just as their owners, depends on the gut microbes. Providing a proper care and nutritionally balanced diet to companion animals is recognised as a part of our responsibility to maintain the health and well being of our pet. However, as microbiota differences may facilitate exposure to pathogens and harmful environmental influences, it is prudent to search for novel tools to protect dogs and cats and at the same time the human owners from pathogens. Specific probiotic strains and/or their defined combinations may be useful in the canine and feline nutrition, therapy, and care. Probiotic supplementations have been successful in the prevention and treatment of acute gastroenteritis, treatment of IBD, and prevention of allergy in companion animals. New challenges for probiotic applications include maintenance of obesity and overweight, urogenital tract infections, Helicobacter gastritis and parasitic infections. The probiotics of human origin appear to be among the new promising tools for the maintenance of pets’ health. However, the host-derived microorganisms might be the most appropriate probiotic source. Therefore, more controlled trials are needed to characterise new and safe probiotic preparations with an impact on general health and well being as well as health maintenance in dogs and cats.

**Nuisances and welfare of free-roaming cats in urban settings and their association with cat reproduction.**

Free roaming cats (FRC) are highly abundant in cities around the world. Increasing populations of these cats might result in impairment of cat welfare and cause nuisances and public health risks. In order to study the seasonal dynamics of FRC populations and its association with events of cat welfare impairment and nuisances, we analyzed a database of FRC-associated citizens’ telephone complaint events, which were registered in five cities in Israel (total human population of 1.42 million residents) during the years 2007-2011. These complaint events were classified to the following six categories: cat’s carcasses, kittens, parturition, aggressive behavior toward people, invasion to human facilities, and cat injuries and distress. Overall, 87,764 complaint events associated with these categories were registered in the five cities during the study period (123.2 complaint events per 10,000 citizens per year). Length of daylight was moderately correlated with the rate of complaints on kittens in the same
month \((r=0.64)\) and parturition in the previous month \((r=0.54)\) \((P<0.001)\). Both kitten and parturition-related complaints showed a prominent seasonal pattern, peaking in April and May, respectively, and declining gradually until November. ‘Kittens’ or ‘parturition’ were explicitly mentioned in 38%, 39% and 19%, respectively, of the complaints regarding cat aggressiveness toward people, cat invasion to human facilities and cat injuries and distress. In most of the cities the rate of citizen complaints regarding carcasses, aggression, invasion and injuries were still significantly correlated with rate of complaints regarding kittens after omission of these joint complaints and remained significant after controlling for seasonality. These findings imply an association of cat welfare impairment and nuisances with FRC reproduction intensity. The current study revealed the high rate of nuisances and potential public health hazards related to FRC, as well as the impairment of cat welfare, which might be merely ‘the tip of the iceberg’ of the real welfare situation of these cats. Further studies should examine the effectiveness of FRC population control strategies for the reduction of the rate of nuisances and public health risks related to FRC, as well as for improving their welfare.

The relations between the presence and bacterial loads of Bartonella species in the cat and cat flea \((Ctenocephalides felis)\), under natural conditions.


The cat is considered as the main reservoir of three zoonotic Bartonella species: Bartonella henselae, Bartonella claridgeiae and Bartonella koechlerae. The cat flea \((Ctenocephalides felis)\) has been experimentally demonstrated to be a competent vector for B. henselae, and has been proposed as the potential vector for the other two Bartonella species. Previous studies have reported a lack of association between the infection status (infected or uninfected) and/or bacteremia levels of Bartonella species in cats and the infection status of their hosted fleas. Nevertheless, to date no study has compared the quantitative distribution of these bacteria in both cats and their associated fleas under natural conditions. Thus, the present study explored these relations by identifying and quantifying the different Bartonella species in both cats and their associated fleas. Therefore, EDTA-blood samples and fleas collected from stray cats were screened for Bartonella. Bacterial loads were quantified by high resolution melt (HRM) real-time qPCR assays. Results indicated a moderate correlation between the Bartonella bacterial loads in the cats and their hosted fleas, when both were infected with the same Bartonella species. Moreover, a positive effect of the host infection-status on the Bartonella bacterial loads of the fleas was observed. Conversely, the cats’ bacterial loads were not affected by the infection-status of their associated fleas. Our results suggest that Bartonella bacterial loads in the fleas are positively affected by the presence of the bacteria in their feline host, probably by multiple acquisitions/accumulation and/or multiplication events.

Fibroblast Growth Factor 23: A New Dimension to Diseases of Calcium-Phosphorus Metabolism.


Traditionally, control of phosphorus in the body has been considered secondary to the tighter control of calcium by parathyroid hormone and vitamin D. However, over the past decade, substantial advances have been made in understanding the control of phosphorus by the so-called phosphatonin system, the lynchpin of which is fibroblast growth factor 23 (FGF23). FGF23 binds to the klotho/FGFR1c receptor complex in renal tubular epithelial cells, leading to upregulation of Na/Pi cotransporters and subsequent excretion of phosphorus from the body. In addition, FGF23 inhibits parathyroid hormone and the renal
1α-hydroxylase enzyme, while it stimulates 24-hydroxylase, leading to decreased 1,25-dihydroxyvitamin D3. FGF23 is intimately involved in the pathogenesis of a number of diseases, particularly the hereditary hypophosphatemic rickets group and chronic kidney disease, and is a target for the development of new treatments in human medicine. Little work has been done on FGF23 or the other phosphatoninis in veterinary medicine, but increases in FGF23 are seen with chronic kidney disease in cats, and increased FGF23 expression has been found in soft tissue sarcomas in dogs.

**Development of a capillary electrophoretic method for determination of plasma clearance of iohexol in dogs and cats.**


Renal function can be monitored by estimation of the glomerular filtration rate (GFR), for example, through measurement of the plasma clearance of a marker that is freely filtrated through the kidney without reabsorption. It has been proposed that iohexol is the most accurate marker for GFR determination in cats and dogs. However, there is a need for a validated capillary electrophoretic method that covers the concentration range for a full curve clearance estimate of iohexol. In the final method, the plasma samples were protein precipitated and the supernatant was analyzed in a background electrolyte containing borate buffer (0.06 m, pH 10.0). The method developed was proved to be linear (concentration range 18-2900 mg/L) and had a good precision (e.g. 2.3-2.9% at 88 mg/L) and accuracy (e.g. 101-105% at 88 mg/L). Finally, the method was compared with a previously published and validated HPLC-UV method by parallel analysis of clinical plasma samples from dogs and cats administered Omnipaque®. This comparison showed excellent agreement between the two methods and no proportional or systematic error was observed. The proposed method is simple and has a low cost per sample, which makes it applicable for routine analysis.

**Enteric protozoa of cats and their zoonotic potential-a field study from Austria.**


Domestic cats can be infected with a variety of enteric protozoa. Genotyping of protozoan species, especially Giardia as the most common, can improve assessment of their relevance as zoonotic agents. For an overview on the occurrence of feline enteric protozoa, 298 faecal samples of cats from private households, catteries and animal shelters in Austria were collected. All samples were examined by flotation and using a rapid test for Giardia (FASTest). For the detection of Tritrichomonas blagburni, freshly voided faeces (n = 40) were processed using a commercial culturing system (InPouch TF-Feline). Genotyping was done at the β-giardin gene loci (each sample) and triosephosphate isomerase gene loci (positive samples) for Giardia and at the 18S rRNA gene (positive samples) for Cryptosporidium. Thirty-seven samples (12.4%) were positive for Giardia by flotation and/or using a rapid test. Cryptosporidium was present in 1.7%, Cystoisospora in 4.0%, Sarcocystis in 0.3% and T. blagburni in 2.5% of the samples. Genotyping revealed Giardia cati, the potentially zoonotic Giardia duodenalis and Cryptosporidium felis. Most of the infected cats had no diarrhoea. Cats from shelters were significantly more often infected than owned cats (p = 0.01). When comparing Giardia detection methods, the rapid test had a higher sensitivity than flotation. Polymerase chain reaction (PCR) results were mostly independent from the other two tests.
Assessment of platelet function in healthy sedated cats using three whole blood platelet function tests.


The objectives of this study were to establish feline references intervals for 3 commercial whole blood platelet function test analyzer systems: Multiplate analyzer (MP; Roche Diagnostics International Ltd., Rotkreuz, Switzerland), Platelet Function Analyzer-100 (PF: Siemens Canada, Mississauga, Ontario, Canada), and Plateletworks Combo-25 kit (PW; Helena Laboratories, Beaumont, TX). Venipuncture was performed on 55 healthy sedated cats, and platelet aggregation in response to adenosine diphosphate (ADP), collagen (COL), and arachidonic acid (AA; MP only) was assessed using citrated blood. For the MP analyzer, median (95% confidence intervals [CIs]) area under curve (Units) for ADP, COL, and AA agonists were 87 (11-176), 81 (32-129), and 91 (59-129), respectively. For the PF analyzer, median (95% CIs) closure time, using COL-ADP cartridges, was 69 (46-89) sec. For the PW assay, median (95% CIs) percent aggregations for ADP and COL agonists were 71 (18-92) and 49 (9-96), respectively, using impedance hematology analyzer platelet counts, and 94 (25-98) and 68 (14-119), respectively, using flow cytometry hematology analyzer platelet counts. There were low correlations between the PF analyzer (COL-ADP cartridge) and MP analyzer (COL agonist; \( \rho = 0.11 \)), and between the PF analyzer (COL-ADP cartridge) and PW assay (COL agonist using impedance platelet counts; \( \rho = 0.14 \)). The PW assay percent aggregations using impedance and flow cytometric platelet counts were correlated for both ADP (\( \rho = 0.64 \)) and COL (\( \rho = 0.64 \)) agonists. Platelet function testing using these tests are feasible in cats, but 95% CIs are wide, so single results may be difficult to interpret. Platelet counting by impedance or flow cytometry may be used for the PW assay but are not interchangeable.

Accuracy of potassium supplementation of fluids administered intravenously.


BACKGROUND: Potassium (K+) supplementation of isotonic crystalloid fluids in daily fluid therapy is commonly performed, yet its accuracy in veterinary medicine is undetermined.
OBJECTIVE: To investigate the accuracy of K(+) supplementation in isotonic crystalloid fluids.
ANIMALS: None. METHODS: Observational study. 210 bags of fluid supplemented with KCl being administered to hospitalized dogs and cats intravenously (IV) were sampled over a 3-month period. Measured K(+) concentration ([K(+) ]) was compared to the intended [K(+) ] of the bag. In a second experiment, 60 stock fluid bags were supplemented to achieve a concentration of 20 mmol/L K(+), mixed well and [K(+) ] was measured. In another 12 bags of 0.9% NaCl, K(+) was added without mixing the bag, and [K(+) ] of the delivered fluid was measured at regular time points during constant rate infusion. RESULTS: The measured [K(+) ] was significantly higher than intended [K(+) ] (mean difference 9.0 mmol/L, range 6.5 to >280 mmol/L, \( P < .0001 \)). In 28% of clinical samples measured [K(+) ] was ≥5 mmol/L different than intended [K(+) ]. With adequate mixing, K(+) supplementation of fluids can be accurate with the mean difference between measured and intended [K(+) ] of 0.7 (95% CI -0.32 to 1.7) mmol/L. When not mixed, K(+) supplementation of 20 mmol/L can lead to very high [K(+) ] of delivered fluid (up to 1410 mmol/L). CONCLUSIONS AND CLINICAL IMPORTANCE: Inadequate mixing following K(+) supplementation of fluid bags can lead to potentially life threatening
IV infused [K(+)]. Standard protocols for K(+) supplementation should be established to ensure adequate mixing.

**Comparing the efficacy of FeLV vaccines: Comment on: Stuke, K. et al. Efficacy of an inactivated FeLV vaccine compared to a recombinant FeLV vaccine in minimum age cats following virulent FeLV challenge. Vaccine 2014;32(22):2599-603.**


**Enteric parasites of free-roaming, owned, and rural cats in prairie regions of Canada.**


The objective of this study was to determine prevalence, intensity, and zoonotic potential of gastrointestinal parasites in free-roaming and pet cats in urban areas of Saskatchewan (SK) and a rural region in southwestern Alberta (AB). Fecal samples were analyzed using a modified double centrifugation sucrose flotation to detect helminth eggs and coccidian oocysts, and an immunofluorescence assay to detect Giardia and Cryptosporidium. Endoparasite prevalence was higher in samples from rural AB cats (41% of 27) and free-roaming SK cats (32% of 161) than client-owned SK cats (6% of 31). Parasites identified using morphological and molecular techniques included *Toxocara cati*, *Toxascaris leonina*, Baylisascaris-type eggs, *Eucoeles aerophilus*, *Taenia taeniaeformis*, *Isospora spp.*, *Cryptosporidium spp.*, and zoonotic genotype A of *Giardia duodenalis*. This study demonstrates significant differences in endoparasite prevalence in feline populations, and the value of molecular techniques in fecal-based surveys to identify and determine parasite zoonotic potential. Abstract available from the publisher.

**Cats as a potential source of emerging influenza virus infections.**


**Current concepts in negative pressure wound therapy.**


Negative pressure wound therapy (NPWT) is becoming recognized in veterinary medicine as a viable option for the management of complex wounds. NPWT has many advantages over traditional wound care and results in quicker and improved wound healing in many instances. This article discusses the art and science of NPWT, as well as the many current indications, complications, advantages and disadvantages, and future directions of NPWT in small animal veterinary medicine. This therapy will likely have a growing role in veterinary medical practice for complicated wound management and other usages in coming years.
Levels of Ancylostoma infections and phylogenetic analysis of cox 1 gene of A. ceylanicum in stray cat faecal samples from Guangzhou, China.


Ancylostoma ceylanicum is a common zoonotic nematode. Cats act as natural reservoirs of the hookworm and are involved in transmitting infection to humans, thus posing a potential risk to public health. The prevalence of feline A. ceylanicum in Guangzhou (South China) was surveyed by polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP). In total, 112 faecal samples were examined; 34.8% (39/112) and 43.8% (49/112) samples were positive with hookworms by microscopy and PCR method, respectively. Among them, 40.8% of samples harboured A. ceylanicum. Twelve positive A. ceylanicum samples were selected randomly and used for cox 1 sequence analysis. Sequencing results revealed that they had 97-99% similarity with A. ceylanicum cox 1 gene sequences deposited in GenBank. A phylogenetic tree showed that A. ceylanicum isolates were divided into two groups: one comprising four isolates from Guangzhou (South China), and the other comprising those from Malaysia, Cambodia and Guangzhou. In the latter group, all A. ceylanicum isolates from Guangzhou were clustered into a minor group again. The results indicate that the high prevalence of A. ceylanicum in stray cats in South China poses a potential risk of hookworm transmission from pet cats to humans, and that A. ceylanicum may be a species complex worldwide.

Protective effect of high concentration of BN52021 on retinal contusion in cat eyes.


BACKGROUND: Blunt injuries/contusion on eyes might cause retina blunt trauma. This study is to evaluate the protective function of BN52021 against retinal trauma. METHODS: A total of 70 cats, 6 months old, were divided into six groups: Group A to E (n = 12) and normal control (N) group (n = 10). The right eyes in Group A to E were contused. All experiments were performed under general anesthetization. Retrolubular injections of medication in right eyes were performed. Cats were administrated with 0.5 mL of normal saline (NS), dimethyl sulphoxide, 0.2 g/L BN52021, 1 g/L BN52021 and 5 g/L BN52021, respectively. Cats in Group N were administrated with 0.5 mL of NS. Intraocular pressure (IOP), flash electroretinogram (ERG), and retinal nerve fiber layer (RNFL) thickness were measured. Hematoxylin and eosin (HE) staining and transmission electron microscope (TEM) were detected. RESULTS: No significant difference was observed in IOP levels among groups. Comparing with cats in Group N, those in Group A to E showed significant lower amplitudes of rod a- and b-waves (P < 0.05). Amplitudes of rod a- and b-waves were increased by administration of high concentration of BN52021 (≥ 1 g/L). Moreover, high concentration of BN52021 decreased the RNFL thickness increased by contusion. Axons in RNFL in Group E arranged neatly at 7 days after modeling. CONCLUSIONS: The degenerated axons caused by contusion were repaired by BN52021. The administration of high concentration of (≥ 1 g/L) BN52021 could partially repair retinal function in contused cat eyes.

Randomized placebo-controlled clinical trial of a chewable formulation of amlodipine for the treatment of hypertension in client-owned cats.

**BACKGROUND:** There is an unmet clinical need for a cat-specific formulation of amlodipine to treat hypertensive cats. **OBJECTIVES:** To assess the efficacy of chewable amlodipine tablets in reducing systolic blood pressure (SBP) in cats diagnosed with systemic arterial hypertension. **ANIMALS:** Seventy-seven client-owned cats with systemic hypertension were included (median age 14 years). **METHODS:** The study was randomized, double-blinded, and placebo-controlled. Forty-two cats received 0.125-0.50 mg/kg amlodipine once daily for 28 days; 35 cats received placebo. After 28 days all cats continued with amlodipine for 2-3 months in an open-label phase. Blood pressure was measured using high definition oscillometry. A responder was defined as a cat showing a decrease of SBP to <150 mmHg at 28 days or a decrease from baseline ≥15%. **RESULTS:** Sixty-one cats completed the study. The responder rate was 63% in amloidipine group and 18% in placebo group. Cats receiving amlodipine were 7.9 (95% CI 2.6-24.1) times more likely to be classified as responders when compared to those receiving placebo (P < .001). From a mean (±SD) baseline value of 181 (±12) mmHg, SBP decreased to 154 (±17) mmHg with amlodipine and to 170 (±21) mmHg with placebo (P < .001). The voluntary acceptance rate of amlodipine formulation was 73%. **CONCLUSIONS AND CLINICAL IMPORTANCE:** The chewable amlodipine tablet effectively reduced SBP compared with placebo in hypertensive cats, and was well-tolerated. It can be used concomitantly with angiotensin-converting enzyme inhibitors and in cats with chronic kidney disease.

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


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

**Prescription of perioperative analgesics by UK small animal veterinary surgeons in 2013.**

Data from a survey conducted in 1996-1997 suggested a low level of perioperative analgesic administration to cats and dogs in the UK. In order to evaluate current practice and attitudes with regards to perioperative analgesic prescription, a cross-sectional survey of UK practising small animal veterinary surgeons was undertaken in spring 2013. Four thousand one hundred paper questionnaires were distributed and the survey was made available online. Seven hundred and twenty valid responses were received and analysed. All respondents had access to at least one non-steroidal anti-inflammatory drug (NSAID) and one opioid within their practice. Respondents considered analgesic efficacy, and degree of intraoperative pain, the most important factors governing their selection of NSAID and opioid analgesics. Perioperative NSAIDs were administered by approximately 98 per cent of respondents to dogs and cats undergoing neutering. Multimodal (opioid+NSAID) analgesia was prescribed by the majority of respondents. Neutering was considered more painful in dogs than in cats, and lower rates of opioid and postdischarge NSAID prescription were reported for cats. Orthopaedic, abdominal and dental surgeries were considered equally painful in dogs and cats. Local analgesic techniques were not commonly used. Analgesic prescription has increased since previous surveys, which should translate to improved animal welfare.

Evaluation of biochemical and haematological parameters and prevalence of selected pathogens in feral cats from urban and rural habitats in South Korea.

OBJECTIVES: In this study, we evaluated the potential association between the habitat types of feral cats and the prevalence of selected infectious pathogens and health status based on a set of blood parameters. METHODS: We live-trapped 72 feral cats from two different habitat types: an urban area (n = 48) and a rural agricultural area (n = 24). We compared blood values and the prevalence of feline immunodeficiency virus (FIV), feline leukaemia virus (FeLV) and haemotropic Mycoplasma infection in feral cats from the two contrasting habitats. RESULTS: Significant differences were observed in several blood values (haematocrit, red blood cells, blood urea nitrogen, creatinine) depending on the habitat types and/or sex. Two individuals from the urban area were seropositive for FIV (3.0%), and eight (12.1%) were positive for FeLV infection (five from an urban habitat and three from a rural habitat). Haemoplasma infection was more common. Based on molecular analysis, 38 cats (54.3%) were positive for haemoplasma, with a significantly higher infection rate in cats from rural habitats (70.8%) compared with urban cats (47.8%). CONCLUSIONS AND RELEVANCE: Our study observed haematological and serum biochemical values, and prevalence of selected pathogens in feral cat populations from two different habitat types. A subset of important laboratory parameters from rural cats showed values under or above the corresponding reference intervals for healthy domestic cats, suggesting potential differences in the health status of feral cats depending on the habitat type. Our findings provide information about the association between 1) blood values (hematological and serum biochemistry parameters) and 2) prevalence of selected pathogen infections with different habitat types; this may be important for veterinarians who work with feral and/or stray cats and for overall cat welfare management.

Relationship of glomerular filtration rate based on serum iodixanol clearance to IRIS staging in cats with chronic kidney disease.
We examined the correlation between the glomerular filtration rate (GFR) estimated from an equation based on the serum iodixanol clearance technique and International Renal Interest Society (IRIS) stages of chronic kidney disease (CKD) in cats. The equation included the injection dose, sampling time, serum concentration, and estimated volume of distribution (Vd) of the isotonic, nonionic, contrast medium iodixanol as a test tracer. The percent changes in the median basal GFR values calculated from the equation in CKD cats resembled those of IRIS stages 1-3. These data validate the association between the GFR derived from the simplified equation and IRIS stages based on the serum creatinine concentration in cats with CKD. They describe the GFR ranges determined using single-sample iodixanol clearance for healthy cats and cats with various IRIS stages of CKD.

Three-year duration of immunity for feline herpesvirus and calicivirus evaluated in a controlled vaccination-challenge laboratory trial.


Feline vaccination guidelines recommend less frequent boosters for the core vaccines (rhinotracheitis, calicivirus, infectious panleucopenia). Most guidelines recommend boosters at 3-yearly intervals after a basic vaccination including primary vaccination and revaccination one year later. The objective of this study was to assess the duration of immunity induced by PUREVAX(R) RCPCh FeLV, a non-adjuvanted vaccine against feline rhinotracheitis, calicivirus, infectious panleucopenia, chlamydioidis and leukemia. After primary vaccination followed by revaccination one year later with a vaccine formulated at minimum dose, the cats were kept in a confined environment and challenged 3 years later with a virulent heterologous strain of feline calicivirus (FCV) and subsequently a virulent strain of feline herpesvirus (FHV). Clinical signs and viral excretion were recorded for two weeks after each viral inoculation. Contemporary unvaccinated cats and new animals added at the time of challenge were used as controls. The vaccination regimen induced a stable and long-lasting humoral response. Vaccination resulted in a significant reduction in the severity of the disease after FHV challenge and in the frequency of cats showing a severe calicivirus (defined as a combination of systemic clinical symptoms and oronasal ulcers). As opposed to the significant reduction of excretion observed a few weeks after primo-vaccination or even one year after vaccination for FCV, viral shedding was not reduced 3 years after revaccination. This study showed that primary vaccination and revaccination one year later with PUREVAX(R) RCPCh FeLV was able to induce 3-year duration of immunity against FCV and FHV. The results and conclusion of this study are consistent with current vaccination guidelines and will allow the veterinarian to adapt the vaccination regimen to the way of life of the cat.

Pollen Allergies in Humans and their Dogs, Cats and Horses: Differences and Similarities.


Both humans and their most important domestic animals harbor IgE and a similar IgE receptor repertoire and expression pattern. The same cell types are also involved in the triggering or regulation of allergies, such as mast cells, eosinophils or T-regulatory cells. Translational clinical studies in domestic animals could therefore help cure animal allergies and at the same time gather knowledge relevant to human patients. Dogs, cats and horses may spontaneously and to different extents develop immediate type symptoms to pollen allergens. The skin, nasal and bronchial reactions, as well as chronic skin lesions due to pollen are in principle comparable to human patients. Pollen of various
species most often causes allergic rhinitis in human patients, whereas in dogs it elicits predominantly eczematous lesions (canine atopic dermatitis), in horses recurrent airway obstruction or hives as well as pruritic dermatitis, and in cats bronchial asthma and so-called cutaneous reactive patterns (eosinophilic granuloma complex, head and neck pruritus, symmetric self-induced alopecia). In human allergy-specific IgE detection, skin tests or other allergen provocation tests should be completed. In contrast, in animals IgE and dermal tests are regarded as equally important and may even replace each other. However, for practical and economic reasons intradermal tests are most commonly performed in a specialized practice. As in humans, in dogs, cats and horses allergen immunotherapy leads to significant improvement of the clinical symptoms. The collected evidence suggests that canines, felines and equines, with their spontaneous allergies, are attractive model patients for translational studies.

**Diagnostic accuracy assessment of cytopathological examination of feline sporotrichosis.**


Sporotrichosis is an implantation mycosis caused by pathogenic species of Sporothrix schenckii complex that affects humans and animals, especially cats. Its main forms of zoonotic transmission include scratching, biting and/or contact with the exudate from lesions of sick cats. In Brazil, epidemic involving humans, dogs and cats has occurred since 1998. The definitive diagnosis of sporotrichosis is obtained by the isolation of the fungus in culture; however, the result can take up to four weeks, which may delay the beginning of antifungal treatment in some cases. Cytopathological examination is often used in feline sporotrichosis diagnosis, but accuracy parameters have not been established yet. The aim of this study was to evaluate the accuracy and reliability of cytopathological examination in the diagnosis of feline sporotrichosis. The present study included 244 cats from the metropolitan region of Rio de Janeiro, mostly males in reproductive age with three or more lesions in non-adjacent anatomical places. To evaluate the inter-observer reliability, two different observers performed the microscopic examination of the slides blindly. Test sensitivity was 84.9%. The values of positive predictive value, negative predictive value, positive likelihood ratio, negative likelihood ratio and accuracy were 86.0, 24.4, 2.02, 0.26 and 82.8%, respectively. The reliability between the two observers was considered substantial. We conclude that the cytopathological examination is a sensitive, rapid and practical method to be used in feline sporotrichosis diagnosis in outbreaks of this mycosis.

**Molecular typing of Sporothrix schenckii isolates from cats in Malaysia.**


Epidemiological data on the aetiologic agents of feline sporotrichosis in Malaysia have not been reported, though human sporotrichosis in Malaysia is reported to be transmitted primarily via cat scratch. To the best of our knowledge, the present report is the first study of the molecular epidemiology of Sporothrix schenckii isolates from cats with sporotrichosis in Malaysia. In the present work, we characterised 18 clinical isolates from cats in Malaysia based on molecular properties, including sequence analyses of the calmodulin gene and the rDNA ITS region and selective PCR of mating type (MAT) loci. In this study, isolates from feline sporotrichosis were identified as a S. schenckii sensu stricto by sequence analyses of the calmodulin gene and the internal transcribed spacer (ITS) region. Notably, phylogenetic analysis of the ITS confirmed assignment to clinical clade D (and not C) of S. schenckii sensu stricto. Therefore, clinical clade D of S. schenckii sensu stricto appeared to
be the prevailing source of feline sporotrichosis in Malaysia. The ratio of MAT1-1-1:MAT1-2-1 in these Malaysian isolates was found to be 1:0. This result suggested that a clonal strain of S. schenckii is the prevailing causative agent of feline sporotrichosis in Malaysia.

Genetic diversity in the feline leukemia virus gag gene.
Feline leukemia virus (FeLV) belongs to the Gammaretrovirus genus and is horizontally transmitted among cats. FeLV is known to undergo recombination with endogenous retroviruses already present in the host during FeLV-subgroup A infection. Such recombinant FeLVs, designated FeLV-subgroup B or FeLV-subgroup D, can be generated by transduced endogenous retroviral env sequences encoding the viral envelope. These recombinant viruses have biologically distinct properties and may mediate different disease outcomes. The generation of such recombinant viruses resulted in structural diversity of the FeLV particle and genetic diversity of the virus itself. FeLV env diversity through mutation and recombination has been studied, while gag diversity and its possible effects are less well understood. In this study, we investigated recombination events in the gag genes of FeLVs isolated from naturally infected cats and reference isolates. Recombination and phylogenetic analyses indicated that the gag genes often contain endogenous FeLV sequences and were occasionally replaced by entire endogenous FeLV gag genes. Phylogenetic reconstructions of FeLV gag sequences allowed for classification into three distinct clusters, similar to those previously established for the env gene. Analysis of the recombination junctions in FeLV gag indicated that these variants have similar recombination patterns within the same genotypes, indicating that the recombinant viruses were horizontally transmitted among cats. It remains to be investigated whether the recombinant sequences affect the molecular mechanism of FeLV transmission. These findings extend our understanding of gammaretrovirus evolutionary patterns in the field.

Trap-spay-vaccinate-release for cats.

Assessment of the accuracy and precision of the i-Smart 30 VET Electrolyte Analyzer in dogs, cats, cattle and pigs.
BACKGROUND: Performance evaluation of point-of-care (POC) electrolyte analyzers is essential for determining their precision and accuracy in clinical practice. OBJECTIVE: The purpose of this study was to validate the i-Smart 30 VET Electrolyte Analyzer for canine, feline, bovine, and porcine samples in comparison with the ion-selective electrolyte analyzer Roche 9180 electrolyte analyzer. METHODS: A total of 400 heparinized whole blood samples were collected and analyzed by both instruments for sodium, potassium, and chloride concentrations. Within-run, between-day, and total imprecision were evaluated. Statistical analyses included tests for correlation, regression, bias, and total error. RESULTS: The coefficients of variation (CV) of both within-run and between-day imprecisions
in the i-Smart 30 VET ranged from 0.4-1.6%. In addition, total CV (0.3-1.7%) and total error (0.7-3.7%) of the i-Smart 30 VET were acceptable according to the ASVCP guidelines (<5%). The correlation between the i-Smart 30 VET and the Roche 9180 was excellent (r > .98). There was no proportional error according to the regression (slope ranges 0.92-1.00, 95% CI includes 1.00), but a constant error was detected for sodium concentration in dogs (interval = 0.5), cattle (interval = 3.0), and pigs (interval = 4.0), and for chloride concentration in cats (interval = 1.0). Most of the bias was within 95% CI, and the total error range (0.8-3.5%) was acceptable according to ASVCP guidelines.

CONCLUSION: The i-Smart 30 VET Electrolyte Analyzer provides precise and accurate measurements of sodium, potassium, and chloride concentrations in whole blood samples from dogs, cats, cattle, and pigs.

**Broad-spectrum inhibitors against 3C-like proteases of feline coronaviruses and feline caliciviruses.**


UNLABELLED: Feline infectious peritonitis and virulent, systemic calicivirus infection are caused by certain types of feline coronaviruses (FCoVs) and feline caliciviruses (FCVs), respectively, and are important infectious diseases with high fatality rates in members of the Felidae family. While FCoV and FCV belong to two distinct virus families, the Coronaviridae and the Caliciviridae, respectively, they share a dependence on viral 3C-like protease (3CLpro) for their replication. Since 3CLpro is functionally and structurally conserved among these viruses and essential for viral replication, 3CLpro is considered a potential target for the design of antiviral drugs with broad-spectrum activities against these distinct and highly important viral infections. However, small-molecule inhibitors against the 3CLpro enzymes of FCoV and FCV have not been previously identified. In this study, derivatives of peptidyl compounds targeting 3CLpro were synthesized and evaluated for their activities against FCoV and FCV. The structures of compounds that showed potent dual antiviral activities with a wide margin of safety were identified and are discussed. Furthermore, the in vivo efficacy of 3CLpro inhibitors was evaluated using a mouse model of coronavirus infection. Intraperitoneal administration of two 3CLpro inhibitors in mice infected with murine hepatitis virus A59, a hepatotropic coronavirus, resulted in significant reductions in virus titers and pathological lesions in the liver compared to the findings for the controls. These results suggest that the series of 3CLpro inhibitors described here may have the potential to be further developed as therapeutic agents against these important viruses in domestic and wild cats. This study provides important insights into the structure and function relationships of 3CLpro for the design of antiviral drugs with broader antiviral activities. IMPORTANCE: Feline infectious peritonitis virus (FIPV) is the leading cause of death in young cats, and virulent, systemic feline calicivirus (vs-FCV) causes a highly fatal disease in cats for which no preventive or therapeutic measure is available. The genomes of these distinct viruses, which belong to different virus families, encode a structurally and functionally conserved 3C-like protease (3CLpro) which is a potential target for broad-spectrum antiviral drug development. However, no studies have previously reported a structural platform for the design of antiviral drugs with activities against these viruses or on the efficacy of 3CLpro inhibitors against coronavirus infection in experimental animals. In this study, we explored the structure-activity relationships of the derivatives of 3CLpro inhibitors and identified inhibitors with potent dual activities against these viruses. In addition, the efficacy of the 3CLpro inhibitors was demonstrated in mice infected with a murine coronavirus. Overall, our study provides the first insight into a structural platform for anti-FIPV and anti-FCV drug development.
Clinical safety of robenacoxib in feline osteoarthritis: results of a randomized, blinded, placebo-controlled clinical trial.


OBJECTIVES: The objective of this study was to evaluate the clinical safety of the nonsteroidal anti-inflammatory drug (NSAID) robenacoxib in cats with osteoarthritis. Degenerate joint disease, including osteoarthritis, is highly prevalent in cats and many cases have associated pain and impaired mobility. Although NSAIDs are used routinely to control pain and inflammation in cats with osteoarthritis, there are safety concerns because of the high concurrent prevalence of chronic kidney disease (CKD) and the paucity of data on the safety of these drugs in target clinical populations.

METHODS: A total of 194 cats with osteoarthritis were recruited and randomly allocated to receive either robenacoxib at a dose of 1.0-2.4 mg/kg (n = 95) or placebo (n = 99) tablets orally daily for 28 days. Safety was assessed in 193 cats, including a subgroup of 40 animals with concurrent CKD, defined as serum creatinine concentration $\geq 1.6$ mg/dl and urine specific gravity <1.030. Safety endpoints included reports of adverse events, results of clinical examinations, including body weight, and clinical chemistry and hematology variables. RESULTS: In all 193 cats and the subgroup of 40 animals with concurrent CKD, there were no differences between groups in frequencies of reported adverse events, body weight change or results of serum or urine chemistry or hematology variables. CONCLUSIONS AND RELEVANCE: Robenacoxib was well tolerated when administered daily for 1 month in cats with osteoarthritis, including cats with evidence of concurrent CKD. There was no clinical indication of damage to the gastrointestinal tract, kidney or liver.

Efficacy and acceptability of the new oral phosphate binder Lenziaren(®) in healthy cats fed a renal diet.


The efficacy and acceptability of the new oral phosphate binder Lenziaren(®) (SBR759) were evaluated in healthy cats fed with a commercial diet containing low amounts of phosphate (‘renal diet’). Lenziaren(®) at 0.125, 0.25, 0.5 and 1 g/day was compared to a reference product Lantharenol(®) (3.0 g/day) and a placebo in a masked, randomized, parallel-group design study in 36 cats (n = 6 per group). All products were mixed with the ration which was fed once daily for 28 days. Lenziaren(®) produced significant dose-related reductions in serum and urine phosphate concentrations, faecal apparent phosphorus digestibility and fractional urinary phosphate excretion. Cats administered Lenziaren(®) consumed significantly less food than the placebo group, but this had no negative impact on body weight or acceptability assessments. When compared to the positive control, Lantharenol(®), Lenziaren(®) was significantly more acceptable (0.125, 0.5 and 1.0 g/day doses), was associated with higher food consumption (0.125, 0.5 and 1.0 g/day doses) and had greater efficacy in reducing serum phosphate (0.5 and 1.0 g/day) and urine phosphate concentrations (1.0 g/day). In conclusion, Lenziaren(®) was an effective oral phosphate binder in healthy cats fed with a renal diet. Lenziaren(®) was well accepted and tolerated. Dosages of 0.25-1.0 g/cat per day are recommended for clinical testing.
Efficacy of Broadline against Capillaria aerophila lungworm infection in cats.

Capillaria aerophila is a globally distributed parasite of the respiratory system of carnivores and can be considered the second most common lungworm after Aelurostrongylus abstrusus in domestic cats in the northern hemisphere. To evaluate the efficacy of Broadline (Merial), a combination of fipronil 8.3% w/v, (S)-methoprene 10% w/v, eprinomectin 0.4% w/v and praziquantel 8.3% w/v against C. aerophila, a controlled study with 20 naturally infected cats was conducted. Following blocking by body weight, cats were allocated randomly to two groups of ten animals each: control (untreated) or treated once with Broadline according to the label instructions. For evaluation of efficacy, faeces were examined for capillarid egg shedding prior to and weekly for 3 weeks after treatment, when the cats were necropsied for C. aerophila recovery. Following single topical administration of Broadline, faecal capillarid egg counts were significantly reduced by 93.5 to 99.1% (p < 0.01) compared to the controls. Cats treated harboured significantly fewer C. aerophila lungworms compared to the untreated controls (efficacy 82.4%, p = 0.016). Results of this study demonstrate that Capillaria lungworm burdens can be markedly reduced and that faecal egg shedding can be substantially lowered or eliminated following a single treatment with Broadline.

Basic biological characterization of feline morbillivirus.

Feline morbillivirus (FmoPV) is an emerging virus that was recently discovered in domestic cats with chronic nephritis. Despite the potential role of FmoPV in chronic nephritis, little is known about its biological characteristics. In this study, we established a quantitative assay of FmoPV by using an indirect immunofluorescence technique. Viral titers of FmoPV were determined in one week. Treatment with polybrene(®) or trypsin which was previously used in virus isolation did not augment the virus titers. FmoPV was notably stable at 4°C, retaining high titers for at least 12 days. Heat-treatment at 60°C and 70°C effectively inactivated FmoPV in 10 and 2 min, respectively. The biological characteristics of FmoPV reported here will be beneficial for establishing an efficient virus isolation method and will provide important information to take a measure to reduce the risk of FmoPV infection.

Deaf white cats.

Outcome and Prognostic Indicators in Cats Undergoing Splenectomy for Splenic Mast Cell Tumors.

This was a multi-institutional retrospective study evaluating the outcome and clinical parameters associated with the postoperative prognosis of 36 cats with splenic mast cell tumors treated with splenectomy. Clinical parameters reviewed included signalment, clinical history, results of staging tests, surgical variables, administration of blood products, presence of metastasis, postoperative
complications, administration of chemotherapy postoperatively, chemotherapy protocol, and response to chemotherapy. Overall median survival time was 390 days (range, 2-1737 days). Administration of a blood product (P <.0001), metastasis to a regional lymph node (P =.022), and evidence of either concurrent or historical neoplasia (P =.037) were negatively associated with survival. Response to chemotherapy (P =.0008) was associated with an improved median survival time. Larger-scale prospective studies evaluating different chemotherapy protocols are required to elucidate the discrepancy between lack of survival benefit with administration of chemotherapy and improvement in survival time with positive response to chemotherapy.

**Decreased expression of endogenous feline leukemia virus in cat lymphomas: a case control study.**


**BACKGROUND:** Cats infected with exogenous feline leukemia virus (exFeLV) have a higher chance of lymphoma development than uninfected cats. Furthermore, an increased exFeLV transcription has been detected in lymphomas compared to non-malignant tissues. The possible mechanisms of lymphoma development by exFeLV are insertional mutagenesis or persistent stimulation of host immune cells by viral antigens, bringing them at risk for malignant transformation. Vaccination of cats against exFeLV has in recent years decreased the overall infection rate in most countries. Nevertheless, an increasing number of lymphomas have been diagnosed among exFeLV-negative cats. Endogenous feline leukemia virus (enFeLV) is another retrovirus for which transcription has been observed in cat lymphomas. EnFeLV provirus elements are present in the germline of various cat species and share a high sequence similarity with exFeLV but, due to mutations, are incapable of producing infectious viral particles. However, recombination between exFeLV and enFeLV could produce infectious particles.

**RESULTS:** We examined the FeLV expression in cats that have developed malignant lymphomas and discussed the possible mechanisms that could have induced malignant transformation. For expression analysis we used next-generation RNA-sequencing (RNA-Seq) and for validation reverse transcription quantitative PCR (RT-qPCR). First, we showed that there was no expression of exFeLV in all samples, which eliminates the possibility of recombination between exFeLV and enFeLV. Next, we analyzed the difference in expression of three enFeLV genes between control and lymphoma samples. Our analysis showed an average of 3.40-fold decreased viral expression for the three genes in lymphoma compared to control samples. The results were confirmed by RT-qPCR. **CONCLUSIONS:** There is a decreased expression of enFeLV genes in lymphomas versus control samples, which contradicts previous observations for the exFeLV. Our results suggest that a persistent stimulation of host immune cells is not an appropriate mechanism responsible for malignant transformation caused by feline endogenous retroviruses.

**Review of enterococci isolated from canine and feline urine specimens from 2006 to 2011.**


Canine and feline urine culture reports and medical records were reviewed at a veterinary teaching hospital from 2006 to 2011 for enterococcal growth, coinfections, antimicrobial resistance, urine sediment findings, clinical signs, and concurrent conditions. Of all of the urine specimens with significantly defined colony-forming units/mL, Enterococcus (E.) faecalis was the only enterococci
isolated from cats and predominated (77.4%) in dogs followed by E. faecium (12.9%), E. durans (3.2%), and other Enterococcus spp. (6.5%). The majority of specimens with significant enterococcal growth resulted in complicated urinary tract infections in 83.9% of dogs and 81.8% of cats. Specimens with only enterococcal growth were more common than those mixed with other bacterial species. Cocci were observed in urine sediments of 8 out of 8 cats and 21 out of 25 dogs with available concurrent urinalyses. Pyuria was noted in 5 out of 8 feline and 15 out of 25 canine urine sediments, and pyuria in dogs was associated with growth of only enterococci on aerobic urine culture. Multidrug resistance was identified in 6 out of 11 cats and 7 out of 31 dogs, and E. faecium isolates from dogs were 4.5× more likely to be multidrug resistant than E. faecalis.

Diagnostic accuracy of tests based on radiologic measurements of dogs and cats: a systematic review.

A systematic review of diagnostic tests based on radiologic measurements of structures in dogs and cats was done in order to reach generalizable conclusions about the value of making such measurements. Literature search was done using the ISI Web of Knowledge (SM) for studies in the subject category Veterinary sciences. Studies were eligible for inclusion that employed length, angle, area or volume measurements from radiographic, ultrasonographic, CT or MR images of dogs or cats as a diagnostic test for a naturally occurring condition, compared the results of imaging with a reference standard, included at least 10 subjects, and sufficient data that a 2 × 2 table of results could be constructed. Quality of studies was assessed using the QUADAS-2 tool. Twenty-six studies were found describing 40 tests that satisfied the inclusion criteria. Tests were radiographic in 22 (55%) instances and ultrasonographic in 18 (45%). Quality of studies was generally low, with a risk of bias in patient selection in 92% studies, performance of the index test in 73% studies, and patient flow in 42% studies. Median (range) number of subjects was 64 (20-305), sensitivity was 77% (38-99%), specificity was 82% (50-99%), positive likelihood ratio was 4.1 (1-103), and negative likelihood ratio was 0.29 (0.01-1). Two studies that compared accuracy of radiographic measurements to subjective image interpretation alone found no difference. Evidence is weak that radiologic measurements of structures in dogs and cats are useful for diagnosis, hence measurements should not be emphasized as a basis for diagnosis in either teaching or clinical imaging reports.

Evaluation of systemic absorption and renal effects of topical ophthalmic flurbiprofen and diclofenac in healthy cats.

OBJECTIVE: To investigate systemic absorption and renal effects of topically applied ophthalmic flurbiprofen and diclofenac in healthy cats. ANIMALS STUDIED: Twelve domestic shorthair cats. PROCEDURES: Cats were randomly assigned to two treatment groups (n = 6) and administered one drop (approximately 40 μL) of either flurbiprofen 0.03% or diclofenac 0.1% in both eyes four times daily (6 am, 12 pm, 6 pm, and 12 am) for 14 days. Blood samples were collected on days 0, 4, 8, 14, 16, and 17 and analyzed by liquid chromatography and mass spectrometry for flurbiprofen and diclofenac plasma concentrations. A complete blood count (CBC), serum chemistry, and urinalysis were analyzed at the beginning of the study (Day 0) and at the end of topical drug administration (Day 15). RESULTS: Both drugs demonstrated systemic absorption. Flurbiprofen was detected (mean ± SD)
at day 4 (237 ± 65 ng/mL), day 8 (396 ± 91 ng/mL), day 14 (423 ± 56 ng/mL), day 16 (350 ± 66 ng/mL), and day 17 (350 ± 66 ng/mL), and diclofenac was detected (mean ± SD) at day 4 (130 ± 44 ng/mL), day 8 (131 ± 25 ng/mL), day 14 (150 ± 36 mg/mL), and sporadically on day 16. Flurbiprofen plasma concentration decreased slowly over 48 h after the last dose. No clinically significant abnormalities were noted in the serum blood urea nitrogen, creatinine, or urine specific gravity at the end of topical drug administration compared to the beginning of the study.

CONCLUSIONS: Flurbiprofen and diclofenac were systemically absorbed after topical administration four times daily to both eyes of healthy cats. Flurbiprofen reached higher plasma concentrations compared to diclofenac.

Effect of ciclosporin and methylprednisolone acetate on cats previously infected with feline herpesvirus 1.


Feline herpesvirus 1 (FHV-1) is a common ocular and respiratory pathogen of cats that can be associated with recurrent clinical signs of disease. Ciclosporin (cyclosporine) is commonly administered per os (PO) for the treatment of a number of inflammatory diseases in cats. A number of client-owned cats administered ciclosporin (cyclosporine) A (CsA) PO to block renal transplant rejection have developed clinical signs of upper respiratory tract disease that may have been from activated FHV-1. In this study, cats experimentally inoculated with FHV-1 several months previously were administered methylprednisolone acetate intramuscularly, CsA PO or a placebo PO. While clinical signs of activated FHV-1 occurred in some cats, disease was mild and self-limited in most cats. There was no vomiting, diarrhea, inappetence, weight loss, polydipsia, polyuria or polyphagia recognized.

Effect of oral administration of cyclosporine on Toxoplasma gondii infection status of cats.


OBJECTIVE: To evaluate whether anti-inflammatory doses of cyclosporine activate Toxoplasma gondii in chronically infected cats or potentiate infection in cats exposed for the first time. ANIMALS: 30 T gondii-negative cats. PROCEDURES: Cats were assigned to 1 of 3 groups (10 cats/group). Group 1 (control) cats were administered a placebo for 126 days; group 2 cats were administered a placebo for 84 days, followed by cyclosporine at 7.5 mg/kg/d, PO, for 42 days; and group 3 cats were administered cyclosporine at 7.5 mg/kg/d, PO, for 126 days. Cats were orally inoculated with T gondii on day 42. Results for fecal flotations, PCR assays, and histologic examinations and IgM and IgG titers were analyzed. Cyclosporine concentrations were measured on selected days. RESULTS: All cats were infected by T gondii and developed signs of self-limiting gastrointestinal tract infection. Group 3 had the highest incidence and severity of CNS and pulmonary histopathologic findings typical of toxoplasmosis. One cat in group 3 died of systemic toxoplasmosis; that cat had a cyclosporine concentration of 1,690 ng/mL. Group 2 cats infected with T gondii before cyclosporine administration did not have repeated oocyst shedding. Group 3 cats shed fewer oocysts for a shorter time than did control cats of group 1. CONCLUSIONS AND CLINICAL RELEVANCE: Oral administration of cyclosporine in accordance with the protocol for this study did not potentiate the enteroepithelial phase
of T gondii infection. Cats with high cyclosporine blood concentrations at the time of primary T gondii infection may be at risk of developing systemic toxoplasmosis.

**Evaluation of viremia, proviral load and cytokine profile in naturally feline immunodeficiency virus infected cats treated with two different protocols of recombinant feline interferon omega.**


This study assesses viremia, provirus and blood cytokine profile in naturally FIV-infected cats treated with two distinct protocols of interferon omega (rFeIFN-ω). Samples from FIV-cats previously submitted to two single-arm studies were used: 7/18 received the licensed/subcutaneous protocol (SC) while 11/18 were treated orally (PO). Viremia, provirus and blood mRNA expression of interleukin (IL)-1, IL-4, IL-6, IL-10, IL-12p40, Interferon-γ and Tumor Necrosis Factor-α were monitored by Real-Time qPCR. Concurrent plasma levels of IL-6, IL-12p40 and IL-4 were assessed by ELISA. IL-6 plasma levels decreased in the SC group (p = 0.031). IL-6 mRNA expression (p = 0.037) decreased in the PO group, albeit not sufficiently to change concurrent plasma levels. Neither viremia nor other measured cytokines changed with therapy. Proviral load increased in the SC group (p = 0.031), which can be justified by a clinically irrelevant increase of lymphocyte count. Independently of the protocol, rFeIFN-ω seems to act on innate immunity by reducing pro-inflammatory stimulus.

**Prevalence of antimicrobial resistance in faecal enterococci from vet-visiting pets and assessment of risk factors.**


The objective of this study was to determine the prevalence of antimicrobial resistance (AMR) exhibited by enterococci isolated from faeces of pets and its underlying risk factors. From September 2009 to May 2012, rectal swabs were collected from 74 dogs and 17 cats, selected from the population of animals visiting the Veterinary Hospital of University of Porto, UPVet, through a systematic random procedure. Animal owners answered a questionnaire about the risk factors that could influence the presence of AMR in faecal enterococci. Enterococci isolation, identification and antimicrobial (AM) susceptibility testing were performed. Data analyses of multilevel, univariable and multivariable generalised linear mixed models were conducted. From all enterococci isolated (n=315), 61 per cent were considered multidrug-resistant, whereas only 9.2 per cent were susceptible to all AMs tested. Highest resistance was found to tetracycline (67.0 per cent), rifampicin (60.3 per cent), azithromycin (58.4 per cent), quinupristin/dalfopristin (54.0 per cent) and erythromycin (53.0 per cent). Previous fluoroquinolone treatments and coprophagic habits were the features more consistently associated with the presence of AMR for three (chloramphenicol, ciprofloxacin and azithromycin) and seven (tetracycline, rifampicin, gentamicin, chloramphenicol, ciprofloxacin, erythromycin and azithromycin), respectively, out of nine AMs assessed. Evaluating risk factors that determine the presence of drug-resistant bacteria in pets, a possible source of resistance determinants to human beings, is crucial for the selection of appropriate treatment guidelines by veterinary practitioners.

**Genotyping coronaviruses associated with feline infectious peritonitis.**
Feline coronavirus (FCoV) infections are endemic among cats worldwide. The majority of infections are asymptomatic or result in only mild enteric disease. However, approximately 5% of cases develop feline infectious peritonitis (FIP), a systemic disease that is a frequent cause of death in young cats. In this study, we report the complete coding genome sequences of six FCoVs: three from faecal samples from healthy cats and three from tissue lesion samples from cats with confirmed FIP. The six samples were obtained over a period of 8 weeks at a single-site cat rescue and rehoming centre in the UK. We found amino acid differences located at 44 positions across an alignment of the six virus translatomes and, at 21 of these positions, the differences fully or partially discriminated between the genomes derived from the faecal samples and the genomes derived from the tissue lesion samples. In this study, two amino acid differences fully discriminated the two classes of genomes: these were both located in the S2 domain of the virus surface glycoprotein gene. We also identified deletions in the 3c protein ORF of genomes from two of the FIP samples. Our results support previous studies that implicate S protein mutations in the pathogenesis of FIP.

Pharmacokinetics and bioavailability of itraconazole oral solution in cats.


OBJECTIVES: The aim of this study was to describe the pharmacokinetics and bioavailability of itraconazole (ITR) oral solution in healthy cats. METHODS: The pharmacokinetics of ITR were studied in eight healthy, fasted cats after a single intravenous (IV) and oral (PO) administration at a dose of 5 mg/kg, in a two-period crossover design study. Blood was obtained at predetermined intervals for the determination of ITR concentrations with high-performance liquid chromatography. Pharmacokinetic characterisation was performed by a non-compartmental method using WinNonlin 5.2.1. RESULTS: After IV administration, the major pharmacokinetic parameters were as follows (mean ± SD): terminal elimination half-life (T1/2λz) 15.8 ± 1.88 h; area under the curve from time zero to infinity (AUC0–∞) 13.9 ± 3.17 h·µg/ml; total body clearance 0.37 ± 0.08 l/h/kg; apparent volume of distribution 8.51 ± 1.92 l/kg; mean residence time 20.6 ± 3.95 h. After PO administration, the principal pharmacokinetic parameters were as follows (mean ± SD): T1/2λz 15.6 ± 3.20 h; AUC0–∞ 7.94 ± 2.83 h·µg/ml; peak concentration 0.70 ± 0.14 µg/ml; time of peak 1.43 ± 0.53 h. The absolute bioavailability of ITR oral solution after oral administration was 52.1 ± 11.6%. CONCLUSIONS AND RELEVANCE: The disposition of ITR oral solution in cats is characterised by a long terminal half-life, a short peak time and moderate bioavailability.

Feline gastrointestinal eosinophilic sclerosing fibroplasia: 13 cases and review of an emerging clinical entity.


OBJECTIVE: Feline gastrointestinal eosinophilic sclerosing fibroplasia (FGESF) is a recently described inflammatory disease of cats affecting stomach or intestines and draining regional lymph nodes. This study presents clinical and laboratory data on 13 newly described cases from Australia (11) and the UK (two). OBSERVATIONS: The disease was most often observed in middle-aged cats (median 7 years of age; interquartile range 5-9 years). Ragdolls (7/13) and males (9/13) were
overrepresented. Cats generally had a long history of vomiting and/or diarrhoea. Lesions were typically large, hard, non-painful, easily palpable and most commonly situated near the pylorus or ileopecticocele junction. Lesions were heterogeneous ultrasonographically and on sectioning at celiotomy or necropsy. Masses were hard and ‘gritty’ on fine-needle aspiration due to internal trabeculae made up of mature collagen bundles. Bacteria were commonly detected within masses (9/13 cases) using either culture or conventional light microscopy and a panel of special stains, and/or fluorescence in situ hybridisation (FISH), although detection often required a diligent search of multiple tissue sections. A consistent bacterial morphology could not be appreciated among the different cases. OUTCOME: Patients were treated with a variable combination of cytoreduction (debulking and biopsy, to complete surgical resection), immunosuppressive therapy and antimicrobial agents. Many cats had a poor outcome, which was attributable to late diagnosis combined with suboptimal management. It is hoped that suggestions outlined in the discussion may improve clinical outcomes and long-term survival in future cases.

Audiogenic reflex seizures in cats.

OBJECTIVES: This study aimed to characterise feline audiogenic reflex seizures (FARS).
METHODS: An online questionnaire was developed to capture information from owners with cats suffering from FARS. This was collated with the medical records from the primary veterinarian. Ninety-six cats were included. RESULTS: Myoclonic seizures were one of the cardinal signs of this syndrome (90/96), frequently occurring prior to generalised tonic-clonic seizures (GTCSs) in this population. Other features include a late onset (median 15 years) and absence seizures (6/96), with most seizures triggered by high-frequency sounds amid occasional spontaneous seizures (up to 20%). Half the population (48/96) had hearing impairment or were deaf. One-third of cats (35/96) had concurrent diseases, most likely reflecting the age distribution. Birmanians were strongly represented (30/96). Levetiracetam gave good seizure control. The course of the epilepsy was non-progressive in the majority (68/96), with an improvement over time in some (23/96). Only 33/96 and 11/90 owners, respectively, felt the GTCSs and myoclonic seizures affected their cat’s quality of life (QoL). Despite this, many owners (50/96) reported a slow decline in their cat’s health, becoming less responsive (43/50), not jumping (41/50), becoming uncoordinated or weak in the pelvic limbs (24/50) and exhibiting dramatic weight loss (39/50). These signs were exclusively reported in cats experiencing seizures for >2 years, with 42/50 owners stating these signs affected their cat’s QoL. CONCLUSIONS AND RELEVANCE: In gathering data on audiogenic seizures in cats, we have identified a new epilepsy syndrome named FARS with a geriatric onset. Further studies are warranted to investigate potential genetic predispositions to this condition.

Antimicrobial susceptibility in bacterial isolates from Norwegian cats with lower urinary tract disease.

Studies of feline lower urinary tract disease (FLUTD) among Norwegian cats have shown higher prevalences of bacterial cystitis than most previously published reports. The aims of the present study were to identify bacterial isolates obtained from the urine of Norwegian cats with FLUTD and their susceptibility to antimicrobial agents. Eighty-two bacterial isolates from 72 urine cultures obtained from 71 different cats were included. Escherichia coli, Staphylococcus species, Enterococcus species
and Streptococcus species were the most frequently detected. The percentages of isolates susceptible to the included antimicrobial agents were as follows: enrofloxacin - 92%; trimethoprim/sulfonamide - 91%; nitrofurantoin - 89%; tetracycline - 78%; ampicillin - 73%; amoxicillin/clavulanic acid - 72%; trimethoprim - 68%; amoxicillin - 58%; cephalaxin - 51%; spiramycin - 39%; penicillin - 34%; fucidic acid - 34%; lincomycin - 27%. Although several tendencies towards increasing antimicrobial resistance were detected among the isolates included, the species of bacteria isolated and their patterns of antimicrobial resistance were, in general, in concurrence with the existing literature. Thus, the results do not fully explain the higher prevalence of bacterial cystitis found in Norwegian cats. Moreover, additional explanatory factors beside the inclusion of primary accession cases rather than referred cases were not found.

Risk factors for idiopathic cystitis in Norwegian cats: a matched case-control study.

OBJECTIVES: The aim of the study was to compare a group of cats with feline idiopathic cystitis (FIC) with a group of control cats without present or previous signs of lower urinary tract disease in order to identify factors in characteristics, personality, behaviour, environment and daily life that would make them more susceptible to the disease. METHODS: The study was a matched case-control study comparing results from telephone interviews based on a standardised questionnaire. The questions were organised into six subject groups: the characteristics of the cat; the cat’s environment; the presence of other pets in the household; the cat’s feeding and drinking regime; management of the cat’s litter box; and the cat’s opportunity to perform natural behaviour. RESULTS: The results from the present study showed that a cat diagnosed with FIC was more likely to be overweight and to be of a nervous disposition than the control cats. In addition, several differences between cases and controls were detected at a univariable level of analysis, related to outdoor access and the cats’ perceived safety and comfort in their home environments. While not significant after multivariable analysis, these variables may still be of importance owing to potential interrelations. CONCLUSIONS AND RELEVANCE: Several significant differences between cats with FIC and control cats were revealed, and the results support the hypothesis of environmental stress as being a potential factor in the development of FIC.

Prevalence of Dirofilaria immitis antigen and antibodies to Leishmania infantum in cats from southern Portugal.

Vector-borne diseases (VBD) are caused by a range of pathogens transmitted by arthropods and have emerged in recent years, showing a wider geographic distribution and increased global prevalence. In addition to their veterinary medical importance, cats play a central role in the transmission cycles of some VBD agents by acting as reservoirs, amplifying hosts or sentinels. The aim of this study was to determine the prevalence of Dirofilaria immitis antigen and of antibodies to Leishmania infantum in a sample of 271 cats from southern Portugal. Thirteen (4.8%) cats were positive to D. immitis, while antibodies to L. infantum were detected in 10 (3.7%) animals. The prevalence of D. immitis and L. infantum in the feline population from southern Portugal should alert for the need to implement control measures to protect animals and people from these zoonotic parasites. Furthermore, both parasitoses must be included in the differential diagnosis in feline clinical practice.
Analytical validation of an immunoassay for the quantification of N-terminal pro-B-type natriuretic peptide in feline blood.


The measurement of N-terminal pro-B-type natriuretic peptide (NT-proBNP), a biomarker for heart stress detectable in blood, has been shown to have clinical utility in cats with heart disease. A second-generation feline enzyme-linked immunosorbent assay (Cardiopet® proBNP, IDEXX Laboratories Inc., Westbrook, Maine) was developed to measure NT-proBNP in routine feline plasma or serum samples with improved analyte stability. Results of the analytical validation for the second-generation assay are presented. Analytic sensitivity was 10 pmol/l. Accuracy of 103.5% was determined via serial dilutions of 6 plasma samples. Coefficients of variation for intra-assay, interassay, and total precision were in the ranges of 1.6-6.3%, 4.3-8.8%, and 10.1-15.1%, respectively. Repeatability across 2 lots for both serum and plasma had an average coefficient of determination (r²) of 0.99 and slope of 1.11. Stability of the analyte was found to be high. In serum samples held at 4°C for 24-72 hr, the mean percent recovery from time zero was ≥99%. In serum samples held at 25°C for 24 hr, the mean percent recovery from time zero was 91.9%, and for 48 hr, 85.6%. A method comparison of the first- and second-generation assays with a clinically characterized population of cats revealed no difference in the tests’ ability to differentiate levels of NT-proBNP between normal cats and cats with occult cardiomyopathy (P < 0.001). Results from our study validate that the second-generation feline Cardiopet proBNP assay can measure NT-proBNP in routine feline plasma and serum samples with accuracy and precision.

Computed tomographic findings in cats with mycobacterial infection.


OBJECTIVES: The objective of this study was to describe the CT imaging findings associated with confirmed mycobacterial infection in cats. METHODS: CT images from 20 cats with confirmed mycobacterial disease were retrospectively reviewed. Five cats underwent conscious full-body CT in a VetMouseTrapTM device. All other cats had thoracic CT performed under general anaesthesia, with the addition of CT investigation of the head/neck, abdomen and limbs in some cases. RESULTS: Mycobacterial infection was seen most frequently in adult (mean age 7.4 years; range 0.6-14 years) neutered male cats (11/20). The most common infections were Mycobacterium microti (6/20) and Mycobacterium bovis (6/20). CT abnormalities were most commonly seen in the thorax, consisting of bronchial (9/20), alveolar (8/20), ground glass (6/20) or structured interstitial (15/20) lung patterns, which were often mixed. Tracheobronchial, sternal and cranial mediastinal lymphadenomegaly were common (16/20). Other abnormalities included abdominal (8/13) or peripheral (10/18) lymphadenomegaly, hepatosplenomegaly (7/13), mixed osteolytic/osteoproliferative skeletal lesions (7/20) and cutaneous or subcutaneous soft tissue masses/nodules (4/20). CONCLUSIONS AND RELEVANCE: CT of feline mycobacteriosis shows a wide range of abnormalities, often involving multiple organ systems and mimicking many other feline diseases. Mycobacteriosis should be considered in the differential diagnosis of thoracic, abdominal and skeletal disorders in cats.
Periodic hypokalaemic polymyopathy in Burmese and closely related cats: a review including the latest genetic data.


GLOBAL IMPORTANCE: Hypokalaemic polymyopathy is a genetic disease of Burmese cats that has been encountered in Australasia, Europe and South Africa. CLINICAL FEATURES: Affected cats usually present with signs of muscle weakness and muscle pain in the first year of life. Although certain clinical features, such as ventroflexion of the head and neck, are especially characteristic, some cats do not display these signs. Usually weakness is periodic or episodic, but occasionally it is incessant. DIAGNOSTIC CHALLENGES: In the past, diagnosis was problematic in that clinical signs and a lowered serum potassium concentration were not always observed synchronously. This necessitated serial serum potassium concentration determinations, testing of serum creatine kinase activity and exclusion of other potential causes of muscle disease in cats (including muscular dystrophies, Toxoplasma myositis, immune-mediated polymyositis, organophosphorus intoxication and envenomations). Signs in affected cats often waxed and waned, possibly in response to changes in dietary factors and stress, and some cats could apparently ‘grow out of’ the condition. RECENT ADVANCES AND FUTURE PROSPECTS: Recent molecular genetics research has identified a single nonsense mutation in the gene (WNK4) coding for lysine-deficient 4 protein kinase, an enzyme present primarily in the distal nephron. The underlying pathomechanism in affected cats is therefore likely to be a potassium wasting nephropathy, as this enzyme is involved in complex sodium/potassium exchange mechanisms in the kidney. Additional functional characterisation of the condition is warranted to define precisely how, why and when the serum potassium concentration declines. The diagnosis of Burmese hypokalaemia is now straightforward, as an inexpensive PCR test can identify affected homozygous individuals, as well as carriers. The elimination of this condition from the Burmese breed, and also from pedigree cats infused with Burmese lines, such as the Bombay, Tonkinese and Tiffany breeds, should therefore be possible.

Lack of effects of intramuscular medetomidine on intraocular pressure in clinically normal cats.


OBJECTIVES: This study aimed to determine the effects of intramuscular medetomidine on the results of tonometry in healthy cats. METHODS: Sixteen healthy cats were randomly divided into two groups of eight cats. The first group was sedated with intramuscular medetomidine alone (100 µg/kg) and the second group received only saline (0.5 ml/5 kg). Intraocular pressure (IOP) values were measured immediately before (T0) and after the injections at 15 mins (T15) and 25 mins (T25) in both groups. RESULTS: Sedation with medetomidine did not cause a statistically significant change in the mean IOP values. The pretreatment mean ± SD IOPs in the treatment and control groups were 16.2 ± 3.1 and 15.9 ± 4.0 mmHg, respectively. In the medetomidine group the mean ± SD IOPs at T15 and T25 were 16.1 ± 4.1 (P = 0.9) and 14.6 ± 2.2 (P = 0.1). CONCLUSIONS AND RELEVANCE: Based on this study in healthy cats, medetomidine may be a good choice as a sedative agent in uncooperative cats when IOP measurements are needed. Further investigations in cats with abnormal IOPs are warranted.

Comparison of endoscopy and sonography findings in dogs and cats with histologically confirmed gastric neoplasia.
OBJECTIVE: To compare sonographic and endoscopic findings in a group of dogs and cats with histologically confirmed gastric neoplasia. METHODS: Retrospective analysis of cases with concurrent abdominal ultrasound and endoscopy to evaluate the presence of gastric wall abnormalities, location and tumour appearance between the two examinations. Sonographic findings of the small intestines, liver, spleen and lymph nodes were recorded. Comparison of the findings from each test and assessment of predictive characteristics for neoplasia was evaluated. RESULTS: In total 17 dogs and 5 cats were included. Sonography identified 50% and endoscopy identified 95% of all gastric neoplasms. Lymphoma was the most commonly missed tumour by sonography. There was sonographic and endoscopic tumour location agreement in 36% of cases (Cohen’s kappa = 0.25). Animals with sonographically normal small intestines had a statistically greater probability of gastric neoplasia (P = 0.035). All cats had lymphoma (P < 0.001). CLINICAL SIGNIFICANCE: Sonography and endoscopy are useful for the diagnosis of gastric neoplasia. Endoscopy is more accurate in identifying gastric neoplasia; however, sonography can raise the clinical suspicion for gastric neoplasia and may provide a less invasive means of gathering information before endoscopy. Intraluminal gastric gas or fluid may limit diagnostic capabilities of sonographic evaluation.

Serum aldosterone and cortisol concentrations before and after suppression with fludrocortisone in cats: a pilot study.


Primary hyperaldosteronism is an increasingly recognized syndrome in cats, and diagnosis can be difficult. A potential diagnostic method has been reported, utilizing oral fludrocortisone administered twice daily for 4 days followed by collection of urine. In the current study, we sought to determine if blood sampling and a shorter dosing period would provide a possible means to test for primary hyperaldosteronism. Also, cortisol concentrations were measured to assess the potential of fludrocortisone to act as a glucocorticoid in cats. In phase I, 8 healthy laboratory cats were studied in a placebo-controlled, crossover design. Serum aldosterone and cortisol concentrations were measured before and on the second, third, and fourth day of treatment and compared within groups. In phase II, based on the results obtained in phase I, 8 healthy client-owned cats were administered 3 doses of fludrocortisone or placebo. Serum aldosterone and cortisol concentrations were compared before and after treatment within groups. In both phases, serum aldosterone and cortisol concentrations were significantly suppressed in fludrocortisone-treated cats. Thus, it was determined that oral administration of fludrocortisone causes suppression of serum aldosterone in healthy adult cats after only 3 doses. Further research is needed to determine the effects of oral fludrocortisone in cats with primary hyperaldosteronism and cats with other disorders causing hypertension and/or hypokalemia to determine if this protocol can be used as a tool for the definitive diagnosis of primary hyperaldosteronism.

Effect of One-Lung Ventilation With or Without Low-Pressure Carbon Dioxide Insufflation on Cardiorespiratory Variables in Cats Undergoing Thoracoscopy.

OBJECTIVES: To document a technique for one-lung ventilation (OLV) in cats and evaluate the effect of low-pressure carbon dioxide insufflation and OLV (OLV-CDI) on cardiorespiratory variables in cats. STUDY DESIGN: Prospective randomized study. ANIMALS: Cats (n = 6). METHODS: General anesthesia was induced using a standardized anesthetic protocol. A thermodilution catheter was placed into the pulmonary artery using fluoroscopic guidance. Two 6 mm thoracoscopic cannulae were placed at a subxiphoid and intercostal location, respectively, to allow direct observation of all lung lobes. OLV was induced using an endobronchial blocker, which was placed into the right and left main stem bronchi in randomized order using bronchoscopic guidance. Cardiorespiratory variables were measured at 5 and 30 minutes after induction of OLV and subsequently at 5 and 30 minutes after initiation of OLV-CDI at intra-thoracic pressures of 3 mmHg. RESULTS: Left-sided OLV was successful in 5 cats, right-sided OLV was successful in 2 cats, and neither was successful in 1 cat. No significant effects on hemodynamic variables or oxygen delivery were observed after right or left-sided OLV alone. Hemodynamic variables were also well-preserved after OLV-CDI; however, oxygen delivery was significantly lower after left OLV-CDI compared with right OLV-CDI, and in 2 cats, severe desaturation occurred after L-OLV-CDI before the 30 minute time point. CONCLUSIONS: OLV can be used in cats for thoracoscopic interventions. Although right OLV-CDI was tolerated better than left OLV-CDI, the technique requires further investigation before it can be recommended for widespread clinical use.

Pharmacology of topical prostaglandin F2 α analogs and their place in the treatment of glaucoma in small animals.


A distinguishing feature of the most common types of glaucoma is an increased intra-ocular pressure (IOP), which has a damaging effect on optic nerve axons, leading to the progressive loss of retinal ganglion cells. Therefore, IOP-lowering medications are the mainstay of glaucoma therapy. Topical prostaglandin F2 α analogs (PGAs) are a relatively new class of ocular hypotensive drugs, which have made a huge impact on the treatment of glaucoma in dogs. This study summarizes the current state of knowledge on the mechanism of action of these agents and their effect on IOP in dogs and cats. It also discusses potential harmful side effects of PGAs and presents contemporary opinions about their role and place in the medical management of glaucoma in small animals.

Antiviral effect of mefloquine on feline calicivirus in vitro.


Feline calicivirus (FCV) is an important viral pathogen of domestic cats causing clinical signs ranging from mild to severe oral ulceration or upper respiratory tract disease through to a severe fatal systemic disease. Current therapeutic options are limited, with no direct acting antivirals available for treatment. This study screened a panel of 19 compounds for potential antiviral activity against FCV strain F9 and recent field isolates in vitro. Using a resazurin-based cytopathic effect (CPE) inhibition assay, mefloquine demonstrated a marked inhibitory effect on FCV induced CPE, albeit with a relatively low selectivity index. Orthogonal assays confirmed inhibition of CPE was associated with a significant reduction in viral replication. Mefloquine exhibited a strong inhibitory effect against a panel of seven recent FCV isolates from Australia, with calculated IC50 values for the field isolates approximately 50% lower than against the reference strain FCV F9. In vitro combination therapy with recombinant
Feline interferon-ω, a biological response modifier currently registered for the treatment of FCV, demonstrated additive effects with a concurrent reduction in the IC50 of mefloquine. These results are the first report of antiviral effects of mefloquine against a calicivirus and support further in vitro and in vivo evaluation of this compound as an antiviral therapeutic for FCV.

**Pulmonary cowpox in cats: five cases.**

CASE SERIES SUMMARY: This case series documents five cases of pneumonia (with pleural effusion in three cases) caused by cowpox virus (CPxV) in domestic cats. Predisposition to pneumonia may have resulted from mixed infections in two cases (feline herpesvirus and Bordetella bronchiseptica in one cat, and Mycoplasma species in the other). RELEVANCE AND NOVEL INFORMATION: As well as diagnostic confirmation by previously described methods of virus isolation from skin lesions, and demonstration of pox virions in skin samples using electron microscopy and inclusion bodies in histological preparations, this is the first report of diagnosis by virus isolation from bronchoalveolar lavage fluid or pleural fluid, and demonstration of inclusion bodies in cytological preparations. This is also the first series to report treatment with interferon omega (IFN-ω). Two cats survived, both of which had been treated with IFN-ω. As CPxV represents a serious zoonotic risk it is an important differential diagnosis of pneumonia in cats.

**A comparison of biochemical and histopathologic staging in cats with chronic kidney disease.**

Chronic kidney disease (CKD) is prevalent in elderly cats. Frequently, a diagnosis is made in later stages of disease, by which time many renal lesions are irreversible. As such, little headway has been made in identifying an etiology and preventing this common disease. The aim of this study was to evaluate the presence and severity of both reversible and irreversible histopathologic changes in the kidneys of cats at each stage of CKD and, in addition, to determine if lesion prevalence and character were different between stages. A total of 46 cats with CKD were classified according to the International Renal Interest Society (IRIS) as stage I (3 cats), stage II (16 cats), stage III (14 cats), and stage IV (13 cats). Eleven young, nonazotemic and 10 geriatric, nonazotemic cats were included as controls. The severity of tubular degeneration, interstitial inflammation, fibrosis, and glomerulosclerosis was significantly greater in later stages of CKD compared with early stages of disease. Proteinuria was associated with increased severity of tubular degeneration, inflammation, fibrosis, tubular epithelial single-cell necrosis, and decreased normal parenchyma. Presence of hyperplastic arteriolosclerosis, fibrointimal hyperplasia, or other vascular lesions were not found to be significantly different between hypertensive and normotensive cats. The greater prevalence and severity of irreversible lesions in stage III and IV CKD implies that therapeutic interventions should be targeted at earlier stages of disease.

**Retinopathy associated with ivermectin toxicosis in five cats.**
CASE DESCRIPTION: 5 cats from the same household were examined because of a sudden onset of tremors, obtundation, blindness, and dilated pupils. Approximately 12 hours prior to evaluation, the owner had attempted to treat the cats for suspected ear mite (Otodectes cynotis) infestation by aural administration of a dose of an ivermectin paste intended for oral administration to horses (approx 22 mg/cat; half of the dose was administered into each ear canal). CLINICAL FINDINGS: None of the cats had a menace response; all cats had dilated pupils and decreased pupillary light reflexes. Findings of fundic examination were unremarkable. Electroretinography was performed for 4 cats, and b-wave responses were identified as diminished. Toxicological assay results for serum samples from 2 cats confirmed the presence of ivermectin (450 and 610 µg/L). TREATMENT AND OUTCOME: All 5 cats made a complete recovery. Neurologic abnormalities resolved, electroretinographic responses improved, and vision was restored with no residual pathological changes detected during fundic examination. CLINICAL RELEVANCE: To the authors’ knowledge, the information reported here provided the first description of ophthalmic and electroretinographic findings in cats with ivermectin toxicosis resulting from transdermal administration. Clinical signs, including blindness, resolved with time, without additional medical intervention.

Feline cutaneous mast cell tumours: a UK-based study comparing signalment and histological features with long-term outcomes.


Feline cutaneous mast cell tumours (MCTs) are the second most common skin tumour in cats; but, unlike in dogs, there is currently no histological grading system for this type of tumour. This study recorded the signalment and anatomical location from a total of 287 records from MCTs submitted to a UK commercial diagnostic laboratory. Questionnaires to submitting practices were used to obtain follow-up data, and the histological features of 86 tumours were evaluated from 69 cats with a known outcome. Twelve of the 69 cats (17.4%) died of MCTs, with significantly lower survival times. The median age of cats presenting with MCTs was 11 years (range 5 months-19 years), with no sex or neutered status predilection. Some pedigree breeds were more susceptible to MCTs, particularly the Siamese, Burmese, Russian Blue and Ragdoll. The head was the most common site in younger cats, compared with the trunk in older cats. The number of tumours had no effect on survival. A new subcategory of well-differentiated MCTs with prominent multinucleated cells is described, and three of the five cats with this novel form died from MCT-related disease. There was an association between mitotic index and survival time. However, there was no significant association between histological type and survival.

Seroprevalence of Encephalitozoon cuniculi in wild rodents, foxes and domestic cats in three sites in the United Kingdom.


Encephalitozoon cuniculi is an obligate intracellular microsporidian that is the causal agent of encephalitozoonosis, an important and emerging disease in both humans and animals. Little is known about its occurrence in wildlife. In this study, serum samples from 793 wild rodents [178 bank voles (BV), 312 field voles (FV) and 303 wood mice (WM)], 96 foxes and 27 domestic cats from three study areas in the UK were tested for the presence of antibodies to E. cuniculi using a direct agglutination test
(DAT). Seroprevalence in the wild rodents ranged from 1.00% to 10.67% depending on species (overall 5.31%) and was significantly higher in foxes [49.50% (50/96)]. None of the 27 cats sampled were found to be seropositive. This is the first report of seroprevalence to E. cuniculi in BV, FV, WM, foxes and cats in the UK and provides some evidence that foxes could act as sentinels for the presence of E. cuniculi in rodents. The study demonstrates that wildlife species could be significant reservoirs of infection for both domestic animals and humans.

Social referencing and cat-human communication.
Cats’ (Felis catus) communicative behaviour towards humans was explored using a social referencing paradigm in the presence of a potentially frightening object. One group of cats observed their owner delivering a positive emotional message, whereas another group received a negative emotional message. The aim was to evaluate whether cats use the emotional information provided by their owners about a novel/unfamiliar object to guide their own behaviour towards it. We assessed the presence of social referencing, in terms of referential looking towards the owner (defined as looking to the owner immediately before or after looking at the object), the behavioural regulation based on the owner’s emotional (positive vs negative) message (vocal and facial), and the observational conditioning following the owner’s actions towards the object. Most cats (79%) exhibited referential looking between the owner and the object, and also to some extent changed their behaviour in line with the emotional message given by the owner. Results are discussed in relation to social referencing in other species (dogs in particular) and cats’ social organization and domestication history.

Systematic review of the behavioural assessment of pain in cats.
OBJECTIVES: The objectives were to review systematically the range of assessment tools used in cats to detect the behavioural expression of pain and the evidence of their quality; and to examine behavioural metrics (considering both the sensory and affective domains) used to assess pain.
METHODS: A search of PubMed and ScienceDirect, alongside articles known to the authors, from 2000 onwards, for papers in English was performed. This was followed by a manual search of the references within the primary data sources. Only peer-reviewed publications that provided information on the assessment tool used to evaluate the behavioural expression of pain in cats, in conscious animals (not anaesthetised cats), were included. RESULTS: No previous systematic reviews were identified. One hundred papers were included in the final assessment. Studies were primarily related to the assessment of pain in relation to surgical procedures, and no clear distinction was made concerning the onset of acute and chronic pain. Ten broad types of instrument to assess pain were identified, and generally the quality of evidence to support the use of the various instruments was poor. Only one specific instrument (UNESP-Botucatu scale) had published evidence of validity, reliability and sensitivity at the level of a randomised control trial, but with a positive rather than placebo control, and limited to its use in the ovariohysterectomy situation. The metrics used within the tools appeared to focus primarily on the sensory aspect of pain, with no study clearly discriminating between the sensory and affective components of pain. CONCLUSIONS AND RELEVANCE: Further studies are required to provide a higher quality of evidence for methods used to assess pain in cats. Furthermore, a consistent definition for acute and chronic pain is needed. Tools need to be validated that can detect
pain in a range of conditions and by different evaluators (veterinary surgeons and owners), which consider both the sensory and emotional aspects of pain.

**Polymorphisms in the canine and feline renin-angiotensin-aldosterone system genes.**

**Alternate-day dosing of itraconazole in healthy adult cats.**

The current available formulations of itraconazole are not ideal for dosing in cats. The capsular preparation often does not allow for accurate dosing, the oral solution is difficult to administer and poorly tolerated, and the bioavailability of compounded formulations has been shown to be poor in other species. The aim of this study was to evaluate every other day dosing of 100 mg itraconazole capsule in healthy adult cats. Ten healthy adult cats received a 100 mg capsule of itraconazole orally every 48 h for 8 weeks. Peak and trough serum concentrations of itraconazole were measured weekly using high-performance liquid chromatography (HPLC). Physical examination, complete blood count (CBC), and chemistry profiles were performed weekly. The dosage regimen achieved average therapeutic trough concentrations (>0.5 µg/mL) within 3 weeks. The protocol yielded no adverse effects in 8 of the 10 study cats, with affected cats recovering fully with discontinuation of the drug and supportive care. At 8 weeks, an average peak concentration of $1.79 \pm 0.952$ µg/mL (95% CI: 0.996-2.588) and an average trough concentration of $0.761 \pm 0.540$ µg/mL (95% CI: 0.314-1.216) were achieved. Overall, a 100 mg every other day oral dosage regimen for itraconazole in cats yielded serum concentrations with minimal fluctuation and with careful monitoring may be considered for treatment of cats with systemic fungal disease.

**Decontamination of laundry exposed to Microsporum canis hairs and spores.**

OBJECTIVES: The objective of this study was to determine the efficacy of decontamination of fabric exposed to Microsporum canis hairs and spores by mechanical washing using hot or cold water with or without a sodium hypochlorite additive, and to field test a washing protocol for terry cloth and denim exposed to M canis via direct contact with infected cats. METHODS: Cotton, terry cloth and denim fabric swatches were contaminated with isolated infective spores and hairs and then washed in water at temperatures of 30°C and 60°C, with and without a sodium hypochlorite additive, and with and without mechanical drying. Terry cloth and denim were contaminated by direct contact with infected kittens and washed at 30°C until culture-negative. RESULTS: All prelaundering samples had >300 colony forming units (cfu)/plate. Experimentally contaminated fabrics were culture-negative, regardless of fabric type, water temperature, the presence or absence of sodium hypochlorite, or tumble drying after one wash. After one wash, 22/34 (65%) of terry cloth towels and 12/20 (60%) denim fabric squares were culture-positive, but the infective load was minimal (1-5 cfu/plate). After two washes in cold water there was no detectable contamination of fabric. The rinse water was not contaminated with
spores. The laundry tub was easily decontaminated via mechanical cleaning followed by use of a disinfectant. CONCLUSIONS AND RELEVANCE: Washable textiles exposed to M canis can be decontaminated via mechanical washes in cold water without the addition of bleach. Two washes are recommended to ensure removal of spores. Laundry can be effectively decontaminated by washing twice in cold water on a long wash cycle (for 14 mins). It is important to ensure maximal agitation (ie, the machine should not be overloaded).

Highly pathogenic beta-hemolytic streptococcal infections in cats from an institutionalized hoarding facility and a multi-species comparison.


OBJECTIVES: Two hundred and thirty-four cats removed from an institutionalized hoarding facility (IHF) demonstrated severe, atypical pyogenic infections. The objective of this study was to document the various syndromes and determine the etiology of the infections. METHODS: All cats were evaluated initially after removal from the IHF and on a daily basis for at least 15 months. Samples were collected and sent for culture/susceptibility and histopathology to commercial laboratories or stored at -20(o)C. PCR was performed using universal bacterial primers to amplify the 16S-23S rRNA intergenic spacer region. PCR products were sequenced to determine the identity of the bacteria. RESULTS: Multiple pyogenic syndromes were documented, including abscesses of the paws and carpal/tarsal regions in 82 cats, acute rhinitis with profuse purulent nasal discharge in 68 cats and cervical lymphadenitis with abscession unassociated with any wounding in 51 cats. Many cats exhibited septic arthritis with total joint destruction, necrotizing fasciitis, meningitis, otitis and septic shock, often leading to death. These infections appeared to be caused by beta-hemolytic streptococci (BHS) based on initial culture results (n = 10), though speciation was unclear and some samples (n = 6) produced no growth. Based on PCR results (n = 26), Streptococcus canis was the only bacterial species or the dominant species identified in each sample, and was the only species present in all the regions associated with the pyogenic infections. CONCLUSIONS AND RELEVANCE: Horizontal gene transfer and loss of the cell wall may account for the discrepancy between the culture and PCR results and the highly pathogenic nature of S canis in this particular population of cats. A large-scale hoarding situation with multiple animal species, overcrowding, stress and mixing of animals from many geographical regions created ideal conditions for these events to occur. The specific virulence factors present may be more useful in predicting the pathophysiology of BHS infections than the species of Streptococcus found in the host per se.

Felis catus papillomavirus types 1 and 4 are rarely present in neoplastic and inflammatory oral lesions of cats.


Oral squamous cell carcinomas (OSCCs) are common feline cancers. Why OSCCs are so common in cats is unknown; however, 25% of human OSCCs are caused by papillomaviruses (PVs). Two feline oral PVs (FcaPV-1 and 4) are recognized. As PVs are highly host and location specific, if PVs do cause feline OSCCs, FcaPV-1 and 4 are the most likely etiological agents. PCR primers specific for FcaPV-1 amplified DNA from 1 of 36 feline OSCCs and 1 of 16 inflammatory oral lesions. No DNA was amplified by primers specific for FcaPV-4. PV DNA was not amplified from any additional sample
using consensus primers. No PV cytopathology was visible in the OSCC that contained FcaPV-1 DNA, but viral cytopathology was present in a focus of epithelial hyperplasia in the non-neoplastic sample. This study does not support a PV etiology of feline OSCCs, but shows that FcaPV-1 can asymptomatically infect the mouth of cats.

**Genomic characterisation of the feline sarcoid-associated papillomavirus and proposed classification as Bos taurus papillomavirus type 14.**


Feline sarcoïds are rare mesenchymal neoplasms of domestic and exotic cats. Previous studies have consistently detected short DNA sequences from a papillomavirus (PV), designated feline sarcoid-associated papillomavirus (FeSarPV), in these neoplasms. The FeSarPV sequence has never been detected in any non-sarcoïd sample from cats but has been amplified from the skin of cattle suggesting that feline sarcoïds are caused by cross-species infection by a bovine papillomavirus (BPV). The aim of the present study was to determine the genome of the PV that contains the FeSarPV sequence. Using the circular nature of PV DNA, four specifically designed ‘outward facing’ primers were used to amplify two approximately 4,000 bp DNA segments from a feline sarcoïd. The two PCR products were sequenced using next generation sequencing and the full genome of the PV, consisting 7,966 bp, was assembled and analysed. Phylogenetic analysis revealed the PV was closely related to the species 4 delta BPVs-1, -2, and -13, but distantly related to any carnivoran PV genus. These results are consistent with feline sarcoïds being caused by a BPV type and we propose a classification of BPV-14 for this novel PV. Initial analysis suggests that, like other delta BPVs, the BPV-14 E5 protein could cause mesenchymal proliferation by binding to the platelet derived growth factor beta receptor. Interestingly BPV-14 has not been detected in any equine sarcoïd suggesting that BPV-14 has a host range that is limited to bovids and felids.

**ASSOCIATIONS BETWEEN ULTRASOUND AND CLINICAL FINDINGS IN 87 CATS WITH URETHRAL OBSTRUCTION.**


Urethral obstruction is a life-threatening form of feline lower urinary tract disease. Ultrasonographic risk factors for reobstruction have not been previously reported. Purposes of this retrospective cross-sectional study were to describe urinary tract ultrasound findings in cats following acute urethral obstruction and determine whether ultrasound findings were associated with reobstruction. Inclusion criteria were a physical examination and history consistent with urethral obstruction, an abdominal ultrasound including a full evaluation of the urinary system within 24 h of hospitalization, and no cystocentesis prior to ultrasound examination. Medical records for included cats were reviewed and presence of azotemia, hyperkalemia, positive urine culture, and duration of hospitalization were recorded. For medically treated cats with available outcome data, presence of reobstruction was also recorded. Ultrasound images were reviewed and urinary tract characteristics were recorded. A total of 87 cats met inclusion criteria. Common ultrasound findings for the bladder included echogenic urine sediment, bladder wall thickening, pericystic effusion, hyperechoic pericystic fat, and increased urinary echoes; and for the kidneys/ureters included pyelectasia, renomegaly, perirenal effusion, hyperechoic perirenal fat, and ureteral dilation. Six-month postdischarge outcomes were available for 61 medically
treated cats and 21 of these cats had reobstruction. No findings were associated with an increased risk of reobstruction. Ultrasonographic perirenal effusion was associated with severe hyperkalemia (P = 0.009, relative risk 5.75, 95% confidence interval [1.54-21.51]). Findings supported the use of ultrasound as an adjunct for treatment planning in cats presented with urethral obstruction but not as a method for predicting risk of reobstruction.

Management of endemic Microsporum canis dermatophytosis in an open admission shelter: a field study.
Endemic Microsporum canis dermatophytosis was identified in a large, open admission, private, no-kill shelter that admitted >1200 cats per year. Fungal culture (FC) screening revealed that 166/210 (79%) and 38/99 (38%) cats in the non-public and public area were culture positive, respectively. However, pending screening FC results, the 99 cats in the public area were treated with once-weekly lime sulfur rinses and monitored with once-weekly FC. Cats in the non-public area were not treated. When FC results were available, cats were separated into low-risk (n = 61) and high-risk (n = 38) groups based upon the presence or absence of skin lesions. Low-risk cats continued to receive once-weekly topical lime sulfur and rapidly achieved culture-negative status. High-risk cats were divided into two groups based upon the number of colony-forming units/plate (low or high). All 38 cats were treated with twice-weekly lime sulfur and oral terbinafine and within 6-7 weeks only 5/38 cats were still FC-positive. These cats were moved to a separate room. Dermatophytosis was eradicated within 5 months; eradication was prolonged owing to reintroduction of disease into the remaining room of cats under treatment from three kittens returning from foster care. Continued admissions and adoptions were possible by the institution of intake procedures that specifically included careful Wood’s lamp examination to identify high-risk cats and use of a ‘clean break strategy’.

OBJECTIVE: To describe the clinical features and outcomes of critically ill dogs and cats with acute kidney injury (AKI) receiving fenoldopam infusions compared to patients with AKI that did not receive fenoldopam. DESIGN: Retrospective clinical study from May 1, 2008 until June 1, 2012. SETTING: Private emergency and specialty referral hospital. ANIMALS: Client-owned dogs (28) and cats (34) with AKI that received fenoldopam compared with similar patients with AKI (30 dogs and 30 cats) that did not. INTERVENTIONS: None. MEASUREMENTS AND MAIN RESULTS: The medical records of 62 critically ill dogs and cats with AKI that received fenoldopam were reviewed. Presenting clinical signs, physical examination findings, and primary and secondary disease processes were identified in all patients. The mean number of days on fenoldopam was 1.5 days (range 0.3-4.0 days) for dogs and 1.9 days (range 1.0-4.0 days) for cats. Eleven of 28 (39%) dogs survived to discharge and 13 of 34 (38%) of the cats survived to discharge. Of the animals in the group receiving fenoldopam that died, the majority (84%) were euthanized. Potential adverse reactions were evaluated, with hypotension being the most commonly encountered adverse effect (7% of fenoldopam group [FG] dogs and 23% of FG cats). When compared with patients with AKI that did not receive fenoldopam, no significant differences were found between the groups with regards to survival, length of hospital stay, adverse
High-frequency ultrasound of Peyer’s patches in the small intestine of young cats.


**OBJECTIVES:** A previously unreported, asymmetrically positioned hypoechoic extra layer (APHEL) in the submucosa of the feline distal jejunum and ileum has been recognised using high-frequency ultrasound. The objectives of this study were to characterise the APHEL histologically, and to describe the prevalence and ultrasonographic features of the APHEL in a population of clinically healthy young cats. **METHODS:** In an anatomical study, two cats were autopsied and histopathology of the small intestine was performed. An APHEL was detected with ultrasound in the distal jejunum and ileum ante-mortem in the first cat and post mortem in the second cat. Samples for histopathology were obtained from these areas. In the second, prospective part of the study, to document the presence or absence of an APHEL, high-frequency (18 MHz) ultrasound was performed of the intestinal tract in 20 other cats. These cats were client-owned cats aged 6-18 months presented for neutering. The cats were included in the study based on a normal clinical examination, lack of previous or concurrent signs of disease, and having no abnormalities detected at abdominal ultrasound. **RESULTS:** Histopathology from the distal jejunum and ileum in the two cats in the anatomical part of the study showed that the APHEL represented asymmetrically positioned normal lymphatic tissue (Peyer’s patches) in the lamina propria and submucosa. In the second part of the study, an APHEL was identified in the submucosa of the distal part of the jejunum and ileum in all 20 cats. Additionally, a similar layer could also be seen further proximally in the jejunum in 10 (50%) of the cats. The thickness of the APHEL was 1.0 mm in both jejunum and ileum. **CONCLUSIONS AND RELEVANCE:** Presumed normal lymphatic tissue in the small intestinal submucosa can be seen with high-frequency ultrasound and is a common finding in young cats.

Studying Cat (Felis catus) Diabetes: Beware of the Acromegalic Imposter.


Naturally occurring diabetes mellitus (DM) is common in domestic cats (Felis catus). It has been proposed as a model for human Type 2 DM given many shared features. Small case studies demonstrate feline DM also occurs as a result of insulin resistance due to a somatotrophinoma. The current study estimates the prevalence of hypersomatotropism or acromegaly in the largest cohort of diabetic cats to date, evaluates clinical presentation and ease of recognition. Diabetic cats were screened for hypersomatotropism using serum total insulin-like growth factor-1 (IGF-1; radioimmunoassay), followed by further evaluation of a subset of cases with suggestive IGF-1 (>1000 ng/ml) through pituitary imaging and/or histopathology. Clinicians indicated pre-test suspicion for hypersomatotropism. In total 1221 diabetic cats were screened; 319 (26.1%) demonstrated a serum IGF-1 >1000 ng/ml (95% confidence interval: 23.6-28.6%). Of these cats a subset of 63 (20%)
underwent pituitary imaging and 56/63 (89%) had a pituitary tumour on computed tomography; an additional three on magnetic resonance imaging and one on necropsy. These data suggest a positive predictive value of serum IGF-1 for hypersomatotropism of 95% (95% confidence interval: 90-100%), thus suggesting the overall hypersomatotropism prevalence among UK diabetic cats to be 24.8% (95% confidence interval: 21.2-28.6%). Only 24% of clinicians indicated a strong pre-test suspicion; most hypersomatotropism cats did not display typical phenotypical acromegaly signs. The current data suggest hypersomatotropism screening should be considered when studying diabetic cats and opportunities exist for comparative acromegaly research, especially in light of the many detected communalities with the human disease.

Questions about the article: ‘Alfaxalone or ketamine-medetomidine in cats undergoing ovariohysterectomy: a comparison of intraoperative parameters and postoperative pain’.

Higher PBDE serum concentrations may be associated with feline hyperthyroidism in Swedish cats.

Serum from 82 individual cats was analyzed for decabromobiphenyl (BB-209), polybrominated diphenyl ethers (PBDEs), hydroxylated PBDEs (OH-PBDEs), and 2,4,6-TBP in order to study differences in body burden between healthy and sick cats diagnosed with Feline Hyperthyroidism (FH). Within the study group, 60 of these cats had a euthyroid (n = 23) or hyperthyroid (n = 37) status, all of which were used in the comparison. This study shows that hyperthyroid compared to euthyroid cats have higher serum concentrations for some of the investigated PBDEs (BDE-99, BDE-153, and BDE-183) and CB-153 on a fat weight basis. Further, it is intriguing, and beyond explanation, why the flame retardant BB-209 (discontinued in 2000) is present in all of the cat serum samples in concentrations similar to BDE-209. Median BDE-47/-99 ratios are 0.47 and 0.32 for healthy and euthyroid cats, respectively, which differs significantly from Swedes, where the ratio is 3.5. Another important finding is the occurrence of very low levels or the absence of hydroxylated PBDE metabolites in the cats. In addition, the major OH-PBDE, 6-OH-BDE47, is likely of natural origin, probably ingested via cat food. The statistics indicate an association between elevated PBDE concentrations in the cats and FH.

Azoospermia with variable testicular histology after 7 months of treatment with a deslorelin implant in toms.

The main aim of the study was to assess whether the longer use of a GnRH-agonist implant (deslorelin 4.7 mg, Suprelorin) in toms would lead to the suppression of spermatogenesis comparable with histologic appearance in juvenile animals as was previously described in dogs. The other aims were to monitor the progression of the testes size decrease and development of azoospermia 5 to 7 months after
treatment with a GnRH-agonist implant. In animals, 5, 6, and 7 months after GnRH-agonist implant insertion, variable histological appearance of germinal epithelium was found, when tubules with elongating spermatids, round spermatids, spermatocytes, and spermatogonia as the most developed germinal cells were found in each group of toms. In all male cats, 5, 6, and 7 months after implant insertion, testosterone concentrations and testes size significantly differed between the first and the last visit. All animals, except one tom castrated 5 months after implant insertion, developed complete azoospermia. However, in this tom, all spermatozoa were immotile. Treatment with the subcutaneous GnRH-agonist implant was well tolerated, and no treatment-related adverse effects were noted. These results reported the efficacy of 4.7-mg deslorelin implant (Suprelorin) during its 7 months of use. The complete azoospermia confirms its contraceptive effect. However, the histologic evaluation revealed a great individual variability in the degree of spermatogenic suppression. The question as to whether spermatogenesis in toms can be suppressed in all males to the level of spermatogonia/primary spermatocytes after prolonged exposure to deslorelin has yet to be answered.

Abdominal Ultrasound Examination Findings in 534 Hyperthyroid Cats Referred for Radioiodine Treatment Between 2007-2010.


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

Moderate dietary supplementation with vitamin E enhances lymphocyte functionality in the adult cat.


This study aimed to determine the effects of supplemental Vit E and/or Se on selected parameters of the immune system of the cat. Nine diets were fed in a 3 × 3 factorial design with no supplementation (control (C)); and either moderate (M); or high (H) levels of Vit E (0, 225 or 450 mg/kg DM diet) and/or Se (0, 2 or 10 mg/kg DM diet) added to a complete and balanced basal diet. After 28 days of feeding, enhanced lymphocyte proliferative responses to Concanavalin A and phytohaemagglutinin
were observed (P < 0.05) in cats fed diets containing supplemental Vit E, irrespective of whether they also contained Se. Cats in the MVitE, HVitE, MVitE + MSe, HVitE + MSe, and HVitE + HSe groups all showed enhancement of phagocytic activity compared to control animals (P < 0.001). Our results indicate that a supplemental level of 225 mg/kg DM diet Vit E appears to have beneficial effects on immune function in the cat.

Measurement of feline lipase activity using a dry-chemistry assay with a triolein substrate and comparison with pancreas-specific lipase (Spec fPL(TM)).


Pancreatic lipase immunoreactivity (Spec fPL) is currently considered to be the most accurate blood test for the diagnosis of feline pancreatitis. In this study, we measured lipase activity in cats using a newer catalytic lipase assay of dry-chemistry system (FDC-v-LIP) to determine the reference range and compared the results with those for Spec fPL. Based on the results of healthy cats, the reference range of FDC-v-LIP was determined to be less than 30 U/l. FDC-v-lip did not show a strong correlation with Spec fPL in cats with various diseases, which resulted in the low sensitivity and positive predictive value. However, the relatively high (>90%) specificity and negative predictive value indicated that FDC-v-LIP could be a useful patient-side screening test for the exclusion of feline pancreatitis.

Conjunctival swab PCR to detect Leishmania spp. in cats.


The relevance of the dog as a source of visceral leishmaniasis infection is known, but the role of cats as reservoir hosts for leishmaniasis is not yet fully clear. This study assessed the efficacy of conjunctival swab PCR (CS-PCR) in the detection of cats infected by Leishmania spp. The results were seven (13.5%) cats positive for Leishmania spp. in the PCR, in 52 cats tested from Pirassunuga-SP and Ilha Solteira-SP. From the city of Pirassununga - SP 28.6% (2/7) were positive and from the city of Ilha Solteira - SP 11.1% (5/45) were positive. The results showed that CS-PCR was capable of detecting cats infected by this protozoan. Conjunctival swab samples proved easier to perform in cats, which might facilitate studies on the frequency and distribution of feline leishmaniasis.

Occurrence of Aelurostrongylus abstrusus (Railliet, 1898) in Danish cats: A modified lung digestion method for isolating adult worms.


As Aelurostrongylus abstrusus has not previously received any attention in Denmark, the study investigated the occurrence of A. abstrusus amongst outdoor cats from three regions (Zealand, Møn and Falster). Faeces and lungs were collected from a total of 147 feral (n=125) and domesticated cats (n=22) that were euthanized for reasons outside of this project. Using a modified Baermann technique 13.6% of the cats was found to be positive. A new lung digestion technique was developed to isolate eggs, L1 and adult worms from the lungs and this revealed a prevalence of 15.6% although with regional differences. There was no difference between feral and domesticated cats just as sex and age
did not appear to influence prevalence and worm burden. Lungs from 87% of the positive cats had the gross appearance compatible with A. abstrusus and the severity of lung damage was proportional to LPG and number of adult worms. Within the current range of worm burdens (0-22) with a mean intensity of 7 per cat, there was a correlation with faecal excretion levels of L1 that ranged from 0-39,000 with a mean of 3586 per cat. The results did not indicate that the infection levels of the naturally infected cats were substantially affected by acquired immunity, but further studies are needed to determine the importance of host immune responses in regulating parasite populations.


OBJECTIVES: Resistance to transportation and stressful veterinary visits are major causes for a decrease in feline veterinary care. Few options exist for oral sedatives to reduce cats’ anxiety prior to veterinary visits. The purpose of this study was to evaluate the safety and efficacy of oral trazodone for use as a single dose agent for sedation in cats. METHODS: Six laboratory cats were given single 50, 75 and 100 mg doses of trazodone and placebo. Trazodone 100 mg and placebo treatments were randomized. Pre- and post-study laboratory values and physical examinations were compared. During each 4 h period post-treatment, sedation was measured via accelerometers and video observations scored by an observer blinded to treatment. Examinations were performed on the cats 90 mins after treatment, and their behavioral responses scored by the same blinded observer. RESULTS: No adverse effects or changes in physical examinations or laboratory values were detected as a result of trazodone administration. Accelerometer data showed trazodone 50, 75 and 100 mg caused sedation as measured by activity reduction (83%, 46% and 66%, respectively). In contrast, there was a 14% activity increase after placebo. There was a significant reduction in video observation scores when cats were given trazodone 100 mg compared with placebo. Mean latency to peak sedation for trazodone 100 mg occurred at 2 h. Scores for behavioral response to examination, performed at 90 mins post-treatment, were not significantly different between cats receiving trazodone 100 mg and placebo. CONCLUSIONS AND RELEVANCE: Trazodone was well tolerated in this population of cats and caused appreciable sedation at all doses. Behavior during examination was not significantly different when cats received trazodone 100 mg compared with placebo. Further studies are recommended to investigate the use of oral trazodone in cats for the purpose of decreasing anxiety associated with transportation and examination.


BACKGROUND: Oclacitinib is a Janus kinase inhibitor that decreases pruritus and lesions in allergic dogs. In cats, it is able to inhibit interleukin-31-induced pruritus; no information is available on its clinical effectiveness. HYPOTHESIS/OBJECTIVES: To evaluate the efficacy, ease of administration and tolerability of oclacitinib in feline nonflea-, nonfood-induced hypersensitivity dermatitis. METHODS: Cats >12 months of age and >3 kg body weight with a diagnosis of nonflea-, nonfood-induced hypersensitivity dermatitis were treated with oclacitinib, 0.4-0.6 mg/kg orally (p.o.) twice daily for 2 weeks, then once daily for an additional 14 days. Clinical lesions were evaluated with the Scoring Feline Allergic Dermatitis (SCORFAD) system and pruritus was evaluated with a 10-cm-long visual
analog scale (VAS) before and at the end of the study. Owners assessed global efficacy, ease of
administration and tolerability with a four-point scale. RESULTS: Twelve cats were treated with a
mean initial oclacitinib dose of 0.47 mg/kg p.o. twice daily. There was good improvement in
SCORFAD and VAS pruritus scores in five of 12 cases, while the other cats were unchanged,
deteriorated or dropped out due to treatment failure. Owners scored global efficacy as good/excellent in
two of 12 cases and ease of administration and tolerability as good/excellent in 10 of 12.
CONCLUSIONS AND CLINICAL IMPORTANCE: Oclacitinib at 0.4–0.6 mg/kg p.o. may be an
effective and safe drug for some cats with nonflea-, nonfood-induced hypersensitivity dermatitis.
Further studies are needed to identify the most effective dose range for this species.

The role of wild canids and felids in spreading parasites to dogs and cats in Europe. Part II:
Helminths and arthropods.
Otranto D., Cantacessi C., Dantas-Torres F., Brianti E., Pfeffer M., Genchi C., Guberti V., Capelli G. &
Deplazes P. (2015) *Vet Parasitol*

Over the last few decades, ecological factors, combined with everchanging landscapes mainly linked to
human activities (e.g. encroachment and tourism) have contributed to modifications in the transmission
of parasitic diseases from domestic to wildlife carnivores and vice versa. In the first of this two-part
review article, we have provided an account of diseases caused by protozoan parasites characterised by
a two-way transmission route between domestic and wild carnivore species. In this second and final
part, we focus our attention on parasitic diseases caused by helminth and arthropod parasites shared
between domestic and wild canids and felids in Europe. While a complete understanding of the
biology, ecology and epidemiology of these parasites is particularly challenging to achieve, especially
given the complexity of the environments in which these diseases perpetuate, advancements in current
knowledge of transmission routes is crucial to provide policy-makers with clear indications on
strategies to reduce the impact of these diseases on changing ecosystems.

The role of wild canids and felids in spreading parasites to dogs and cats in Europe: Part I:
Protozoa and tick-borne agents.
Otranto D., Cantacessi C., Pfeffer M., Dantas-Torres F., Brianti E., Deplazes P., Genchi C., Guberti V.
& Capelli G. (2015) *Vet Parasitol*

Over the last few decades, the world has witnessed radical changes in climate, landscape, and
ecosystems. These events, together with other factors such as increasing illegal wildlife trade and
changing human behaviour towards wildlife, are resulting into thinning boundaries between wild
canids and felids and their domestic counterparts. As a consequence, the epidemiology of diseases
caused by a number of infectious agents is undergoing profound realjustements, as pathogens adapt to
new hosts and environments. Therefore, there is a risk for diseases of wildlife to spread to domestic
carnivores and vice versa, and for zoonotic agents to emerge or re-emerge in human populations.
Hence, the identification of the hazards arising from the co-habitation of these species is critical in
order to plan and develop adequate control strategies against these pathogens. In the first of this two-
part article, we review the role that wild canids and felids may play in the transmission of protozoa and
arthropod-borne agents to dogs and cats in Europe, and provide an account of how current and future
progress in our understanding of the ecology and epidemiology of parasites, as well as of host-parasite
interactions, can assist efforts aimed at controlling parasite transmission.
A valentine-shaped cardiac silhouette in feline thoracic radiographs is primarily due to left atrial enlargement.


Conflicting information has been published regarding the cause of a valentine-shaped cardiac silhouette in dorsoventral or ventrodorsal thoracic radiographs in cats. The purpose of this retrospective, cross-sectional study was to test the hypothesis that the valentine shape is primarily due to left atrial enlargement. Images for cats with a radiographic valentine-shaped cardiac silhouette and full echocardiography examination were retrieved and independently reviewed. A subjective scoring system was used to record severity of radiographic valentine shape. Subjective radiographic evidence of left atrial enlargement in a radiographic lateral projection and a final diagnosis based on medical records were also recorded. A total of 81 cats met inclusion criteria. There was a strong positive correlation (P < 0.001) between echocardiographic left atrial size and severity of radiographic valentine shape. There was no effect of echocardiographic right atrial size on the severity of valentine shape, except when concurrent with severe left atrial enlargement. In this situation, right atrial enlargement increased the likelihood of observing a severe valentine shape. There was no effect of right atrial enlargement on the shape of the cardiac silhouette when left atrial enlargement was absent or only mild to moderate. There was no correlation between the category of final diagnosis of cardiac disease and the severity of valentine shape. Findings from this study supported the hypothesis that a valentine-shaped cardiac silhouette in radiographs is due primarily to left atrial enlargement in cats, with right atrial enlargement only impacting the shape if concurrent with severe left atrial enlargement.

Feline hyperparathyroidism: pathophysiology, diagnosis and treatment of primary and secondary disease.


PRACTICAL RELEVANCE: Hyperparathyroidism exists in primary and secondary forms. Primary hyperparathyroidism has typically been considered a disease that uncommonly affects cats, but this condition is more prevalent than previous diagnoses would suggest. Secondary hyperparathyroidism may be caused by either nutritional influences (ie, nutritional secondary hyperparathyroidism) or chronic kidney disease (ie, renal secondary hyperparathyroidism). Tertiary hyperparathyroidism has yet to be documented in veterinary medicine, but it is possible that this condition occurs in some cats following longstanding renal secondary hyperparathyroidism. CLINICAL CHALLENGES: Diagnosis of this group of calcium metabolic disorders presents a number of challenges for the clinician. For example, clinical signs can be non-specific and, especially in the case of primary hyperparathyroidism, there is often a low index of suspicion for the disease; careful sample handling is required for testing of parathyroid hormone (PTH) and ionized calcium levels; and there is currently no feline-specific assay for PTH, which has implications for test sensitivity and interpretation of results. AIMS: This article briefly outlines PTH and calcium physiology by way of introduction to a review of PTH measurement and interpretation. Various forms of feline hyperparathyroidism are then described, encompassing diagnosis and treatment options.
Comparative Efficacy of Feline Leukemia Virus (FeLV) Inactivated Whole-Virus Vaccine and Canarypox Virus-Vectored Vaccine during Virulent FeLV Challenge and Immunosuppression.


Four vaccines for feline leukemia virus (FeLV) are available in the United States. This study’s purpose was to compare the efficacy of Nobivac feline 2-FeLV (an inactivated, adjuvanted whole-virus vaccine) and PureVax recombinant FeLV (a live, canarypox virus-vectored vaccine) following FeLV challenge. Cats were vaccinated at 9 and 12 weeks with Nobivac feline 2-FeLV (group A, n = 11) or PureVax recombinant FeLV (group B, n = 10). Group C (n = 11) comprised unvaccinated controls. At 3 months postvaccination, cats were immunosuppressed and challenged with FeLV-A/61E. The outcomes measured were persistent antigenemia at 12 weeks postchallenge (PC) and proviral DNA and viral RNA at 3 to 9 weeks PC. Persistent antigenemia was observed in 0 of 11 cats in group A, 5 of 10 cats in group B, and 10 of 11 cats in group C. Group A was significantly protected compared to those in groups B (P < 0.013) and C (P < 0.0001). No difference was found between groups B and C (P > 0.063). The preventable fraction was 100% for group A and 45% for group B. At 9 weeks PC, proviral DNA and viral RNA were detected 1 of 11 cats in group A, 6 of 10 cats in group B, and 9 of 11 cats in group C. Nucleic acid loads were significantly lower in group A than in group C (P < 0.01). Group A had significantly lower proviral DNA loads than group B at weeks 6 to 9 (P < 0.02). The viral RNA loads were significantly lower in group A than in group B at weeks 7 to 9 (P < 0.01). The results demonstrate that Nobivac feline 2-FeLV-vaccinated cats were fully protected against persistent antigenemia and had significantly smaller amounts of proviral DNA and plasma viral RNA loads than PureVax recombinant FeLV-vaccinated cats and unvaccinated controls.

A randomized, controlled clinical trial of intravenous lipid emulsion as an adjunctive treatment for permethrin toxicosis in cats.


OBJECTIVE: To assess for any clinical benefit of intravenous lipid emulsion (ILE) for permethrin toxicosis in cats by comparing the progression of clinical signs of cats before and after treatment with ILE to cats treated with a saline control. To accomplish this objective, a clinical staging system for cats withpermethrin toxicosis was developed and validated. DESIGN: Prospective, multicenter, randomized, controlled clinical trial. SETTING: University veterinary teaching hospital and 12 private veterinary emergency hospitals. ANIMALS: Thirty-four client-owned cats with permethrin toxicosis. INTERVENTIONS: A clinical staging system was designed based on abnormalities found on physical examination of cats with permethrin toxicosis. The clinical staging system had 6 stages, ranging from Stage A for cats with no abnormalities to Stage F for cats with grand mal seizures. The system was validated for intraviewer and interviewer variability. Cats in the clinical trial were randomized to receive 15 mL/kg of either intravenous 0.9% saline (control) or 20% ILE over 60 minutes. For each cat, a clinical stage was recorded at set time points before and after the randomized treatment was administered. The distribution of clinical stage stratified over time was compared across treatment groups. MEASUREMENTS AND MAIN RESULTS: The clinical staging system showed excellent repeatability (P = 1.0) and reliability (P = 1.0). In the clinical trial, there was a significant difference in the distribution of clinical stages over time (P < 0.001) and from presentation stage to Stage B (P = 0.006), with ILE-treated cats (n = 20) having lower clinical stages earlier than control cats (n = 14). There was no significant difference in signalment, body weight, or supportive treatment between the
LeishVet update and recommendations on feline leishmaniosis.

Limited data is available on feline leishmaniosis (FeL) caused by Leishmania infantum worldwide. The LeishVet group presents in this report a review of the current knowledge on FeL, the epidemiological role of the cat in L. infantum infection, clinical manifestations, and recommendations on diagnosis, treatment and monitoring, prognosis and prevention of infection, in order to standardize the management of this disease in cats. The consensus of opinions and recommendations was formulated by combining a comprehensive review of evidence-based studies and case reports, clinical experience and critical consensus discussions. While subclinical feline infections are common in areas endemic for canine leishmaniosis, clinical illness due to L. infantum in cats is rare. The prevalence rates of feline infection with L. infantum in serological or molecular-based surveys range from 0 % to more than 60 %. Cats are able to infect sand flies and, therefore, they may act as a secondary reservoir, with dogs being the primary natural reservoir. The most common clinical signs and clinicopathological abnormalities compatible with FeL include lymph node enlargement and skin lesions such as ulcerative, exfoliative, crusting or nodular dermatitis (mainly on the head or distal limbs), ocular lesions (mainly uveitis), feline chronic gingivostomatitis syndrome, mucocutaneous ulcerative or nodular lesions, hypergammaglobulinaemia and mild normocytic normochromic anaemia. Clinical illness is frequently associated with impaired immunocompetence, as in case of retroviral coinfections or immunosuppressive therapy. Diagnosis is based on serology, polymerase chain reaction (PCR), cytology, histology, immunohistochemistry (IHC) or culture. If serological testing is negative or low positive in a cat with clinical signs compatible with FeL, the diagnosis of leishmaniosis should not be excluded and additional diagnostic methods (cytology, histology with IHC, PCR, culture) should be employed. The most common treatment used is allopurinol. Meglumine antimoniate has been administered in very few reported cases. Both drugs are administered alone and most cats recover clinically after therapy. Follow-up of treated cats with routine laboratory tests, serology and PCR is essential for prevention of clinical relapses. Specific preventative measures for this infection in cats are currently not available.

Effects of two calculolytic diets on parameters of feline mineral metabolism.

OBJECTIVES: To evaluate the influence of two feline calculolytic diets on selected parameters of mineral metabolism. MATERIALS AND METHODS: Two dry commercial diets designed for struvite urolith dissolution were evaluated in 14 cats. The study was designed as a two-sequence, four-period crossover protocol with a baseline period, two 60-day “run-in” periods in which calculolytic diets (Diet 1 and Diet 2) were fed and one 30-day “wash-out” period. Data are expressed as median (range). RESULTS: Feeding the calculolytic diets for two months did not alter plasma concentrations of calcium, phosphorus, magnesium and parathyroid hormone. A significant (P < 0.05 in each case)
decline in calcitriol was observed after administering both diets from 236.4 (122.4-429.6) to 170.4 (108.0-394.3) pmol/L (Diet 1) and from 278.4 (153.6-492.0) to 177.1 (87.6-392.4) pmol/L (Diet 2). Cats fed Diet 1 showed a significant increase in urine calcium concentration (from 0.3 (0.2-0.5) to 0.4 (0.3-0.7) mmol/L). Magnesium concentration in urine was significantly increased with both diets, from 1.4 (0.1-1.7) to 1.5 (1.3-2.4) mmol/L (Diet 1) and from 1.1 (0.4-1.9) to 2.0 (0.1-3.1) mmol/L (Diet 2). 

CLINICAL SIGNIFICANCE: Both diets resulted in an increased urinary concentration of magnesium, through different mechanisms: urine acidification (Diet 1) and increased sodium load (Diet 2).

Pharmacokinetics of oral transmucosal and intramuscular dexmedetomidine combined with buprenorphine in cats.


Plasma concentrations and pharmacokinetics of dexmedetomidine and buprenorphine after oral transmucosal (OTM) and intramuscular (i.m.) administration of their combination in healthy adult cats were compared. According to a crossover protocol (1-month washout), a combination of dexmedetomidine (40 µg/kg) and buprenorphine (20 µg/kg) was given OTM (buccal cavity) or i.m. (quadriceps muscle) in six female neutered cats. Plasma samples were collected through a jugular catheter during a 24-h period. Plasma dexmedetomidine and buprenorphine concentrations were determined by liquid chromatography-tandem mass spectrometry. Plasma concentration-time data were fitted to compartmental models. For dexmedetomidine and buprenorphine, the area under the plasma concentration-time curve (AUC) and the maximum plasma concentrations (Cmax) were significantly lower following OTM than following i.m. administration. For buprenorphine, time to reach Cmax was also significantly longer after OTM administration than after i.m. injection. Data suggested that dexmedetomidine (40 µg/kg) combined with buprenorphine (20 µg/kg) is not as well absorbed from the buccal mucosa site as from the intramuscular injection site.

Prepubertal gonadectomy in cats: different injectable anaesthetic combinations and comparison with gonadectomy at traditional age.


Anaesthetic and analgesic effects of three different injectable anaesthetic combinations for prepubertal gonadectomy (PPG) in cats were studied. One anaesthetic protocol was compared with a similar one for gonadectomy at traditional age (TAG). Kittens were randomly assigned to PPG or TAG. For PPG, three different protocols were compared: (1) intramuscular (IM) administration of 60 µg/kg dexmedetomidine plus 20 µg/kg buprenorphine followed by an IM injection of the anaesthetic agent (20 mg/kg ketamine) (DB-IM protocol); (2) oral transmucosal (OTM) administration of 80 µg/kg dexmedetomidine plus 20 µg/kg buprenorphine followed by an IM injection of 20 mg/kg ketamine combined with 20 µg/kg dexmedetomidine (DB-OTM protocol); (3) IM injection of a 40 µg/kg medetomidine-20 µg/kg buprenorphine-20 mg/kg ketamine combination (MBK-IM protocol). For TAG, a DB-IM protocol was used, but with different doses for dexmedetomidine (40 µg/kg) and ketamine (5 mg/kg). All cats (PPG and TAG) received a non-steroidal anti-inflammatory before surgery. Anaesthetic and analgesic effects were assessed pre- and postoperatively (until 6 h). Cumulative logit, linear and logistic regression models were used for statistical analysis. Compared
with the DB-OTM protocol, the DB-IM and MBK-IM protocols provided better anaesthesia with fewer adverse effects in PPG cats. Postoperative pain was not significantly different between anaesthetic protocols. PPG and TAG cats anaesthetised with the two DB-IM protocols differed significantly only for sedation and pain scores, but sedation and pain scores were generally low. Although there were no anaesthesia-related mortalities in the present study and all anaesthetic protocols for PPG in cats provided a surgical plane of anaesthesia and analgesia up to 6 h postoperatively, our findings were in favour of the intramuscular (DB-IM and MBK-IM) protocols.

**Relationship between age at gonadectomy and health problems in kittens adopted from shelters.**

Prepubertal gonadectomy (PPG) is promoted as a way of managing overpopulation in cats, but concerns about PPG and potential health issues still exist. The objective of the present study was to evaluate short-term and long-term health problems in cats subjected to PPG in comparison to gonadectomy at traditional age (TAG). In a prospective clinical trial, 800 shelter kittens aged between approximately 8 weeks and 12 weeks were recruited before adoption and randomly assigned to either the PPG group (gonadectomy performed immediately) or the TAG group (gonadectomy delayed until six months to eight months of age). Short-term health issues included mortality between when kittens arrived at the clinic and up to seven days after they returned to the shelter, as well as the occurrence of various other health issues arising in the first month following adoption. Kittens were followed-up until 24 months of age specifically for feline lower urinary tract disease, urethral obstruction (male cats), lameness, fractures and hypersensitivity disorders with dermatological presentation. In the short term, there were no significant differences between health problems in PPG and TAG kittens. Similarly, no significant differences were observed between treatment groups in terms of the type or number of health issues in the long term. In conclusion, there are no health-related contraindications to advocating PPG strategies in shelter cats. Ideally, PPG should be performed at the shelter facility itself as long as excellent infectious disease control and postoperative clinical observation before adoption are guaranteed.

**Concurrent diseases in hyperthyroid cats undergoing assessment prior to radioiodine treatment.**

Hyperthyroidism is a common endocrinopathy of geriatric cats, which are also prone to various other diseases. This retrospective study examined the prevalence and type of non-renal concurrent diseases present in cats referred for radioiodine assessment that were believed to have no other comorbidities at the time of referral. Ninety-four cats were included and analysed. Seventeen cases (18%) were identified as having concurrent disorders, with alimentary lymphoma (n = 5) and chronic enteropathy (n = 4) as the two most common comorbid diseases. The eosinophil count, total bilirubin and total calcium were significantly higher in the concurrent disease group, although the differences are unlikely to be clinically useful. The results support the utility of careful and individual assessment for all hyperthyroid cats prior to receiving radioiodine.
Molecular identification of black-pigmented bacteria from subgingival samples of cats suffering from periodontal disease.


OBJECTIVES: To characterise the black-pigmented bacterial species found in the subgingival samples of cats with periodontal disease using molecular-based microbiological techniques. METHODS: Sixty-five subgingival samples obtained from 50 cats with periodontal disease were analysed by polymerase chain reaction amplified ribosomal DNA restriction analysis and cloning and sequencing of the 16S rRNA genes. RESULTS: Among the 65 subgingival samples, eight phylogenetic profiles were obtained, of which the most prevalent species were: Porphyromonas gulae (40%), P. gingivalis/P. gulae (36 · 9%), P. gulae/Porphyromonas sp. UQD 406 (9 · 2%), Odoribacter denticanis (6 · 2%), P. gulae/Porphyromonas sp. UQD 348 (1 · 5%) and P. circumdentaria (1 · 5%). When compared with the species resulting from biochemical diagnosis, the identification of P. gulae was congruent in 70% of the cases, while colonies identified as P. intermedia-like corresponded in 80% of cases to P. gulae. CLINICAL SIGNIFICANCE: The use of molecular-based microbiological diagnostic techniques resulted in a predominance of Porphyromonas spp. in the subgingival plaque of cats suffering from periodontal disease. Further characterisation of these bacteria identified P. gulae, O. denticanis and P. circumdentaria. The more frequently detected phylogenetic profiles corresponded to P. gingivalis and P. gulae.

Novel treatment strategies for feline chronic kidney disease: A critical look at the potential of mesenchymal stem cell therapy.


Stem cell therapy is an innovative field of scientific investigation with tremendous potential for clinical application that holds promise for the treatment of a variety of diseases in veterinary medicine. Based on the known desirable properties of mesenchymal stem cells, the therapy has potential for treatment of both acute kidney injury and chronic kidney disease in cats. This review details terminology commonly used in this field of study, sources of mesenchymal stem cells and their proposed mechanism of action particularly as it relates to renal repair. Studies performed in rodent models of chronic kidney disease and feline clinical trial results are also summarized with the aim of providing an overview of the current status of this treatment modality and its potential for the future.

Short-term wound complications and predictive variables for complication after limb amputation in dogs and cats.


OBJECTIVES: To identify short-term wound complications and associated predictive factors following amputation in dogs and cats. MATERIALS AND METHODS: Retrospective review of case records of dogs and cats undergoing thoracic or pelvic limb amputation. Preoperative data on signalment, body weight, limb amputated, reason for amputation and laboratory parameters were collected. Details regarding surgical procedures and use of anaesthesia such as total surgical and anaesthesia times, incidences of intraoperative hypotension or hypothermia, method of muscle excision and type of skin closure utilized were recorded. Postoperative data on duration of hospital stay, use of postoperative
antibiotics, use of a wound soaker catheter, wound complications noted both during hospitalization and at recheck and treatments if applicable were collected. RESULTS: In total, 67 records were identified including 39 dogs and 28 cats. Wound infection/inflammation complications occurred in 20.9% of cases and wound infection complications in 9%; 12.8% in dogs and 3.6% in cats. One (1.5%) complication was classified as major, which occurred immediately postoperatively. Nine (13.4%) minor complications occurred immediately after surgery and four (6.0%) were identified at recheck. Age was the only significant predictor of postoperative infection/inflammation following pelvic or thoracic limb amputation. CLINICAL SIGNIFICANCE: Short-term wound complications following pelvic or thoracic limb amputation in cats and dogs were typically minor and resolved after treatment.

A prospective evaluation of the impact of second-opinion histopathology on diagnostic testing, cost and treatment in dogs and cats with cancer.
Second-opinion histopathology is a common practice in human medicine to avoid unnecessary procedures, costs and to optimize therapy. Histopathology review has been recommended in veterinary oncology as well. In this prospective evaluation of 52 tumours over a 1-year period, there was diagnostic agreement between first and second opinions in 52% of cases. Twenty-nine percent of cases had partial diagnostic disagreement, most often a change in grade, tumour subtype or margin status. Nineteen percent had complete diagnostic disagreement, including a change in cell of origin or a change from benign to malignant. Minor disagreements, which would not affect treatment or prognosis, were present in 21% of cases. Major disagreements, which would affect either treatment or prognosis, were present in 37% of cases. Costs of ideal staging and treatment recommendations were considerably different between first and second opinions.

Routine plasma biochemistry analytes in clinically healthy cats: within-day variations and effects of a standard meal.
Limited information is available on pre-analytical variations in plasma analytes in cats. The objectives of this study were to assess the effects of the time of sampling and a standard meal on plasma analytes in healthy cats. Eight healthy, adult, fasted cats underwent blood sampling every 2 h from 8 am to 8 pm twice at a 12 day interval. On the days of sampling, four cats were kept fasted and the others were fed just after the first sample, in a crossover design. Plasma glucose, urea, creatinine, sodium, potassium, chloride, CO2, calcium, phosphate, proteins, albumin, cholesterol and triglycerides, alanine aminotransferase and alkaline phosphatase were assayed on each sample. Effects of time of sampling and meal on plasma biochemistry results were tested using a general linear model. Diurnal variations in tested plasma analytes in fasted cats were negligible except for urea and creatinine, which gave noticeably higher plasma concentrations in the afternoon than in the morning. Observed postprandial variations were of some importance for phosphate and creatinine and of indisputable clinical relevance for CO2 and urea.
Effects of intramuscular sedation with alfaxalone and butorphanol on echocardiographic measurements in healthy cats.


OBJECTIVES: The aim of the study was to evaluate the effects of intramuscular (IM) injections of alfaxalone combined with butorphanol on echocardiographic (ECG) measurements in cats.

METHODS: Client-owned adult domestic shorthair cats younger than 5 years of age were recruited. All cats that were considered healthy on the basis of physical examination, blood work, urinalysis, blood pressure measurement and baseline ECG underwent a second ECG under sedation. Cats were sedated with two separate IM injections of butorphanol at 0.2 mg/kg and alfaxalone at 2 mg/kg. ECG variables were analysed using a linear mixed model, and sedation scores were analysed using an ordinal mixed logistic model. The significance level was set at $\alpha = 0.05$ and adjusted at $\alpha = 0.0017$ for multiple comparisons of the ECG measurements. RESULTS: Ten healthy cats were included. Sedation was uneventful, and recovery was smooth and quick for all cats. The mean duration of lateral recumbency was 36.3 ± 4.37 mins. Reduction in heart rate following sedation approached statistical significance ($P = 0.002$). The thickness of the interventricular septum, the thickness of the left ventricular free wall, and the left ventricular internal dimensions in diastole and systole were not affected by the sedation. The changes in left atrium/aortic ratio and shortening fraction were statistically significant. Although the peak velocity of early diastolic transmitral flow (E) and late diastolic transmitral flow (A), the peak early diastolic (Ea) mitral valve annulus velocity, and the peak late diastolic (Aa) mitral valve annulus velocity changed after sedation, the ratios E/A, E/Ea and Ea/Aa were not significantly different after sedation. CONCLUSIONS AND RELEVANCE: IM injections of alfaxalone and butorphanol induced rapid, deep and short-lasting sedation. The mean differences after sedation were not clinically significant for most echocardiographic measurements.

Factors affecting urine specific gravity in apparently healthy cats presenting to first opinion practice for routine evaluation.


Evidence suggests that apparently healthy cats presenting for routine evaluation should have a randomly sampled urine specific gravity (USG) >1.035. A USG <1.035 might reflect inappropriate concentrating ability warranting further investigation. We measured the USG of 1040 apparently healthy cats presenting to first opinion practice in an observational study, using either in-clinic refractometers or measurements provided by reference laboratories, and examined factors that might affect USG. In-clinic refractometers were calibrated using distilled water (specific gravity = 1.000). The USG was >1.030 in 91% of cats and >1.035 in 88% of cats; 121 adult cats (>6 months old) and five young cats (<6 months old) had USGs of <1.035. Of these 126 cats, a pathological cause was identified in 27 adult cats - of these, 26 were >9 years old - but no young cats. No cause was identified in 43 adult cats, and further investigation was not pursued in 51 adult cats. Factors that affected USG included age, diet type, sex, fasting status, drinking avidity, refractometer type, and the interaction between sex and diet - increasing dietary moisture content lowered USG only in female cats. Most factors minimally affected USG. The odds of having a USG <1.035 without apparent pathology included age and dietary moisture content. Drinking avidity decreased with increasing dietary moisture content. Our results show that most apparently healthy cats presenting to first-opinion practice should have a USG >1.035. Dietary management strategies to lower USG might be less effective than
anticipated, and warrant monitoring of USG to determine efficacy. Older cats with USG <1.035 are more likely to have pathological causes identified, although clinicians are more likely to examine these cats for possible pathology. A lack of stringent refractometer calibration could have caused some errors in estimates of USG by some observers, but would be unlikely to alter markedly the findings.

**A novel method of continuous cage-side monitoring of hyperthyroid cats treated with radioiodine.**

A continuous monitoring system (MGP DM2000X) was assessed for monitoring γ radiation emissions and determining appropriate isolation times for hyperthyroid cats treated with radioactive iodine (I(131)). Daily radiation emitted by 12 cats who had received a range of doses of I(131) (80-200 MBq) was measured and average background radiation readings deducted. The effective half-lives of the I(131) in the cats were found to have a median of 2.54 days (range 1.40-3.24 days). Cats treated with 200 MBq emitted 5 µGy/day more exposure than cats treated with lower doses throughout the study period (P=0.032). All cats were found to emit a total radiation dose exposure less than 100 µGy (range 0-43 µGy) during days 18-21 of isolation. The potential additional dose exposure to owners was calculated at various days that might be considered for the cats to be returned to their owners. Using this provisional data, maximum isolation periods at this institution could be safely reduced to 17 days as long as certain precautions are followed. This preliminary study demonstrated that this novel cage-side monitoring system can be used to calculate the effective half-life of I(131) and to measure γ radiation exposure from treated cats, which may assist other institutions in determining appropriate isolation times for individual cats.

**Using early neutering to control unwanted litters.**

**Non-invasive evaluation of the haemodynamic effects of high-dose medetomidine in healthy cats for semen collection.**

OBJECTIVES: This study aimed to assess non-invasively the cardiovascular effects of high-dose medetomidine on healthy male cats undergoing semen collection. METHODS: Haemodynamic evaluations were assessed on the basis of clinical examination, systolic arterial pressure (SAP) and transthoracic echocardiographic examination. Eight male domestic shorthair client-owned cats were sedated with a bolus of medetomidine intramuscularly (IM; 0.13 mg/kg), and semen collection was performed. A second transthoracic echocardiography and SAP measurement were carried out 15 mins after sedation. At the end of the examination, the patients received a bolus of atipamezole (0.3 mg/kg) IM. RESULTS: The cats were deeply sedated, relaxed and laterally recumbent during the entire procedure. No rhythm abnormalities were observed during the examinations and no significant increase in SAP was recorded. Heart rate dropped from 200 ± 33 to 92 ± 13.1 beats per min after sedation.
There was a significant increase in left ventricular dimensions and the left atrial area. The parameters of left ventricular systolic function were reduced, as were systemic and pulmonary cardiac outputs. Peak diastolic wave velocities were significantly reduced, while isovolumic contraction and relaxation time of the left ventricle were prolonged. Aortic valve insufficiency was recorded for all cats, while mitral valve insufficiency was noted in five cats. None of the subjects developed systolic anterior motion of the mitral valve. CONCLUSIONS AND RELEVANCE: The protocol allowed us to collect good semen samples in healthy cats. However, high-dose medetomidine induces significant haemodynamic effects on the feline heart, mainly due to a reduced heart rate, an increased cardiac preload and impaired systolic function. The animals recovered from the anaesthesia after antagonist administration, without showing any clinically relevant consequences.

Rebound hyperglycaemia in diabetic cats.


OBJECTIVES: Rebound hyperglycaemia (also termed Somogyi effect) is defined as hyperglycaemia caused by the release of counter-regulatory hormones in response to insulin-induced hypoglycaemia, and is widely believed to be common in diabetic cats. However, studies in human diabetic patients over the last quarter century have rejected the common occurrence of this phenomenon. Therefore, we evaluated the occurrence and prevalence of rebound hyperglycaemia in diabetic cats. METHODS: In a retrospective study, 10,767 blood glucose curves of 55 cats treated with glargine using an intensive blood glucose regulation protocol with a median of five blood glucose measurements per day were evaluated for evidence of rebound hyperglycaemic events, defined in two different ways (with and without an insulin resistance component). RESULTS: While biochemical hypoglycaemia occurred frequently, blood glucose curves consistent with rebound hyperglycaemia with insulin resistance was confined to four single events in four different cats. In 14/55 of cats (25%), a median of 1.5% (range 0.32-7.7%) of blood glucose curves were consistent with rebound hyperglycaemia without an insulin resistance component; this represented 0.42% of blood glucose curves in both affected and unaffected cats. CONCLUSIONS AND RELEVANCE: We conclude that despite the frequent occurrence of biochemical hypoglycaemia, rebound hyperglycaemia is rare in cats treated with glargine on a protocol aimed at tight glycaemic control. For glargine-treated cats, insulin dose should not be reduced when there is hyperglycaemia in the absence of biochemical or clinical evidence of hypoglycaemia.


Exenatide extended-release (ER) is a microencapsulated formulation of the glucagon-like peptide 1-receptor agonist exenatide. It has a protracted pharmacokinetic profile that allows a once-weekly injection with comparable efficacy to insulin with an improved safety profile in type II diabetic people. Here, we studied the pharmacology of exenatide ER in 6 healthy cats. A single subcutaneous injection of exenatide ER (0.13 mg/kg) was administered on day 0. Exenatide concentrations were measured for 12 wk. A hyperglycemic clamp (target = 225 mg/dL) was performed on days -7 (clamp I) and 21 (clamp II) with measurements of insulin and glucagon concentrations. Glucose tolerance was defined as the amount of glucose required to maintain hyperglycemia during the clamp. Continuous glucose monitoring was performed on weeks 0, 2, and 6 after injection. Plasma concentrations of exenatide
peaked at 1 h and 4 wk after injection. Comparing clamp I with clamp II, fasting blood glucose decreased (mean ± standard deviation = -11 ± 8 mg/dL, \( P = 0.02 \)), glucose tolerance improved (median [range] +33% [4%-138%], \( P = 0.04 \)), insulin concentrations increased (+36.5% [-9.9% to 274.1%], \( P = 0.02 \)), and glucagon concentrations decreased (-4.7% [0%-12.1%], \( P = 0.005 \)). Compared with preinjection values on continuous glucose monitoring, glucose concentrations decreased and the frequency of readings <50 mg/dL increased at 2 and 6 wk after injection of exenatide ER. This did not correspond to clinical hypoglycemia. No other side effects were observed throughout the study. Exenatide ER was safe and effective in improving glucose tolerance 3 wk after a single injection. Further evaluation is needed to determine its safety, efficacy, and duration of action in diabetic cats.

Dynamic sound localization in cats.

Sound localization in cats and humans relies on head-centered acoustic cues. Studies have shown that humans are able to localize sounds during rapid head movements that are directed toward the target or other objects of interest. For example, a sound target can be localized accurately even if it is presented when the head is actively scanning the environment or orienting to a visual target at a different spatial location. Thus, the human auditory system appears capable of processing dynamic acoustic cues and the oculomotor system is capable of accurately issuing appropriate motor commands despite ensuing head and eye movements. We studied whether cats are able to utilize similar dynamic acoustic cues to localize acoustic targets during rapid eye-head gaze shifts. We trained cats with visual-auditory two-step tasks in which we presented a 25-ms sound burst during saccadic eye-head gaze shifts toward a prior visual target. Although there is some decline in accuracy, no consistent or significant difference in accuracy or precision was found between this dynamic task (two-step saccade) and the comparable static task (single saccade when the head is stable) in either horizontal or vertical directions. Cats appear to be able to process dynamic auditory cues and execute complex motor adjustments to accurately localize auditory targets during rapid eye-head gaze shifts.

Complications associated with corrective surgery for patellar luxation in 85 feline surgical cases.

The objective was to review surgical techniques and postoperative complications of surgical correction for patellar luxation (PL) in cats. A retrospective study evaluating 85 surgeries in 71 cats was performed. The records from four referral centres were searched for cats with surgical management of PL. Signalment, history, PL grade and direction, corrective surgical techniques and outcome were retrieved. Binary logistic regression analysis was used to interrogate relationships between case features, surgical correction methods and outcomes. The outcomes were classified as minor and major complications (requiring revision surgery), including continued PL (reluxation). Postoperative complications occurred in 26% of cases; 20% had major complications, including 5% patellar reluxation, and 6% had minor complications. Cats with previous ipsilateral femoral fracture were significantly more likely to suffer complications, including minor (\( P = 0.02, \text{ odds ratio} = 12.67 \)), major (\( P = 0.03, \text{ OR} = 7.2 \)) and patellar reluxation (\( P = 0.01, \text{ OR} = 19.25 \)). Minor complications were significantly more likely with grade 4 PL (\( P = 0.03, \text{ OR} = 8.5 \)). Major complications were significantly more likely with tibial tuberosity transposition (TTT; \( P = 0.03, \text{ OR} = 5.57 \)). Patellar reluxation was
significantly more likely if stifle surgery had been performed previously (P = 0.05, OR = 8.00). The presence of bilateral PL, hip dysplasia, grade 1, 2 or 3 PL, corrective surgery using an anti-rotational suture or femoral sulcoplasty did not influence complications. Complications were more likely for grade 4 PL, previous ipsilateral femoral fracture, if TTT was performed and for cases with previous stifle surgery. This information allows consideration of risks and complicating factors.

Prevalence, species distribution and antimicrobial resistance patterns of methicillin-resistant staphylococci in Lithuanian pet animals.


BACKGROUND: The bacterial genus Staphylococcus consists of many species that causes infections in pet animals. Antimicrobial resistant staphylococci cause infections that are difficult to treat and they are important from the point of one health perspective. The aim of this study was to determine the prevalence of methicillin-resistant Staphylococcus (MRS) species, including methicillin-resistant S. aureus (MRSA) in diseased pet animals (Group A) and kennel dogs (Group B) in Lithuania and to characterize the isolates according to their antimicrobial resistance. RESULTS: Twenty-one MRS isolates were obtained from 395 clinical samples (5.3 %; CI 95 % 3.5-8.0) of Group A animals. Sixteen, four and one isolates were from dogs, cats and a pet rabbit, respectively. The mecA gene was present in 20 isolates, whereas one isolate was positive for the mecC gene. Twenty-one MRS isolates (20.0 %; CI 95 % 13.5-28.6) were obtained from the vagina of female dogs (n = 105) (Group B). All isolates carried the mecA gene. Twelve MRS species were isolated of which S. pseudintermedius was the most common (18/42) followed by S. haemolyticus (8/42) and S. lentus (4/42). MRSA was not found. All MRS strains were susceptible to vancomycin, linezolid, daptomycin and quinupristin/dalfopristin. Resistance to tetracycline (16/21), clindamycin (15/21) and erythromycin (14/21) was the most common types of resistance in Group A animals. Three isolates also demonstrated resistance to rifampin. Resistance toward gentamicin (16/21), ciprofloxacin (15/21), macrolides (15/21) and tetracycline (12/21) was the most common in kennel dogs (Group B). The most common genes encoding resistance to antimicrobials (excluding beta-lactams) in isolates from Group A pets were tetK (21/42), aph(3')-IIIa (11/42) and aac(6')-le-aph(2'')(29/42). CONCLUSIONS: A wide range of MRS species were found in pet animals in Lithuania. MRSA was not found.

In vitro host range of feline morbillivirus.


Feline morbillivirus (FmoPV) is an emerging virus in cats, which is associated with tubulointerstitial nephritis. To study the in vitro host range of FmoPV, we inoculated FmoPV strain SS1 to 32 cell lines originated from 13 species and cultured for two weeks, followed by RNA extraction and reverse-transcription-polymerase chain reaction for FmoPV detection. As a result, only cell lines derived from cats and African green monkeys were susceptible to FmoPV. FmoPV infects diverse feline cell lines: epithelial, fibroblastic, lymphoid and glial cells. These results indicate that the receptor(s) for FmoPV are ubiquitously expressed in cats. No infectivity of FmoPV was observed in human cell lines, which suggests least threatening of cross-species transmission of FmoPV from cats to humans.
Mathematical equation for prediction of cat mandibular canal height dimension based on canine tooth width measurement.


OBJECTIVES: The present study was performed in a sample of 33 cats and aimed (1) to characterise the mandible height (Mh), mandibular canal height (MCh) and the distance between the interdental alveolar margin and the mandibular canal (dIAM-MC); and (2) to develop a mathematical model for dimension prediction of MCh using the patient’s age, weight (Wg) and canine tooth width at the free gingival margin level (wCGM) that was easily accessible during the oral examination. METHODS: Age, sex, breed, weight, skull type and the wCGM were the recorded variables for each patient. Right and left lateral view skull radiographs were made followed by measurements of the mandible anatomical structures, taken between the third premolar distal root and the fourth premolar proximal root. Results were considered statistically significant for P values <0.05, and statistical analysis was performed using SPSS software. RESULTS: We observed a strong correlation only between wCGM and MCh, and a prediction mathematical model was developed to calculate the MCh, with a standard error of only 0.4 mm. CONCLUSIONS AND RELEVANCE: Our study allows a surgeon to establish relationships between a physical parameter, such as wCGM, evaluated in an oral examination, and the mandibular canal, which is a very important anatomical structure to consider in surgical procedures. Ideally, surgeons should always plan their mandible work only after obtaining a final diagnosis achieved through the use of complementary imaging exams, such as intra- and extra-oral radiographs. Thus, this mathematical equation offers an additional tool providing more information on the relationships between oral anatomical structures, reducing the risk of iatrogenic lesions and promoting patient safety.

Dermoscopic features in 12 cats with dermatophytosis and in 12 cats with self-induced alopecia due to other causes: an observational descriptive study.


BACKGROUND: Dermoscopy is a noninvasive technique allowing rapid magnified in vivo observation of the skin and structures that lie beneath the skin surface. Various congenital and acquired hair shaft abnormalities may also be evaluated by dermoscopy. Additionally, characteristic features of Microsporum canis-induced tinea capitis and trichotillomania in humans have been reported. OBJECTIVES: To describe the dermoscopic findings observed in cats with patchy alopecia due to M. canis infection and in cats with self-inflicted hair loss. ANIMALS: Twenty-four client-owned cats presented at a veterinary referral practice. METHODS: Dermoscopy was performed with a hand-held nonpolarized light dermoscope at 10-fold magnification. The glass plate of the dermoscope was applied gently to the lesions and no sedation was required. RESULTS: Twelve cats were diagnosed with dermatophytosis and 12 with self-induced alopecia due to other causes. At 10-fold magnification, the most characteristic findings observed in circumscribed lesions of cats with dermatophytosis were opaque, slightly curved, broken hairs of a homogeneous thickness (comma-like structures) and a variable amount of brown-to-yellow greasy scales. In cats with self-induced alopecia, multiple hairs with a normal shaft cleanly broken at different lengths, short tufts of hairs broken at an equal level and hook-like and coiled hairs were observed. CONCLUSIONS AND CLINICAL IMPORTANCE: This observational descriptive study suggests that dermoscopy may represent a helpful noninvasive in vivo technique in the differential diagnosis of patchy alopecia in cats.
Systematic review of ground reaction force measurements in cats.

Although orthopaedic abnormalities in cats are frequently observed radiographically, they remain clinically underdiagnosed, and kinetic motion analysis, a fundamental aspect of orthopaedic research in dogs and horses, is not commonly performed. More information obtained with non-invasive measurement techniques to assess normal and abnormal gait in cats would provide a greater insight into their locomotion and biomechanics and improve the objective measurement of disease alterations and treatment modalities. In this systematic review, 12 previously performed studies that investigated ground reaction force measurements in cats during locomotion were evaluated. The aims of these studies, the measurement methods and equipment used, and the outcomes of parameters used to assess both sound and diseased cats are summarised and discussed. All reviewed studies used pressure sensitive walkways to gain data and all provided an acclimatisation period as a prerequisite for measurements. In sound cats during walking, the forelimb peak vertical force was greater than in the hindlimb and the peak vertical force in the hindlimb was greater in cats than in dogs. This review confirms that ground reaction forces can be used to evaluate lameness and treatment effects in the cat.

Characterization of feline serum-cobalt binding.

BACKGROUND: Oxidative stress inhibits albumin’s ability to complex with cobalt. Feline serum-cobalt binding has not been described. OBJECTIVES: The objective was to develop a cobalt binding test for use with feline serum, and correlate the results with other biochemical and cellular constituents in blood, and with clinical diseases of cats. METHODS: A colorimetric test of cobalt binding, based on the oxidation-reduction reaction of Co(2+) and dithiothreitol, was developed using feline serum. The test was used to measure cobalt binding in stored serum from 176 cats presented to the University of Illinois Veterinary Teaching Hospital for a variety of disease conditions. Time-matched hematology and biochemical data, and clinical information, were obtained from the medical record of each cat and correlated with the serum-cobalt binding results. RESULTS: Serial dilution of feline serum with phosphate-buffered saline resulted in a highly linear decrease in serum-cobalt binding ($r^2 = .9984$). Serum-cobalt binding of the clinical samples also correlated with albumin concentrations in a stepwise linear regression model ($r^2 = .425$), and both cobalt binding and albumin were significantly decreased in cases of inflammation. Albumin and cobalt binding also shared significant correlations with several erythron variables, and serum concentration of total calcium and bilirubin. CONCLUSIONS: The correlation of cobalt binding measured by a colorimetric test with albumin concentration in the clinical samples and with serum dilution is consistent with feline albumin-cobalt complex formation. Hypoalbuminemia is the likely cause of reduced serum-cobalt binding in inflammation and the correlations observed between cobalt binding and other variables.

Rapid high resolution melt analysis of *Cytauxzoon felis* cytochrome b to aid in the prognosis of cytauxzoonosis.
Cytauxzoon felis is a virulent tick-transmitted protozoan parasite that infects felines. Cytauxzoonosis was previously believed to be uniformly fatal in domestic cats. Treatment combining atovaquone and azithromycin (A&A) has been associated with survival rates over 60%. Atovaquone, a ubiquinone analogue, targets C. felis cytochrome b (cytb), of which 30 unique genotypes have been identified. The C. felis cytb genotype cytb1 is associated with increased survival in cats treated with A&A. The purpose of this study was to design a PCR panel that could distinguish C. felis cytb1 from other cytochrome b genotypes. Primer pairs were designed to span five different nucleotide positions where single nucleotide polymorphisms (SNPs) had been identified in the C. felis cytb gene. Through the use of high-resolution melt (HRM) analysis, this panel was predicted to distinguish cytb1 from other cytb genotypes. Assays were validated using samples from 69 cats with cytauxzoonosis that had their C. felis cytb genotypes previously characterized. The PCR panel identified C. felis cytb1 with 100% sensitivity and 98.2% specificity. High resolution melt analysis can rapidly provide prognostic information for clients considering A&A treatment in cats with cytauxzoonosis.

Pasireotide for the Medical Management of Feline Hypersomatotropism.

**BACKGROUND:** Feline hypersomatotropism (HST) is a cause of diabetes mellitus in cats. Pasireotide is a novel multireceptor ligand somatostatin analog that improves biochemical control of humans with HST. **HYPOTHESIS/OBJECTIVES:** Pasireotide improves biochemical control of HST and diabetes mellitus in cats. **ANIMALS:** Hypersomatotropism was diagnosed in diabetic cats with serum insulin-like growth factor-1 (IGF-1) concentration >1,000 ng/mL by radioimmunoassay and pituitary enlargement. **METHODS:** Insulin-like growth factor 1 was measured and glycemic control assessed using a 12-hour blood glucose curve on days 1 and 5. On days 2, 3, and 4, cats received 0.03 mg/kg pasireotide SC q12h. IGF-1, insulin dose, and estimated insulin sensitivity (product of the area under the blood glucose curve [BGC] and insulin dose) were compared pre- and post treatment. Paired t-tests or Wilcoxon signed rank tests were employed for comparison where appropriate; a linear mixed model was created to compare BGC results. **RESULTS:** Insulin-like growth factor 1 decreased in all 12 cats that completed the study (median [range] day 1: 2,000 ng/mL [1,051-2,000] and day 5: 1,105 ng/mL [380-1,727], P = .002, Wilcoxon signed rank test). Insulin dose was lower on day 5 than on day 1 (mean reduction 1.3 [0-2.7] units/kg/injection, P = .003, paired t-test). The product of insulin dose and area under the BGC was lower on day 5 than day 1 (difference of means: 1,912; SD, 1523; \(u \times \text{mg/dL} \times \text{hours}\), P = .001; paired t-test). No clinically relevant adverse effects were encountered. **CONCLUSIONS:** Short-acting pasireotide rapidly decreased IGF-1 in cats with HST and insulin-dependent diabetes. The decrease in IGF-1 was associated with increased insulin sensitivity.

Seroprevalence of Coxiella burnetii in domesticated and feral cats in eastern Australia.

The seroprevalence of Coxiella burnetii (C. burnetii) in cats in eastern Australia is unknown, and the risk of transmission from cats to humans is undetermined. This study aimed to determine the exposure of cats to C. burnetii in four distinct cat subpopulations. An indirect immunofluorescence assay (IFA) and an Enzyme-linked immunosorbent assay (ELISA) used for detection of anti-C. burnetii antibodies in humans were adapted, verified for use on feline serum, and compared. Cat serum samples (n=712)
were tested with IFA from four subpopulations [cattery-confined breeding cats, pet cats, feral cats and shelter cats]. The proportions of seropositive cats were; cattery-confined breeding cats (35/376, 9.3%), pets (2/198, 1%), feral cats (0/50), shelter cats (0/88). The significant variables in C. burnetii seropositivity were cattery-confined breeding cat subpopulation and sterilisation status, with infected cats 17.1 (CI 4.2-70.2; P<0.001) times more likely to be cattery-confined breeding cats and 6.00 (CI 2.13-16.89; P<0.001) times more likely to be entire than sterilised. ELISA was used on 143 of 712 sera tested with IFA, and the Cohen’s Kappa coefficient of 0.75 indicated 92.2% agreement between the two assays. These results confirm that Australian cats have been exposed to C. burnetii and that a higher seroprevalence of C. burnetii is seen amongst cattery-confined breeding cats. Cat breeders and veterinary personnel involved in feline reproductive procedures may be at higher risk of exposure to C. burnetii.

Cardiopulmonary Effects of Laparoscopic Ovariectomy of Variable Duration in Cats.
OBJECTIVE: To evaluate the cardiopulmonary effects of low-pressure (6 mmHg) peritoneal insufflation of varying duration in healthy cats during ovariectomy (OVE). STUDY DESIGN: Prospective, randomized study. ANIMALS: Female cats (n = 24). METHODS: After anesthesia induction, cats had short (Short LAP; n = 8) or long duration (Long LAP; n = 8) laparoscopic ovariectomy, or Open OVE (Open; n = 8) for comparison. Hemodynamic and pulmonary measurements were recorded after induction of anesthesia (T0), 5 minutes after abdominal insufflation had reached 6 mmHg of pressure (T1), after the 2nd ovary had been resected (T2), after abdominal decompression (T3), and at the end of anesthesia, after abdominal closure (T4). Hemodynamic and pulmonary variables were compared between groups. RESULTS: Low-pressure abdominal insufflation caused cardiopulmonary changes in cats. At T1 and T2, Long LAP and Short LAP caused a significant change in PvCO2 and RC when compared with Open. During T3, RC was lower only in Long LAP. At T2, there was decrease in SV, but not CO for Long LAP when compared with Open. CONCLUSIONS: Duration of insufflation was associated with worsening of negative cardiopulmonary effects; however, these effects were reversible and resolved by the end of the procedure.

Zoonotic Intestinal Trematodes in Stray Cats (Felis catus) from Riverside Areas of the Republic of Korea.
The present study was performed to survey the infection status of zoonotic intestinal trematode (ZIT) in stray cats from 5 major riverside areas in the Republic of Korea. Total 400 stray cats were captured with live-traps in riverside areas of Seomjingang (‘gang’ means river) (203 cats) from June to October 2010, and of Yeongsangang (41), Nakdonggang (57), Geumgang (38), and Hangang (61 cats) from June to October 2011, respectively. Small intestines resected from cats were opened with a pair of scissors in a beaker with 0.85% saline and examined with naked eyes and under a stereomicroscope. More than 16 ZIT species were detected in 188 (92.6%) cats from Seomjingang areas, and the number of worms recovered was 111 per cat infected. In cats from riverside areas of Yeongsangang, Nakdonggang, Geumgang, and Hangang, more than 9, 8, 3, and 5 ZIT species were recovered, and the
worm burdens were 13, 42, 11, and 56 specimens per infected cat, respectively. As the members of family Heterophyidae, more than 10 species, i.e., Metagonimus spp., Pygidiopsis summa, Heterophyes nocens, Stellantchasmus falcatus, Heterophyopsis continua, Acanthotrema felis, Centrocestus armatus, Procerovum varium, Cryptocotyle concava, and Stictodora lari, were recovered. More than 5 species of echinostomes, i.e., Echinostoma hortense, Echinocotylus japonicus, Echinocotylus sp., Echinoparyphium sp., and unidentified larval echinostomes, were collected. Plagiorchis spp. were detected in cats from areas of Seomjin-gang and Yeongsangang. From the above results, it has been confirmed that stray cats in 5 major riverside areas of Korea are highly infected with various species of ZITs.

**Clostridium perfringens: A review of enteric diseases in dogs, cats and wild animals.**


Clostridium perfringens is a gram-positive anaerobic bacillus that is commonly part of the microbiota of humans and animals. It is considered a common enteric pathogen, but the pathogenesis and the predisposing factors of the disease commonly differ between host species. Thus, specific research is necessary to understand the role of this pathogen, how to diagnose it, and which control measures are applicable. The aim of this paper is to review the current knowledge of C. perfringens infections in dogs, cats and wild animals.

**Notoedres cati in cats and its management.**


Notoedres cati was observed in two domestic cats. Cats exhibited crust formation, hyperkeratosis, alopecia and intense pruritus. Distribution of lesions observed at the ear margins, face, and legs. Owners also had intense pruritus over the hands, small erythematic crusted papules on the wrists and both the legs. Laboratory examination of skin scrapings from the cat revealed the presence of ova, adult mites of N. cati. The infected cats were treated with weekly twice oral administration of ivermectin at 200 µg/kg body weight, oral administration of 2 ml of multi-vitamin and mineral syrup daily. Improvement was noticed by complete clinical recovery along with absence of mites in skin scrapings, after completion of four doses of oral ivermectin along with supportive therapy.

**Biomarkers for differentiation of causes of respiratory distress in dogs and cats: Part 1 - Cardiac diseases and pulmonary hypertension.**


OBJECTIVE: To review the current veterinary and relevant human literature regarding biomarkers of cardiac disease leading to respiratory compromise. DATA SOURCES: Veterinary and human medical literature: original research articles, scientific reviews, consensus statements, and recent textbooks. HUMAN DATA SYNTHESIS: Cardiac troponins (cTn) and natriuretic peptides are routinely used in human medicine. VETERINARY DATA SYNTHESIS: Although biomarkers should not be accepted in lieu of gold standard diagnostics, they may be useful in directing care in the stabilization process. Biomarkers of congestive heart failure (CHF) include natriuretic peptides, cTn, and endothelin. cTnI is useful in differentiating causes of pericardial effusion, but is unlikely to be useful in differentiating
CHF from other causes of respiratory distress. The most extensively studied and promising cardiac biomarker is amino-terminal probrain natriuretic peptide, although a bedside test is not currently available. Other natriuretic peptides have also proven useful, but have lower availability. Endothelin is unlikely to be clinically useful. Although critically evaluated for their use in cardiac diseases, many of the biomarkers are affected by more than one type of respiratory or systemic disease. Several cardiac biomarkers are increased in cases of pulmonary hypertension (PH), but discerning CHF alone from PH or a combination of heart disease and PH is challenging when evaluating biomarkers alone. CONCLUSION: At this time, there are no point-of-care tests for biomarkers that can reliably differentiate among causes of dyspnea of cardiac origin in dogs and cats, although there are reference laboratory tests that show promise and future development of point-of-care tests that may be useful in certain situations.

**Biomarkers for differentiation of causes of respiratory distress in dogs and cats: Part 2 - Lower airway, thromboembolic, and inflammatory diseases.**


OBJECTIVES: To review the current veterinary and relevant human literature regarding biomarkers of respiratory diseases leading to dyspnea and to summarize the availability, feasibility, and practicality of using respiratory biomarkers in the veterinary setting. DATA SOURCES: Veterinary and human medical literature: original research articles, scientific reviews, consensus statements, and recent textbooks. HUMAN DATA SYNTHESIS: Numerous biomarkers have been evaluated in people for discriminating respiratory disease processes with varying degrees of success. VETERINARY DATA SYNTHESIS: Although biomarkers should not dictate clinical decisions in lieu of gold standard diagnostics, their use may be useful in directing care in the stabilization process. Serum immunoglobulins have shown promise as an indicator of asthma in cats. A group of biomarkers has also been evaluated in exhaled breath. Of these, hydrogen peroxide has shown the most potential as a marker of inflammation in asthma and potentially aspiration pneumonia, but methods for measurement are not standardized. D-dimers may be useful in screening for thromboembolic disease in dogs. There are a variety of markers of inflammation and oxidative stress, which are being evaluated for their ability to assess the severity and type of underlying disease process. Of these, amino terminal pro-C-type natriuretic peptide may be the most useful in determining if antibiotic therapy is warranted. Although critically evaluated for their use in respiratory disorders, many of the biomarkers which have been evaluated have been found to be affected by more than one type of respiratory or systemic disease. CONCLUSION: At this time, there are point-of-care biomarkers that have been shown to reliably differentiate between causes of dyspnea in dogs and cats. Future clinical research is warranted to understand of how various diseases affect the biomarkers and more bedside tests for their utilization.

**What do we know about feline leishmaniosis.**


According to the World Health Organization (WHO), endemic areas of leishmaniosis have spread and the number of reported cases has increased. Europe is one of the most affected continents concerning the risk of the re-emergence of this zoonosis. The significance of the cat as a reservoir of Leishmania species and not simply an accidental host seems to be gaining ground, mainly because: (i) cats can present increased seropositivity between serology analysis; (ii) cats can be infected during some
months and thus are available for sandflies; and (iii) cats transmit the Leishmania species agent in a competent form. Furthermore, cats have behavioural characteristics that contribute to the infection by Leishmania infantum, and as such, feline leishmaniosis (FeL) has been reported worldwide. When clinical signs of FeL are present, they are unspecific and frequently occur in other feline diseases. If they go undiagnosed, they can contribute to an underestimation of the actual occurrence of the disease in cats. The low seroprevalence titres along with the commonly asymptomatic infection in cats can further contribute to the underestimation of FeL occurrence. This work aims to raise awareness about FeL among veterinarians, as it reviews the current status of FeL infection caused by L infantum worldwide, the major clinicopathological features of infection, along with recent developments on FeL diagnosis, treatment and prevention.

**Ki-67 as a Prognostic Factor in Feline Mammary Carcinoma: What Is the Optimal Cutoff Value.**

Ki-67 is a nuclear protein and a proliferation marker frequently used in establishing the prognosis for breast cancer patients. To investigate the prognostic value of the Ki-67 proliferation index in female cats with mammary carcinoma, a prospective study was conducted with 96 animals. The Ki-67 index of primary tumors (n = 96) was initially determined, and whenever possible, the Ki-67 index of regional lymph node metastasis (n = 38) and distant metastasis (n = 16) was also estimated. The optimal cutoff value for the Ki-67 index was determined by univariate and multivariate analysis. Ki-67 indices ≥14% were detected in 72.9% (70 of 96) of the tumors. Tumors with a Ki-67 index ≥14% were significantly associated with large size (P = .022), poor differentiation (P = .009), presence of necrotic areas (P = .008), estrogen receptor-negative status (P < .0001), fHER2-negative status (P = .003), and shorter overall survival (P = .012). Moreover, Ki-67 expression in the primary tumor was strongly and positively correlated with both regional metastasis (P < .0001; r = 0.83) and distant metastasis (P < .0001; r = 0.83), and was significantly higher in distant metastases when compared with the primary tumor (P = .0009). A similar correlation was also observed between regional and distant metastasis (P < .0001; r = 0.75). On the basis of the above results, the authors propose the adoption of the 14% value as the optimal cutoff for Ki-67 to identify tumors with high risk of disease progression.

**Clinical and haematological responses of feline blood donors anaesthetised with a tiletamine and zolazepam combination.**

This prospective study investigated the effect on clinical and haematological variables of the anaesthetic combination of tiletamine and zolazepam in feline blood donors. Blood (10 ml/kg bodyweight to a maximum volume of 60 ml) was collected from the jugular vein of 31 owned healthy cats anaesthetised with 2.5 mg/kg of tiletamine and 2.5 mg/kg of zolazepam intramuscularly. Rectal temperature (RT), systolic arterial pressure (SAP), mean arterial pressure (MAP), diastolic arterial pressure (DAP), heart rate (HR) and complete blood count (including red blood cells [RBC], haemoglobin [HB], haematocrit [HT], platelet [PLT] count, white blood cells [WBC], lymphocytes, neutrophils, eosinophils, monocytes and basophils) were evaluated pre- and postdonation. RT decreased significantly (P < 0.01) after blood donation (mean change in RT -0.7°C). Significant increases in SAP (P = 0.03), MAP (P < 0.01) and DAP (P < 0.01) occurred after blood donation (mean
increase 13 mmHg, 12 mmHg and 11 mmHg, respectively). Although RBC, HT, HB, WBC, PLT, neutrophil and monocyte counts decreased, and HR, and lymphocyte, eosinophil and basophil counts increased after blood donation this change was not statistically significant. Mean time from pre- to postdonation evaluation was 39 ± 11 mins (range 24-76 mins). None of the cats had evidence of pallor or collapse after recovery from anaesthesia. The collection of blood at 10 ml/kg bodyweight to a maximum volume of 60 ml in healthy cats using a low dose tiletamine and zolazepam anaesthetic appears to be well tolerated by feline blood donors.

Survival in cats with primary and secondary cardiomyopathies.

OBJECTIVES: Feline cardiomyopathies (CMs) represent a heterogeneous group of myocardial disease. The most common CM is hypertrophic cardiomyopathy (HCM), followed by restrictive cardiomyopathy (RCM). Studies comparing survival and outcome for different types of CM are scant. Furthermore, little is known about the cardiovascular consequences of systemic diseases on survival. The aim of this retrospective study was to compare survival and prognostic factors in cats affected by HCM, RCM or secondary CM referred to our institution over a 10 year period. METHODS: The study included 94 cats with complete case records and echocardiographic examination. Fifty cats presented HCM, 14 RCM and 30 secondary CM. RESULTS: A statistically significant different survival time was identified for cats with HCM (median survival time of 865 days), RCM (273 days) and secondary CM (<50% cardiac death rate). In the overall population and in the primary CM group (HCM + RCM), risk factors in the multivariate analysis, regardless of the CM considered, were the presence of clinical signs, an increased left atrial to aortic root (LA/Ao) ratio and a hypercoagulable state. CONCLUSIONS AND RELEVANCE: Primary CMs in cats share some common features (ie, LA dimension and hypercoagulable state) linked to feline cardiovascular physiology, which influence survival greatly in end-stage CM. The presence of clinical signs has to be regarded as a marker of disease severity, regardless of the underlying CM. Secondary CMs are more benign conditions, but if the primary disease is not properly managed, the prognosis might also be poor in this group of patients.

Management of acute kidney injury with continuous venovenous haemodiafiltration in a cat.

Continuous renal replacement therapy is an emerging technique for the treatment of acute kidney injury (AKI). Data regarding its use in cats are limited. This report describes the use of a novel continuous renal replacement therapy (CRRT) system for the treatment of AKI in a cat. A 1.3-year-old cat developed uraemic signs following the administration of a non-steroidal anti-inflammatory agent for the treatment of a suspect traumatic episode. CRRT was provided with a Prismaflex Gambro machine used in continuous venovenous haemodiafiltration mode, with an AN-69 surface-treated membrane, synthetic colloid priming and heparin anticoagulation. Two treatment cycles were performed, totalling 51 h of CRRT. The treatment was effective in controlling uraemic signs, and no major complications were noted. Owing to financial constraints the owners declined further CRRT treatments, and on day 8 of hospitalisation, owing to the lack of significant clinical improvement, humane euthanasia was performed. The set-up detailed in this report provides a viable option for the initial treatment of cats with AKI.
Clinical effects of a constant rate infusion of remifentanil, alone or in combination with ketamine, in cats anesthetized with isoflurane.


**OBJECTIVE:** To evaluate the effects of a constant rate infusion of remifentanil, alone or in combination with ketamine, in healthy cats anesthetized with isoflurane. **DESIGN:** Randomized, controlled, clinical trial. **ANIMALS:** 23 cats undergoing elective ovariohysterectomy. **PROCEDURES:** Cats were premedicated with acepromazine and morphine; anesthesia was induced with propofol and maintained with isoflurane. Cats were given constant rate infusions of remifentanil (20 µg/kg/h [9 µg/lb/h], IV; n = 8), remifentanil and ketamine (0.5 mg/kg [0.23 mg/lb], then 1.8 mg/kg/h [0.82 mg/lb/h], IV; 7), or crystalloid fluids (8). The anesthesiologist was blinded to treatment group, end-tidal isoflurane concentration, and vaporizer setting. Heart rate, systolic arterial blood pressure, respiratory rate, end-tidal partial pressure of CO2, temperature, and end-tidal isoflurane concentration were monitored; recovery scores were assigned. **RESULTS:** There were no significant differences among treatment groups with respect to age, body weight, surgery time, anesthesia time, time to extubation, recovery score, or cardiorespiratory variables. End-tidal isoflurane concentration was significantly reduced in cats given remifentanil and ketamine (mean ± SD, 0.63 ± 0.4%), compared with concentration in cats given crystalloid fluids (1.22 ± 0.5%) but not compared with concentration in cats given remifentanil alone (1.03 ± 0.4%). Compared with cats given crystalloid fluids, mean isoflurane requirement was reduced by 48.3% in cats given remifentanil-ketamine and 15.6% in cats given remifentanil alone. **CONCLUSIONS AND CLINICAL RELEVANCE:** At the dosages administered, a constant rate infusion of remifentanil-ketamine resulted in a significant decrease in the isoflurane requirement in healthy cats undergoing ovariohysterectomy. However, significant differences in cardiovascular variables were not observed among treatment groups.

The fecal microbiome in cats with diarrhea.


Recent studies have revealed that microbes play an important role in the pathogenesis of gastrointestinal (GI) diseases in various animal species, but only limited data is available about the microbiome in cats with GI disease. The aim of this study was to evaluate the fecal microbiome in cats with diarrhea. Fecal samples were obtained from healthy cats (n = 21) and cats with acute (n = 19) or chronic diarrhea (n = 29) and analyzed by sequencing of 16S rRNA genes, and PICRUSt was used to predict the functional gene content of the microbiome. Linear discriminant analysis (LDA) effect size (LEfSe) revealed significant differences in bacterial groups between healthy cats and cats with diarrhea. The order Burkholderiales, the families Enterobacteriaceae, and the genera Streptococcus and Collinsella were significantly increased in diarrheic cats. In contrast the order Campylobacterales, the family Bacteroidaceae, and the genera Megamonas, Helicobacter, and Roseburia were significantly increased in healthy cats. Phylum Bacteroidetes was significantly decreased in cats with chronic diarrhea (>21 days duration), while the class Erysipelotrichi and the genus Lactobacillus were significantly decreased in cats with acute diarrhea. The observed changes in bacterial groups were accompanied by significant differences in functional gene contents: metabolism of fatty acids, biosynthesis of glycosphingolipids, metabolism of biotin, metabolism of tryptophan, and ascorbate and...
aldarate metabolism, were all significantly (p<0.001) altered in cats with diarrhea. In conclusion, significant differences in the fecal microorganisms between healthy cats and cats with diarrhea were identified. This dysbiosis was accompanied by changes in bacterial functional gene categories. Future studies are warranted to evaluate if these microbial changes correlate with changes in fecal concentrations of microbial metabolites in cats with diarrhea for the identification of potential diagnostic or therapeutic targets.

**Assessment of left ventricular longitudinal function in cats with subclinical hypertrophic cardiomyopathy using tissue Doppler imaging and speckle tracking echocardiography.**


Hypertrophic cardiomyopathy (HCM) in cats is characterized by concentric left ventricular (LV) hypertrophy and both diastolic and systolic dysfunction. Although impaired cardiac function detected by tissue Doppler imaging (TDI) in cats with HCM was previously reported, reference ranges of TDI in normal cats and cats with HCM have been reported as widely variable. Two-dimensional speckle tracking echocardiography (STE) was useful for assessment of cardiac function in human patients with HCM, but clinical utility was not known in cats. The aim of this study was to assess global and segmental LV myocardial function using STE in cats with HCM whose TDI variables were within the reference range. A total of 35 cats of different breeds were enrolled in this study. The HCM group (n=22) was cats diagnosed as HCM without left atrial enlargement and with normal TDI measurements. HCM cats were further divided into a segmental hypertrophy (S-HCM) group and a diffuse hypertrophy (D-HCM) group. The control group consisted of 13 clinically healthy cats. No cats in any group showed any clinical symptoms. Conventional echocardiography, TDI, and global and segmental STE indices were evaluated and compared between groups. Only the longitudinal strain rate during early diastole was significantly decreased in both HCM groups, even in all segments including those without hypertrophy in S-HCM group. This study suggests that STE parameters are the more sensitive variables compared with conventional TDI parameters to detect early myocardial diastolic dysfunction in cats with HCM.

**Sparse serological evidence of H5N1 avian influenza virus infections in domestic cats, northeastern China.**


Today the cross-species transmission of avian influenza viruses (AIV) are a great concern. A number of AIV strains are now enzootic among poultry, with H9N2 and highly pathogenic H5N1 AIV strains prevalent in China. H5N1 strains have been recognized to infect zoo and domestic feline species. In this serological study we sought to examine evidence that H5N1 strains have infected domestic cats in northeastern China. In 2013, we conducted a cross-sectional serological study of 916 healthy cats in Heilongjiang, Jilin, and Liaoning Provinces. Sera were screened with a hemagglutinin inhibition (HI) assay and seropositive specimens (HI ≥ 1:20) were further evaluated with a microneutralization (MN) assay against a clade 2.3.2 H5N1 AIV, a H9N2 AIV, A (H1N1)pdm09, and a canine H3N2 virus. While ~2% of cats had elevated HI assays against H5N1, no elevations were confirmed (MN ≥ 1:80). These data serve as baseline for future surveillance for AIV infections among domestic cats. Conducting such surveillance seems important for geographical areas recognized as endemic for AIVs.
This is especially true for countries such as China where domestic cats and poultry are often in close contact.

**Feline chronic kidney disease is associated with upregulation of transglutaminase 2: a collagen cross-linking enzyme.**


Chronic kidney disease is a major cause of morbidity and mortality in cats. Transglutaminase 2 (TG2) is a calcium-dependent enzyme proposed to mediate tubulointerstitial fibrosis in the kidney by cross-linking collagen fibrils. Postmortem kidney tissue was obtained from primary renal azotemic (n = 10) and nonazotemic (n = 5) cats (14 domestic short hair, 1 Burmese; aged 9-23.7 years). Extracellular matrix protein deposition was determined by Masson’s trichrome staining and collagen immunofluorescence. Total kidney transglutaminase (TG) enzyme activity and TG2 protein were measured in tissue homogenates by putrescine incorporation and Western blotting. Extracellular TG enzyme activity and TG2 protein were determined in situ by immunofluorescence, quantified by multiphase image analysis. Results were compared using the unpaired Student’s t-test with Welch’s correction. Elevated plasma creatinine, urea, and phosphate concentrations were associated with tubulointerstitial fibrosis but not glomerular fibrosis. Kidney homogenates from azotemic cats showed a 3-fold higher total TG enzyme activity and TG2 protein compared with kidneys from nonazotemic cats. Immunofluorescent studies performed in situ confirmed a 3-fold higher extracellular TG enzyme activity and TG2 protein in cats with azotemia. Tubulointerstitial TG2 showed a positive linear correlation with both renal function and tubulointerstitial fibrosis. In conclusion, for cats with azotemia, both filtration failure and tubulointerstitial fibrosis were associated with the upregulation of TG2, a collagen cross-linking enzyme and the major isoform of transglutaminase in the kidney. TG2 may provide a new therapeutic target for drugs designed to slow the progression of feline chronic kidney disease.

**Differential effects of viroporin inhibitors against feline infectious peritonitis virus serotypes I and II.**


Feline infectious peritonitis virus (FIP virus: FIPV), a feline coronavirus of the family Coronaviridae, causes a fatal disease called FIP in wild and domestic cat species. The genome of coronaviruses encodes a hydrophobic transmembrane protein, the envelope (E) protein. The E protein possesses ion channel activity. Viral proteins with ion channel activity are collectively termed “viroporins”. Hexamethylene amiloride (HMA), a viroporin inhibitor, can inhibit the ion channel activity of the E protein and replication of several coronaviruses. However, it is not clear whether HMA and other viroporin inhibitors affect replication of FIPV. We examined the effect of HMA and other viroporin inhibitors (DIDS [4,4’-disothiocynano-2,2’-stilbenedisulphonic acid] and amantadine) on infection by FIPV serotypes I and II. HMA treatment drastically decreased the titers of FIPV serotype I strains Black and KU-2 in a dose-dependent manner, but it only slightly decreased the titer of FIPV serotype II strain 79-1146. In contrast, DIDS treatment decreased the titer of FIPV serotype II strain 79-1146 in dose-dependent manner, but it only slightly decreased the titers of FIPV serotype I strains Black and KU-2. We investigated whether there is a difference in ion channel activity of the E protein between viral serotypes using E. coli cells expressing the E protein of FIPV serotypes I and II. No difference
was observed, suggesting that a viroporin other than the E protein influences the differences in the actions of HMA and DIDS on FIPV serotypes I and II.

**Molecular characterization and pathogenicity of a genogroup GVI feline norovirus.**

Norovirus (NoV) has been classified into 6 genogroups, GI-GVI. In the present study, we identified novel feline NoV (FNoV) M49-1 strain. The C-terminal of RNA-dependent RNA polymerase of the FNoV M49-1 strain was highly homologous with GIV FNoV and GIV lion norovirus, whereas VP1 was highly homologous with GVI canine NoV (CNoV). Based on the results of the Simplot analysis, the FNoV M49-1 strain may have been produced by recombination between GIV.2 FNoV and GVI.1 CNoV. In addition, specific pathogen-free cats inoculated with FNoV gene-positive-fecal samples developed diarrhea symptoms, and the viral gene was detected in their feces and blood.

**Correlation between glucose concentrations in serum, plasma, and whole blood measured by a point-of-care glucometer and serum glucose concentration measured by an automated biochemical analyzer for canine and feline blood samples.**

Objective-To investigate the correlation between glucose concentrations in serum, plasma, and whole blood measured by a point-of-care glucometer (POCG) and serum glucose concentration measured by a biochemical analyzer. Design-Prospective clinical study. Samples-96 blood samples from 80 dogs and 90 blood samples from 65 cats. Procedures-Serum, plasma, and whole blood were obtained from each blood sample. The glucose concentrations in serum, plasma, and whole blood measured by a POCG were compared with the serum glucose concentration measured by a biochemical analyzer by use of the Lin concordance correlation coefficient (pc) and Bland-Altman plots. Results-For both canine and feline samples, glucose concentrations in serum and plasma measured by the POCG were more strongly correlated with the serum glucose concentration measured by the biochemical analyzer (pc, 0.98 for both canine serum and plasma; pc, 0.99 for both feline serum and plasma) than that in whole blood (pc, 0.62 for canine samples; pc, 0.90 for feline samples). The mean difference between the glucose concentrations determined by the biochemical analyzer and the POCG in serum, plasma, and whole blood was 0.4, 0.3, and 31 mg/dL, respectively, for canine samples and 7, 6, and 32 mg/dL, respectively, for feline samples. Conclusions and Clinical Relevance-Results indicated that use of a POCG to measure glucose concentrations in serum or plasma may increase the accuracy and reliability of diagnostic and treatment decisions associated with glucose homeostasis disorders in dogs and cats. (J Am Vet Med Assoc 2015;246:1327-1333).

**Pharmacokinetic and pharmacodynamic evaluation of high doses of buprenorphine delivered via high-concentration formulations in cats.**

OBJECTIVES: To evaluate the potential benefits of high-dose buprenorphine formulations for analgesia in cats, serial and crossover studies were undertaken to investigate their pharmacokinetics
and thermal antinociceptive effects. METHODS: Twelve healthy adult domestic shorthair cats (6.0 ± 1.1 kg bodyweight) were studied. Aqueous solutions of buprenorphine hydrochloride at 0, 0.02, 0.06, 0.12 and 0.24 mg/kg bodyweight and formulations containing 0, 0.3, 0.6 and 1.2 mg/ml with and without preservatives were given subcutaneously. Blood samples were taken and thermal threshold (TT) measured prior to and at regular time points up to 72 h after dosing. Descriptive statistics and analyses of variance were applied as appropriate. RESULTS: Baseline TT was 47.6 ± 4.1°C, which increased in all groups treated with all buprenorphine dosages and formulations. After doses of 0.12 mg/kg and above, TT was significantly higher than baseline at most time points from 1-30 h post-treatment. The time to maximum effect (Tmax) ranged between 0.25 and 2.00 h; and plasma concentrations associated with maximum antinociceptive effect (Cmax) were 1.01-1.72 ng/ml after the 0.02 mg/kg dose, 1.4-4.9 ng/ml after the 0.06 mg/kg dose, 4.6-51.4 ng/ml after the 0.12 mg/kg dose and 5.3-22.3 ng/ml after the 0.24 mg/kg dose. The range of estimates for the buprenorphine elimination half-life were as follows: 0.02 mg/kg = 1.35-5.33 h; 0.06 mg/kg = 16.1-31.2 h; 0.12 mg/kg = 10.1-34.0 h; and 0.24 mg/kg = 16.1-31.6 h. The mean ‘plasma concentration for the offset of analgesia’ was 2.3 ± 2.0 ng/ml. No adverse effects were seen. The addition of preservatives to a high-concentration buprenorphine formulation had no impact on antinociception nor any side effects. CONCLUSIONS AND RELEVANCE: Aqueous high-concentration buprenorphine formulations administered at 0.12 or 0.24 mg/kg have potential for clinical use in cats, providing prolonged antinociception in a single subcutaneous injection of minimal dose volume.

Serum biomarkers of oxidative stress in cats with feline infectious peritonitis.


The purpose of this study was to elucidate the possible presence of oxidative stress in cats naturally affected by feline infectious peritonitis (FIP) by investigating two antioxidant biomarkers in serum: paraoxonase-1 (PON1) and total antioxidant capacity (TAC). PON1 was measured by spectrophotometric assays using three different substrates: p-nitrophenyl acetate (pNA), phenyl acetate (PA) and 5-thiobutil butyrolactone (TBBL), in order to evaluate possible differences between them. The PA and TBBL assays for PON1 and the assay for TAC were validated, providing acceptable precision and linearity although PA and TAC assays showed limit of detection higher than the values found in some cats with FIP. Cats with FIP and other inflammatory conditions showed lower PON1 values compared with a group of healthy cats with the three assays used, and cats with FIP showed significant decreased TAC concentrations. This study demonstrated the existence of oxidative stress in cats with FIP.

A retrospective clinical and epidemiological study on feline coronavirus (FCoV) in cats in Istanbul, Turkey.


The presence of antibodies to feline coronavirus (FCoV) and feline immunodeficiency virus (FIV), together with feline leukemia virus (FeLV) antigen was investigated in 169 ill household and stray cats attending a veterinary surgery in Istanbul in 2009-14. The estimated FCoV and FIV seroprevalence (95% confidence intervals) were 37% (30-45%) and 11% (6-16%), respectively and FeLV prevalence
was 1% (0-3%). FCoV seroprevalence increased until 2 years of age, was highest in 2014 and among household cats living with other cats and with outdoor access, and was lower in FIV seropositive compared to seronegative cats. Symptoms typically associated with wet feline infectious peritonitis (FIP) including ascites, abdominal distention or pleural effusion, coupled in many cases with non-antibiotic responsive fever, were observed in 19% (32/169) of cats, and 75% (24/32) of these cats were FCoV seropositive. FCoV seropositivity was also associated with a high white blood cell count, high plasma globulin, low plasma albumin and low blood urea nitrogen. The percentage of FCoV seropositive and seronegative cats that died in spite of supportive veterinary treatment was 33% (21/63) and 12% (13/106), respectively. These results indicate that FCoV is widespread and has a severe clinical impact in cats from Istanbul. Moreover, the incidence of FCoV infections could be rising, and in the absence of effective vaccination cat owners need to be made aware of ways to minimize the spread of this virus.

**Resistive index for kidney evaluation in normal and diseased cats.**


**OBJECTIVES:** To determine the resistive index (RI) in normal cats and in cats with various renal diseases, and to evaluate the effect of age on RI. **METHODS:** The subjects were cats that had ultrasonography (US) of the urinary tract and RI measurement at our centre between January 2003 and April 2014. Based on clinical evaluation, biochemical and haematological tests, urinalysis and US, the cats were classified as healthy or diseased. RI measurements were made from the interlobar or arcuate arteries. Data were analysed for differences between the right and the left kidney, the two sexes, different age groups in healthy cats, and between healthy and diseased cats. **RESULTS:** A total of 116 cats (68 males, 48 females) were included: 24 healthy and 92 diseased. In the healthy cats, RI (mean ± SD) differed significantly (P = 0.02) between the right kidney (0.54 ± 0.07) and the left kidney (0.59 ± 0.08). For the left kidney, RI was significantly higher in cats with chronic kidney disease (0.73 ± 0.12) and acute kidney injury (0.72 ± 0.08) (P = 0.0008). For the right kidney, RI was significantly higher in cats with chronic kidney disease (0.72 ± 0.11), acute kidney injury (0.74 ± 0.08), polycystic kidney disease (0.77 ± 0.11) and renal tumour (0.74 ± 0.001) (P <0.0001). There was no significant effect on RI value in either kidney in terms of age or sex. **CONCLUSIONS AND RELEVANCE:** RI could be considered a valuable diagnostic tool in cats, useful in the differential diagnosis of diffuse renal diseases. While it does not change with the age of the cat, ultrasonographers should be aware that RI may differ between the two kidneys.

**Vitamin d status predicts 30 day mortality in hospitalised cats.**


Vitamin D insufficiency, defined as low serum concentrations of the major circulating form of vitamin D, 25 hydroxyvitamin D (25(OH)D), has been associated with the development of numerous infectious, inflammatory, and neoplastic disorders in humans. In addition, vitamin D insufficiency has been found to be predictive of mortality for many disorders. However, interpretation of human studies is difficult since vitamin D status is influenced by many factors, including diet, season, latitude, and exposure to UV radiation. In contrast, domesticated cats do not produce vitamin D cutaneously, and most cats are
fed a commercial diet containing a relatively standard amount of vitamin D. Consequently, domesticated cats are an attractive model system in which to examine the relationship between serum 25(OH)D and health outcomes. The hypothesis of this study was that vitamin D status would predict short-term, all-cause mortality in domesticated cats. Serum concentrations of 25(OH)D, together with a wide range of other clinical, hematological, and biochemical parameters, were measured in 99 consecutively hospitalised cats. Cats which died within 30 days of initial assessment had significantly lower serum 25(OH)D concentrations than cats which survived. In a linear regression model including 12 clinical variables, serum 25(OH)D concentration in the lower tertile was significantly predictive of mortality. The odds ratio of mortality within 30 days was 8.27 (95% confidence interval 2.54-31.52) for cats with a serum 25(OH)D concentration in the lower tertile. In conclusion, this study demonstrates that low serum 25(OH)D concentration status is an independent predictor of short term mortality in cats.

**Gastric perforation following endoscopic removal of a Bravo pH capsule in a cat.**


A 7-year-old domestic shorthair cat was evaluated for hyporexia and weight loss following endoscopic placement of an intragastric pH monitoring device. Physical examination of the cat was unremarkable, and its blood work was notable for a mild hypoalbuminemia. The cat’s acute hyporexia and weight loss was attributed to discomfort associated with the intragastric pH monitoring device, as has been reported in humans. Endoscopic removal of the intragastric pH monitoring device resulted in gastric perforation. The cat underwent exploratory laparotomy for surgical resection and repair of the perforated area. To our knowledge, this is the first report of gastric perforation secondary to removal of a Bravo pH capsule. Caution may be advised when considering intragastric pH capsule removal in cats.

**Monitoring the Foetal Phase of Gestation in the Queen With a 12.5-MHz Ultrasound Probe and Prediction of the Parturition by Combining the Measurements of Head and Abdominal Diameters.**


Ten gestations in six domestic shorthair cats (Europeans) were monitored daily during the foetal phase of gestation, from the 28th day after the first mating until parturition, using ultrasound with a 12.5-MHz probe. The development of the various organs over this period was recorded. The diameters of the head (HD) and abdomen (AD) were measured. Skeletal calcification visible on ultrasound occurred in a defined order between the 34th and 40th day of gestation. During the last 30 days of gestation, there was a significant correlation between HD and days before parturition (DBP) ($r(2) = 0.99$) and between AD and DBP ($r(2) = 0.98$). The following equations were obtained: DBP = -2.10*HD (mm) + 50.74; DBP = -1.01*AD (mm) + 42.19. The confidence intervals were stable over the last 30 days of gestation. For the HD, the confidence interval was ±1 day in 53% of cases and ±2 days in 85% of cases. For the AD, the confidence interval was ±1 day in 45% of cases and ±2 days in 77% of cases. A table obtained by combining the HD and AD measurements made it possible to estimate the date of parturition within 2 days with a reliability of over 85%.

**Increased erythrocytic osmotic fragility in anemic domestic shorthair and purebred cats.**
OBJECTIVES: Increased erythrocytic osmotic fragility and splenomegaly have been reported in anemic Abyssinian and Somali cats. Here we report on this condition in anemic domestic shorthair cats and two other breeds, and describe common features of the clinicopathological profiles, management and outcomes. METHODS: Anemic cats, other than Abyssinians and Somalis, were included. The erythrocytic osmotic fragility test was performed, known causes of anemia were excluded, the illness was followed and medical records were reviewed. RESULTS: Twelve neutered cats were first found to be anemic between 0.5 and 9.0 years of age. Pallor, lethargy, inappetence, pica, weight loss and splenomegaly were commonly observed. A moderate-to-severe macrocytic and hypochromic anemia with variable regeneration was noted. Infectious disease screening, direct Coombs’ and pyruvate kinase DNA mutation test results were negative. Freshly drawn blood did not appear hemolysed but became progressively lysed during storage at 4°C. The sigmoid osmotic fragility curves were moderately to severely right shifted, indicating erythrocyctic fragility at 20°C. Cross-correction studies indicated an intrinsic red cell effect rather than plasma effect. Most cats were treated with immunosuppressive doses of prednisolone and doxycycline, with variable responses. Five cats with recurrent or persistent anemia responded well to splenectomy. However, two had occasional recurrence of severe anemia: one was found to be Bartonella vinsonii-positive during one episode and responded to azithromycin and prednisolone, while the other cat had two episodes of severe anemia of unknown cause. Finally, six cats were euthanized within 1 month and 7 years after initial presentation. Histopathology of six spleens revealed mainly congestion and extramedullary hematopoiesis. CONCLUSIONS AND RELEVANCE: Similarly to Abyssinian and Somali cats, domestic shorthair and cats of other breeds can also develop severe erythrocytic osmotic fragility with anemia and splenomegaly, which should be considered as a differential diagnosis in anemic cats.

Comparison of specific gravity analysis of feline and canine urine, using five refractometers, to pycnometric analysis and total solids by drying.


AIMS: To compare the performance of five refractometers for determination of urine specific gravity in cats and dogs, with reference to weight of total solids and pycnometer analysis. METHODS: Urine samples from 27 cats and 31 dogs submitted for routine urinalysis were included. Urine specific gravity was determined with five refractometers. Four were optical, hand-held refractometers with a temperature compensation method and one was a digital model. Urine was dried to determine the precise weight of total solids. The total solids (g/L) were converted to an estimated specific gravity by division with 2.33. Urine specific gravity of four feline and seven canine samples were analysed with a pycnometer. Limits of agreement analysis was used to evaluate the agreement between specific gravity (analysed as specific gravity minus 1) measured by the refractometers and estimated from dried total solids, or pycnometer results. RESULTS: The five refractometers reported clearly different results from each other. Proportional negative bias was noted for refractometer results compared to estimated specific gravity from total solids and a constant negative bias compared to pycnometer results. The two refractometers designed for cat urine reported similar and lowest specific gravity results with a mean negative bias of 0.007 and 0.008 units compared to estimated specific gravity from total solids, and a mean negative bias of 0.006 units compared to pycnometer results. CONCLUSIONS: Refractometer results did not increase consistently with increasing urine specific gravity compared to reference methods or to other refractometers. Two feline refractometers reported consistently lower specific
Reducing error in feline platelet enumeration by addition of Iloprost to blood specimens: comparison to prostaglandin E1 and EDTA.


BACKGROUND: Prostaglandin E1 (PGE1) and Iloprost inhibit platelet aggregation and should prevent or minimize preanalytic error with feline platelet enumeration. OBJECTIVES: The objective was to compare the relative effectiveness in reducing errors in platelet enumeration by adding Iloprost to feline EDTA blood specimens in comparison to adding PGE1 or EDTA alone. In addition, a grading system for platelet aggregation in blood smears was evaluated for effectiveness in predicting prominent errors and compared to ADVIA’s PLT-CLM flag. Finally, the use of plateletcrit in feline blood with platelet aggregation was evaluated. METHODS: Blood specimens from 35 cats were included. Blood was collected into EDTA tubes with or without Iloprost or PGE1, and was rapidly mixed. Platelet count (PLT), plateletcrit (PCT), mean platelet volume (MPV), and platelet flags were determined with an ADVIA 2120. Manual PLT was performed with a Leucoplate stain. PLT was determined by an IDEXX VetAutoread hematology analyzer (QBC). RESULTS: Neither addition of Iloprost nor PGE1 to EDTA blood specimens completely prevented platelet aggregation. Iloprost-treated specimens had the least severe aggregation. PGE1 was better than EDTA alone. Significant errors in PLT results were consistently identified by the grading system. ADVIA’s PLT-CL flag usually predicted significant errors in PLT. QBC PLT results showed high imprecision. Manual PLT error was smaller than ADVIA PLT in EDTA specimens with aggregation. CONCLUSIONS: Adding Iloprost to feline blood specimens improved platelet enumeration accuracy. A grading system for severity of platelet aggregation and usually the ADVIA’s PLT-CL alarm predicted specimens with significant errors in platelet enumeration.

Plasma lactate concentrations and comparison of two point-of-care lactate analyzers to a laboratory analyzer in a population of healthy cats.


OBJECTIVE: To establish a reference interval for plasma lactate in a population of healthy adult cats on a laboratory analyzer (Nova Biomedical Critical Care Xpress [CCX]) and 2 commercially available point-of-care (POC) analyzers (Abbott i-STAT [i-STAT] and Nova Biomedical Lactate Plus [LP]), and to compare the level of agreement of lactate measurement between the laboratory analyzer and POC analyzers. DESIGN: Prospective observational study. SETTING: University veterinary teaching hospital. ANIMALS: Forty-seven healthy adult cats. INTERVENTIONS: Jugular phlebotomy. MEASUREMENTS AND MAIN RESULTS: In this population, plasma lactate reference interval was 0.67-5.44 mmol/L for the CCX, 0.65-5.16 mmol/L for the i-STAT, and 0.68-4.39 mmol/L for the LP. Comparisons were made between lactate measurements on 2 point-of-care analyzers and the laboratory analyzer using the Bland-Altman method. For the comparison of CCX and i-STAT, the bias was -0.10 mmol/L; for the CCX and LP, the bias was -0.24 mmol/L. CONCLUSIONS: Measurements of plasma
lactate in cats using the i-STAT showed acceptable agreement with the CCX. The LP showed weaker agreement. However, both POC analyzers are suitable for measurement of lactate in cats, provided results from different POC analyzers are not directly compared. This study identified a larger reference interval for plasma lactate concentration in cats than what has been previously reported.

Pharmacokinetics of minocycline in domestic cats.

OBJECTIVES: Recently, the increased cost and decreased availability of doxycycline has sparked an interest in using minocycline as an alternative. The purpose of this study was to determine the pharmacokinetics of minocycline in domestic cats in order to facilitate dosage decisions. METHODS: Purpose-bred, young adult cats were administered a single dose of either intravenous (IV; n = 4; 5 mg/kg) or oral (n = 6; 50 mg/cat) minocycline. Blood was collected from each at intervals up to 24 h afterwards. Minocycline was measured using high performance liquid chromatography with ultraviolet detection. A one-compartment pharmacokinetic model was fit to the oral data and a two-compartment model to the IV data via a computer program. Plasma protein binding was measured by fortifying blank plasma from untreated healthy cats with minocycline at two concentrations and applying an ultracentrifugation method. RESULTS: Two cats became transiently lethargic and tachypneic during IV drug infusion. One cat vomited 6.0 h after infusion, and two cats vomited either 1.5 h or ~5.0 h after oral drug administration. The mean oral dose administered was 13.9 ± 0.47 mg/kg. Oral bioavailability was approximately 62%. Plasma protein binding was 60% at 5 µg/ml and 46% at 1 µg/ml. After IV administration, elimination half-life (t½), apparent volume of distribution at steady-state, and systemic clearance were 6.7 h (coefficient of variation [CV] 14.4%), 1.5 l/kg (CV 34.5%) and 2.9 ml/kg/min (CV 40.8%), respectively. After oral administration the terminal t½ and peak concentration (Cmax) were 6.3 h (CV 9%) and 4.77 µg/ml (CV 36%), respectively. CONCLUSIONS AND RELEVANCE: Because most bacteria will have a minimum inhibitory concentration of 0.5 µg/ml, a once-daily oral dose of 8.8 mg/kg would be adequate to meet pharmacokinetic-pharmacodynamic targets after adjusting for protein binding. Although some gastrointestinal upset may occur, one 50 mg capsule orally once daily would provide appropriate dosing for most cats.

Treatment of feline giardiasis during an outbreak of diarrhoea in a cattery: potential effects on faecal Escherichia coli resistance patterns.

OBJECTIVES: An outbreak of diarrhoea involving 16 cats at a cattery in Norway was investigated. Treatment and control of the outbreak were the primary objectives, but the effects of treatment on the antimicrobial resistance profiles of Escherichia coli isolated from faeces were also investigated. METHODS: Faecal samples were investigated for Giardia cysts by immunofluorescence microscopy, and multi-locus genotyping was performed to determine the Giardia genotype. Faecal E coli were assessed, before and after treatment for giardiasis, for antimicrobial resistance. RESULTS: The outbreak was probably caused by Giardia duodenalis, Assemblage F. Although infection was eliminated in most cats following treatment with fenbendazole, over 30% of the infected cats required a second treatment round (combined fenbendazole and metronidazole). Investigation of sensitivity to antibacterial drugs of E coli that had been isolated both prior to and following treatment demonstrated that fenbendazole treatment may select for resistant bacteria. CONCLUSIONS AND RELEVANCE:
Controlling Giardia infections in dense cat populations can be challenging, and requires strict hygiene measures. In cases where fenbendazole alone does not result in treatment success, a combination treatment with fenbendazole and metronidazole may be effective. Although this study did not include untreated controls, we suggest that the potential for changes in gut microbiota and antimicrobial resistance development should be considered when choosing antiprotozoal drugs, particularly in cases of treatment failure and where repeat treatment is required.

Incidence, severity and prognosis associated with hypernatremia in dogs and cats.
BACKGROUND: Hypernatremia has been associated with substantial morbidity and death in human patients. The incidence and importance of hypernatremia in dogs and cats has not been determined.
HYPOTHESIS/OBJECTIVES: To describe the incidence of and prognosis associated with hypernatremia in dogs and cats at a university teaching hospital. ANIMALS: A total of 16,691 dogs and 4,211 cats with measured blood or serum sodium concentration. METHODS: Retrospective study. Medical records of animals with a blood or serum sodium concentration measured during a 60-month period were reviewed to determine the severity of hypernatremia and its associated case fatality rate. Cases with moderate (11-15 mmol/L above the reference range) or severe hypernatremia (≥16 mmol/L above the reference range) were further reviewed. RESULTS: A total of 957 dogs (5.7%) and 338 cats (8.0%) were diagnosed with hypernatremia. Case fatality rates of dogs and cats with hypernatremia was 20.6 and 28.1%, respectively compared to 4.4 and 4.5% with a normal blood or serum sodium concentration (P < .0001). The magnitude of hypernatremia was linearly associated with a higher case fatality rate (P < .0001). Hypernatremia was associated with a higher case fatality rate than hyponatremia. Among the animals with moderate or severe hypernatremia, 50% of dogs and 38.5% of cats presented with community-acquired hypernatremia, and 50% of dogs and 61.5% of cats developed hospital-acquired hypernatremia. CONCLUSIONS AND CLINICAL IMPORTANCE: Hypernatremia was found infrequently in this population but was associated with increased case fatality rates in dogs and cats. Presence and severity of hypernatremia might be useful as a prognostic indicator.

Incidence, severity and prognosis associated with hyponatremia in dogs and cats.
BACKGROUND: Hyponatremia is a common electrolyte abnormality in human patients and is associated with substantial morbidity and death. The incidence and importance of hyponatremia in dogs and cats has not been determined. HYPOTHESIS/OBJECTIVES: To describe the incidence of and prognosis associated with hyponatremia in dogs and cats at a university teaching hospital. ANIMALS: Of 16,691 dogs and 4,211 cats with measured blood or serum sodium concentration. METHODS: Retrospective study. Medical records of animals with a blood or serum sodium concentration measured during a 60-month period were reviewed to determine the severity of hyponatremia and its associated fatality rate. Cases with moderate (11-15 mmol/L below the reference range) or severe hyponatremia (≥16 mmol/L below the reference range) were further reviewed. RESULTS: Of 4,254 dogs (25.5%) and 2,081 cats (49.4%) were diagnosed with hyponatremia. Case fatality rates of dogs and cats with hyponatremia were 13.7% and 11.9%, respectively, compared to 4.4% and 4.5% with a normal blood or serum sodium concentration (P < 0.0001). The magnitude of hyponatremia was linearly associated with a higher case fatality rate (P < 0.0001). Hyponatremia was associated with a lower case fatality
rate than hypernatremia in the same population. Among the animals with moderate or severe hyponatremia, 92.1% of dogs and 90.6% of cats presented with community-acquired hyponatremia, and 7.9% of dogs and 9.4% of cats developed hospital-acquired hyponatremia. CONCLUSIONS AND CLINICAL IMPORTANCE: Hyponatremia was found commonly in this population and was associated with increased case fatality rate. Presence and severity of hyponatremia might be useful as a prognostic indicator.

Urine protein-to-creatinine concentration ratio in samples collected by means of cystocentesis versus manual compression in cats.


Objective-To compare urine protein-to-creatinine concentration (UPC) ratios in samples collected by means of cystocentesis versus manual compression in cats. Design-Evaluation study. Animals-43 client-owned cats requiring urinalysis. Procedures-In all cats, 5 mL of urine from the midstream phase of micturition was collected by means of manual compression and, subsequently, an additional 5 mL of urine was obtained by means of ultrasound-guided cystocentesis. A complete urinalysis was performed on all samples, and UPC ratios were determined. Results-Cats were classified on the basis of the International Renal Interest Society substaging system as being free from proteinuria (UPC ratio, < 0.2; n = 19) or as having borderline proteinuria (UPC ratio, 0.2 to 0.4; 7) or proteinuria (UPC ratio, > 0.4; 17). None of the cats had postrenal proteinuria. A significant linear correlation was identified between UPC ratios in urine samples obtained by means of manual compression and ratios in samples obtained by means of cystocentesis. For all cats, UPC ratios for samples obtained by the 2 collection methods resulted in classification in the same IRIS substage. Conclusions and Clinical Relevance-Results suggested that collection of a urine sample from the midstream phase of micturition by manual compression would be a reliable alternative to cystocentesis for the determination of UPC ratio in cats, provided that postrenal proteinuria was excluded by means of urine sediment analysis. Once postrenal proteinuria was ruled out, the method used to collect urine samples did not appear to influence the quantification of urine protein concentration.

Pharmacokinetics of intravenous ketorolac in cats undergoing gonadectomy.


AIM: To determine the pharmacokinetics of ketorolac tromethamine (0.5 mg/kg) when administered I/V to cats undergoing gonadectomy. METHODS: Ketorolac was administered to nine female and three male shorthair domestic cats as an I/V bolus of 0.5 mg/kg after intubation, and 20 minutes prior to ovariectionomy or orchiectionomy. Intra-operative cardiorespiratory variables were monitored and blood samples were collected over 24 hours. Concentrations of ketorolac in serum were determined by high-performance liquid chromatography to establish pharmacokinetic parameters. RESULTS: During surgery, mean end tidal isoflurane concentration was 1.63 (SD 0.24)% and normocapnia and spontaneous ventilation were maintained in all animals. The kinetics of ketorolac was described by a two-compartment model. The distribution and elimination half-lives were 0.09 (SD 0.06) and 4.14 (SD 1.18) hours, respectively. The body clearance was 56.8 (SD 33.1) mL/h/kg. The volume of distribution at steady-state and the mean residence time were 323.9 (SD 115.7) mL/kg and 6.47 (SD 2.86) hours,
respectively. CONCLUSION AND CLINICAL RELEVANCE: On the basis of the results, concentrations of ketorolac in serum in cats were above the human effective concentrations for 5-6 hours postoperatively. However, other studies including a control group are advocated to further investigate the ketorolac kinetics and the analgesic efficacy in this species.

Parasite prevalence in fecal samples from shelter dogs and cats across the Canadian provinces.


BACKGROUND: In Canada, surveys of enteric parasites in dogs and cats have been reported sporadically over the past 40 years, mostly focusing on a specific region. The present work was performed to determine the current prevalence of various parasites in fecal samples from shelter dogs and cats across the Canadian provinces. METHODS: A total of 1086 dog and 636 cat fecal samples from 26 shelters were analysed using a sugar solution double centrifugal flotation technique. Prevalences (national, regional, provincial, age and parasite-specific), were calculated and compared using the Fisher-Exact test. A multiplex PCR was performed to distinguish Taenia spp, Echinococcus granulosus and E. multilocularis on samples positive for taeniid eggs. RESULTS: Overall, 33.9% of dogs and 31.8% of cats were positive for at least one parasite. Toxocara canis and T. cati were the most prevalent parasite present in fecal samples followed by Cystoisospora spp. Prevalence in dogs was similar across the Atlantic, East, West and Pacific regions, while prevalence in cats varied regionally. Eggs of E. granulosus/E. canadensis were detected in samples from dogs from BC, AB, and ON. CONCLUSIONS: Data from this study will help in the development of strategies, based on the level of risk per geographic location for the prevention and response to these parasites in pets and free-roaming and shelter animals in Canada.

Metal projectile injuries in cats: review of 65 cases (2012-2014).


OBJECTIVES: The objective of this study was to compare the prevalence of different types of injuries caused by various types of projectiles amongst urban, suburban and rural cats of different ages in order to predict the type of injury sustained. METHODS: For the period 1 January 2012 to 30 April 2014, the medical records of cats with metal projectile injuries (PIs) were searched from the archive of the university’s small animal diagnostic imaging centre. Age, sex, owner address, admission during a weekend or on a working day, month of admission, projectile position (head and neck; thoracic region; abdominal region, including lumbosacral spine; forelimbs; and hindlimbs, including tail), number of projectiles, presence of a wound and fracture related to the projectile, and the type of projectile were recorded for each cat. RESULTS: Sixty-five cats with PIs were admitted during the defined period. In 38.5% of cats the projectiles found upon radiograph were incidental findings. The frequency of PIs peaked in March. Airgun projectiles were found in 80.0% of the cats. PIs in two or more body regions were found in 29.2% of the cats. Among the cats that had only been shot in one body region, the projectile was most frequently found in the abdominal region, including the lumbosacral spine (41.3%). CONCLUSIONS AND RELEVANCE: These results might prompt clinicians to evaluate closely and screen for feline PIs in emergency situations.
Sedative, hematologic and hemostatic effects of dexmedetomidine-butorphanol alone or in combination with ketamine in cats.


Acute stress induced by physical restraint can interfere with the validity of laboratory findings. Sedation could minimize such stress. However, it is not known whether sedation can affect hematologic and hemostatic parameters in cats. The purpose of this study was to evaluate hematologic and hemostatic parameters in domestic cats subjected to physical restraint in addition to one of two sedation protocols. In total, 50 cats were subjected to physical restraint and were then randomly divided into two groups of 25 animals, receiving dexmedetomidine (5 µg/kg) and butorphanol (0.3 mg/kg; DB group) or dexmedetomidine (5 µg/kg), butorphanol (0.3 mg/kg) and ketamine (3 mg/kg; DBK group). The cats were assessed for acute stress, sedation level, onset of sedation and duration of sedation. Blood samples were collected after handling and after sedation. The complete blood count (CBC), platelet count, buccal mucosal bleeding time (BMBT), whole-blood clotting time, prothrombin time (PT), activated partial thromboplastin time (aPTT) and thrombin time (TT) were determined for each sample, before and after chemical restraint. No statistically significant differences were found in the hematologic parameters. Certain hemostatic parameters (PT, aPTT and TT) were higher in the DB group (P <0.05). The onset of sedation was similar in the two groups, and the duration of sedation was longer in the DBK group. Both sedation protocols were effective for short-duration chemical restraint for blood collection from the studied cats, and no clinically relevant effects on hematologic or hemostatic parameters were detected.

**Serum microRNA profiles in cats with hypertrophic cardiomyopathy.**


The role of microRNAs (miRNAs) in the pathogenesis of heart diseases of humans and rodents, as well as their diagnostic potential, has recently received much attention, but comparable studies for spontaneous disease models in the domestic cat are missing. Hypertrophic cardiomyopathy (HCM) is the most common heart disease in cats. The pathology is largely unknown, but is suspected to be influenced by genetic background. In this study, we examined the miRNA profiles in the serum of cats with stable congestive heart failure caused by HCM (n = 11) and healthy control cats (n = 12) using miRNA arrays. 965 out of 2026 miRNAs could be detected in at least six samples of either of the groups. Eleven mammalian miRNAs were differentially expressed between the groups with a fold change ≥ 1.6. Hierarchical cluster analysis resulted in distinct separation of the two groups. After correction for multiple testing (adjusted p < 0.05), a higher expression of miR-381-3p, miR-486-3p, miR-4751, miR-476c-3p, miR-5700, miR-513a-3p, and miR-320e in the HCM group was confirmed. Additionally, miR-1246 was found to be upregulated 3-fold in the HCM group using quantitative RT-PCR. Software analysis of the significantly regulated miRNAs revealed 49 mRNA targets involved in cardiac hypertrophy. Cats with primary HCM show a distinct miRNA profile that includes miRNAs that have already been shown to be differentially regulated in human patients and rodent models for cardiac disease. Studying HCM as a spontaneous cardiac disease of the cat may help to reveal additional pathophysiologic pathways.

**Acute liver failure in dogs and cats.**
OBJECTIVE: To define acute liver failure (ALF), review the human and veterinary literature, and discuss the etiologies and current concepts in diagnostic and treatment options for ALF in veterinary and human medicine. ETIOLOGY: In veterinary medicine ALF is most commonly caused by hepatotoxin exposure, infectious agents, inflammatory diseases, trauma, and hypoxic injury. DIAGNOSIS: A patient may be deemed to be in ALF when there is a progression of acute liver injury with no known previous hepatic disease, the development of hepatic encephalopathy of any grade that occurs within 8 weeks after the onset of hyperbilirubinemia (defined as plasma bilirubin >50 µM/L [>2.9 mg/dL]), and the presence of a coagulopathy. Diagnostic testing to more specifically characterize liver dysfunction or pathology is usually required. THERAPY: Supportive care to aid the failing liver and compensate for the lost functions of the liver remains the cornerstone of care of patients with ALF. Advanced therapeutic options such as extracorporeal liver assist devices and transplantation are currently available in human medicine. PROGNOSIS: The prognosis for ALF depends upon the etiology, the degree of liver damage, and the response to therapy. In veterinary medicine, the prognosis is generally poor.

Looking for alternatives for feral cats.

Associations between ‘valentine’ heart shape, atrial enlargement and cardiomyopathy in cats.

Valentine’ heart shape is a common qualifier used in veterinary radiology to describe a cardiac silhouette with focal enlargement at the level of the base of the heart in feline patients. Anecdotally, this sign has been thought to be related to biastral enlargement and also to hypertrophic cardiomyopathy (HCM). However, to our knowledge, there has been no study performed to assess the association between cardiac chamber enlargement and cardiac disease with the ‘valentine’-shaped heart. The aim of this study was to verify the association between the ‘valentine’ heart shape observed in ventrodorsal thoracic radiographs and the presence of singular or combined cardiac chamber enlargement, and also the presence and type of cardiomyopathy (CM) in cats. A search of the database of the Small Animal Veterinary Hospital of the University of Florida for cats with a radiology report of thoracic radiographs that contained the words ‘valentine’ and ‘biastral’, and echocardiography performed within 1 week, was undertaken; 41 cases met the inclusion criteria. Eighty-two percent of the cats of the study sample had some form of CM. The ‘valentine’ heart shape was associated with biastral enlargement in 41% of the patients in our study sample that had some form of CM and just 8% of cases diagnosed with HCM, suggesting that the ‘valentine’ heart shape has a low association with HCM or biastral enlargement; however, it should be considered a sign of feline CM.

Relationship of adiponectin and its multimers to metabolic indices in cats during weight change.

Adiponectin is an important anti-inflammatory hormone secreted from adipose tissue. The high-molecular-weight form of adiponectin (HMW) closely correlates with insulin sensitivity in human beings. This study uses a novel method of size-exclusion gel chromatography combined with enzyme-linked immunosorbent assay to measure HMW feline adiponectin and determine its relationship to leptin, cholesterol, and insulin sensitivity as cats gain and lose weight. In addition, total adiponectin and its messenger RNA expression in subcutaneous adipose tissue were measured. No correlations were found between total serum adiponectin and subcutaneous adipose messenger RNA expression, fat mass, or measures of insulin sensitivity. This study demonstrates that cats have high percentages of HMW adiponectin. Although weak correlations between HMW adiponectin and fat mass were detected, additional cats are needed to determine if the correlations are significant.

An Evaluation of the Role the Internet Site Petfinder Plays in Cat Adoptions.


To better understand factors contributing to cat adoptions, this study was used to explore a possible association between an adoptable cat’s popularity on Petfinder and the cat’s length of availability for adoption at a managed-intake nonhuman animal shelter. This study was also used to examine factors associated with a cat’s popularity on Petfinder and the percentage of adopters who visited Petfinder before making adoption decisions. One third of adopters surveyed visited Petfinder before adopting, and half of those had viewed their adopted cats’ Petfinder profiles. The number of clicks per day that cats received on the site was negatively correlated with their length of availability. Age at adoption was positively correlated with length of availability and negatively correlated with number of clicks per day. Coat color was a strong predictor of number of clicks per day and length of availability. The only variable within the photographer’s control significantly associated with number of clicks per day was whether the photos included toys. Although cats’ physical characteristics are strong predictors of their popularity, strategic use of toys in cats’ photographs may promote adoptions of cats who are typically overlooked.

Molecular epidemiological and phylogenetic analysis of canine parvovirus in domestic dogs and cats in Beijing, 2010-2013.


Fifty-five samples (15.62%) collected from dogs and cats were identified as canine parvovirus (CPV) infection in Beijing during 2010-2013. The nucleotide identities and aa similarities were 98.2-100% and 97.7-100%, respectively, when compared with the reference isolates. Also, several synonymous and non-synonymous mutations were also recorded for the first time. New CPV-2a was dominant, accounting for 90.90% of the samples. Two of the 16 samples collected from cats were identified as new CPV-2a (12.5%), showing nucleotide identities of 100% with those from dogs. Twelve samples (15.78%) collected from completely immunized dogs were found to be new CPV-2a, which means CPV-2 vaccines may not provide sufficient protection for the epidemic strains.
Molecular characterisation of Cryptosporidium and Giardia in cats (Felis catus) in Western Australia.

Little is known of the prevalence of Cryptosporidium and Giardia in domestic cats in Western Australia and their potential role as zoonotic reservoirs for human infection. In the present study, a total of 345 faecal samples from four different sources were screened for the presence of Cryptosporidium and Giardia by PCR and genotyped by sequence analysis. Oocyst numbers and cyst numbers for Cryptosporidium and Giardia respectively were also determined using quantitative PCR assays. Cryptosporidium and Giardia were detected in 9.9% (95% CI 6.7-13.0) and 10.1% (95% CI 7.0-13.3) of cats in Western Australia respectively. Sequence analysis at the 18S rRNA locus identified five Cryptosporidium species/genotypes; C. felis (n = 8), C. muris (n = 1), C. ryanae (n = 1), Cryptosporidium rat genotype III (n = 5) and a novel genotype most closely related to Cryptosporidium rat genotype III in one isolate. This is the first report of C. ryanae and Cryptosporidium rat genotype III in cats. For Giardia, assemblage F the most commonly identified species, while only 1 assemblage sequence was detected. Since most human cases of cryptosporidiosis are caused by C. parvum and C. hominis and human cases of giardiasis are caused by G. duodenalis assemblage A and B, the domestic cats in the present study are likely to be of low zoonotic risk to pet owners in Perth. Risk analyses identified that elderly cats (more than 6 years) were more prone to Cryptosporidium and Giardia infections than kittens (less than 6 months) (P = 0.009). Clinical symptoms were not associated with the prevalence of Cryptosporidium and Giardia infections in cats.

Prevalence and Risk Factors of Intestinal Parasites in Cats from China.

The prevalence of intestinal parasites in cats from China was largely unknown prior to this study. The aim of the present study was to investigate the presence of intestinal parasites in cats from central China and also identify risk factors for parasitism. Fecal samples from 360 cats were examined using sugar flotation procedure and fecal smear test by microscope. Cats had mixed two or three kinds of parasites infections. Of the 360 cats feces, intestinal parasites positive feces were 149 (41.39%). 64 (17.78%) were infected with Toxocara cati, 61 (16.94%) with Isospora felis, 41 (11.39%) with Isospora rivolta, 33 (9.17%) with Paragonimus, 23 (6.39%) with hookworms, 11 (3.06%) with Toxoplasma-like oocysts, 10 (2.78%) with Trichuris, 4 (1.11%) with lungworm, 2 (0.56%) with Sarcocystis, and 1 (0.28%) with Trematode. The cats’ living outdoor was identified as risk factor by statistical analysis. These results provide relevant basic data for assessing the infection of intestinal parasites in cats from central region of China. In conclusion, there was high prevalence of intestinal parasites in cats from China.

First deliveries after estrus induction using deslorelin and endoscopic transcervical insemination in the queen.

The present study consists of two distinct parts, experiment 1 and experiment 2. In experiment 1, 13 anestrus queens were treated with a 4.7-mg deslorelin subcutaneous implant to assess its effectiveness in inducing estrus in the domestic cat. Deslorelin is currently used for the reversible suppression of
ovarian and testicular activity in dogs and cats and for estrus induction in the bitch. Estrus induction is also reported in the queen but never reported with a targeted study. All the queens showed a positive response to the induction protocol, and estrus was detected within an average of $5.0 \pm 2.2$ days after the implant placement in 13 out of 13 subjects (100%). Seven of 13 queens exhibited behavioral manifestations of estrus, and the mean number of follicles detected at ultrasound examination was $4.8 \pm 1.6$ per subject. In experiment 2, three of the queens previously treated with deslorelin for estrus induction were submitted to artificial insemination through endoscopic transcervical catheterization, a new nonsurgical technique for intrauterine sperm deposition. All of them (100%) were pregnant after insemination and they gave birth to healthy litters. The study, as a whole, proves the effectiveness of the 4.7-mg deslorelin subcutaneous implants in inducing estrus in the domestic cat and is, to our knowledge, the first study assessing fertility of the induced estruses. Moreover, it shows the effectiveness of endoscopic transcervical catheterization for artificial insemination in the queen.

Serological survey of canine H3N2, pandemic H1N1/09, and human seasonal H3N2 influenza viruses in cats in northern China, 2010-2014.


BACKGROUND: The close contact between cats and humans poses a threat to public health because of the potential zoonotic transmission of influenza viruses to humans. Therefore, we examined the seroprevalence of pandemic H1N1/09, canine H3N2, and human H3N2 viruses in pet cats in northern China from 2010 to 2014. FINDING: Of 1794 serum samples, the seropositivity rates for H1N1/09, canine H3N2, and human H3N2 were 5.7%, 0.7%, and 0.4%, respectively. The seropositivity rate for H1N1/09 in cats was highest in 2010 (8.3%), and then declined continuously thereafter. Cats older than 10 years were most commonly seropositive for the H1N1/09 virus. CONCLUSIONS: Our findings emphasize the need for continuous surveillance of influenza viruses in cats in China.

Detection prevalence of H5N1 avian influenza virus among stray cats in eastern China.


Since 1997, more and more cases of the infectious H5N1 avian influenza virus (AIV) in humans have been reported all over the world but the transmission of H5N1 avian influenza virus to stray cats has been little demonstrated. The objective of this pilot investigation was to determine the prevalence of H5N1 AIV antibodies in stray cats in eastern China where is the dominant enzootic H5N1 highly pathogenic avian influenza virus (HP AIV). A total of 1,020 nasal swab and 1,020 serum samples were collected and tested. Evidence of HPAI H5N1 virus antibodies was present in two of the 1,020 serum samples that were positive by HI assay and NT assay, respectively. The results imply little transmission and that the Clade 2.3.2 HPAIV H5N1 infections in poultry did not significantly affect the rural animal shelters or suburban environment in eastern China. In future studies, these results can be used as baseline seroepidemiological levels for H5N1 AIV among cats in China. J. Med. Virol. 87:1436-1440, 2015. © 2015 Wiley Periodicals, Inc.

Endocrine Pancreas in Cats With Diabetes Mellitus.

Pancreatic amyloidosis and loss of α and β cells have been shown to occur in cats with diabetes mellitus, although the number of studies currently available is very limited. Furthermore, it is not known whether pancreatic islet inflammation is a common feature. The aims of the present study were to characterize islet lesions and to investigate whether diabetic cats have inflammation of the pancreatic islets. Samples of pancreas were collected postmortem from 37 diabetic and 20 control cats matched for age, sex, breed, and body weight. Histologic sections were stained with hematoxylin and eosin and Congo red; double labeled for insulin/CD3, insulin/CD20, insulin/myeloperoxidase, insulin/proliferating cell nuclear antigen, and glucagon/Ki67; and single labeled for amylin and Iba1. Mean insulin-positive cross-sectional area was approximately 65% lower in diabetic than control cats (P =.009), while that of amylin and glucagon was similar. Surprisingly, amyloid deposition was similar between groups (P =.408). Proliferation of insulin- and glucagon-positive cells and the number of neutrophils, macrophages, and T (CD3) and B (CD20) lymphocytes in the islets did not differ. The presence of T and B lymphocytes combined tended to be more frequent in diabetic cats (n = 8 of 37; 21.6%) than control cats (n = 1 of 20; 5.0%). The results confirm previous observations that loss of β cells but not α cells occurs in diabetic cats. Islet amyloidosis was present in diabetic cats but was not greater than in controls. A subset of diabetic cats had lymphocytic infiltration of the islets, which might be associated with β-cell loss.

Cell tropism and molecular epidemiology of Anaplasma platys-like strains in cats.

Bacterial species of the genus Anaplasma are tick transmitted pathogens that negatively impact on animal productions and generate veterinary and public health concerns. This paper reports the identification, molecular characterization and phylogeny of novel unclassified A. platys-like strains in cats. Interestingly, these novel strains are closely related to conspecific strains recently identified in ruminants, and significantly differ from A. platys. A. platys-like strains in cats, unlike ruminants strains, show tropism for platelets. Results have implications in the diagnostic scenario of animal anaplasmosis and provide background for reconstructing the evolutionary history of species genetically related to A. platys.

Diagnostic value of Light’s criteria and albumin gradient in classifying the pathophysiology of pleural effusion formation in cats.

The primary aim of this study was to assess whether human Light’s criteria with the cut-off values previously published for cats are useful and superior to the traditional veterinary classification in diagnosing pathophysiology of fluid formation in cats with pleural effusion. The secondary aim was to assess if the albumin gradient (ALBg) is a reliable criterion for differentiating exudates from transudates in patients with pleural effusion thought to be transudative by clinical criteria but identified as exudative by Light’s criteria. Nineteen client-owned cats with pleural effusion were studied. The aetiology of the pleural effusion was used to establish the pathophysiology of its formation. Parameters measured or calculated undergoing statistical analysis included Light’s criteria, total protein and total
nucleated cell count in the pleural effusions, and the ALBg. Based on the pathophysiology of fluid formation there were seven transudates caused by increased hydrostatic pressure and 12 exudates. There was a significant difference in the accuracy of the Light’s criteria to classify correctly the origin of the pleural fluid formation compared with the traditional veterinary classification (84% vs 53%). ALBg values were significantly different between transudates and exudates. One of the three transudates misclassified as exudates by Light’s criteria was correctly identified as a transudate by the ALBg. In conclusion, pleural effusion should be classified as either a transude or an exudate using Light’s criteria. In cats with pleural effusion thought to be transudative by clinical criteria, but identified as exudative by Light’s criteria, the ALBg may further help in correctly differentiating exudates from transudates.

**Correlation of renal histopathology with renal echogenicity in dogs and cats: an ex-vivo quantitative study.**
BACKGROUND: Increased cortical or cortical and medullary echogenicity is one of the most common signs of chronic or acute kidney disease in dogs and cats. Subjective evaluation of the echogenicity is reported to be unreliable. Patient and technical-related factors affect in-vivo quantitative evaluation of the echogenicity of parenchymal organs. The aim of the present study is to investigate the relationship between histopathology and ex-vivo renal cortical echogenicity in dogs and cats devoid of any patient and technical-related biases. RESULTS: Kidney samples were collected from 68 dog and 32 cat cadavers donated by the owners to the Veterinary Teaching Hospital of the University of Padua and standardized ultrasonographic images of each sample were collected. The echogenicity of the renal cortex was quantitatively assessed by means of mean gray value (MGV), and then histopathological analysis was performed. Statistical analysis to evaluate the influence of histological lesions on MGV was performed. The differentiation efficiency of MGV to detect pathological changes in the kidneys was calculated for dogs and cats. Statistical analysis revealed that only glomerulosclerosis was an independent determinant of echogenicity in dogs whereas interstitial nephritis, interstitial necrosis and fibrosis were independent determinants of echogenicity in cats. The global influence of histological lesions on renal echogenicity was higher in cats (23%) than in dogs (12%). CONCLUSIONS: Different histopathological lesions influence the echogenicity of the kidneys in dogs and cats. Moreover, MGV is a poor test for distinguishing between normal and pathological kidneys in the dog with a sensitivity of 58.3% and specificity of 59.8%. Instead, it seems to perform globally better in the cat, resulting in a fair test, with a sensitivity of 80.6% and a specificity of 56%.

**Differences in the faecal microbiome of non-diarrhoeic clinically healthy dogs and cats associated with Giardia duodenalis infection: impact of hookworms and coccidia.**
The protozoan parasite Giardia duodenalis causes a waterborne diarrhoeal disease in animals and humans, yet many Giardia-infected hosts remain asymptomatic. Mixed parasite infections are common in both animals and humans with unknown consequences for Giardia or other parasites. We compared the composition and diversity of bacterial communities from 40 dogs, including free-roaming dogs, and 21 surrendered cats from Australia. The dog cohort included 17 (42.5%) dogs positive for Giardia and 13 (32.5%) dogs positive for dog hookworm (Ancylostoma caninum). The cat samples included eight
positive for Giardia and eight positive for Cystoisospora. The V4 region of 16S rRNA was sequenced at an average of 36,383 high quality sequences (>200bp) per sample using the Ion Torrent PGM™ platform. In dogs we found significant (P<0.05, AnoSim) difference between the Giardia-positive and -negative groups when evaluating bacterial genera. No such difference was demonstrated between Ancylostoma-positive and -negative dogs. However, there was a modest but not significant separation of the Giardia-negative and -positive dogs (P=0.09, UniFrac) using principal coordinate analysis. Removal of dogs with hookworms further separated Giardia-positive and -negative groupings (P=0.06, UniFrac). In cats, the presence of Giardia was not associated with a significant difference based on bacterial genera (P>0.05, AnoSim). Cystoisospora-positive cats, however, exhibited significantly different profiles from Cystoisospora-negative cats (P=0.02, AnoSim) and UniFrac showed significant separation of Cystoisospora-positive and -negative samples (P<0.01). The results suggest that in clinically healthy dogs and cats, helminths and protozoa are associated with different microbiomes and possibly variable gut microbiota functions. Understanding the association of parasites and microbiomes has important consequences for the administration of antiparasitic drugs in animals and humans.

The Effect of Orally Administered Ranitidine and Once-Daily or Twice-Daily Orally Administered Omeprazole on Intragastric pH in Cats.

BACKGROUND: Gastric acid suppressants frequently are used in cats with acid-related gastric disorders. However, it is not known if these drugs effectively increase intragastric pH in cats.

OBJECTIVES: To examine the effects of PO administered ranitidine and omeprazole on intragastric pH in cats and to compare the efficacy of once-daily versus twice-daily dosage regimens for omeprazole.

ANIMALS: Eight domestic shorthair cats. METHODS: Using a randomized 4-way crossover design, cats were given enteric-coated omeprazole granules (1.1-1.3 mg/kg q24h and q12h), ranitidine (1.5-2.3 mg/kg q12h), and placebo. Intragastric pH was monitored continuously for 96 hours using the Bravo(™) system, starting on day 4 of treatment, followed by a median washout period of 12 days. Mean percentage of time pH was ≥3 and ≥4 was compared among groups using repeated measures ANOVA. RESULTS: Mean ± SD percentage of time intragastric pH was ≥3 and ≥4 was 67.0 ± 24.0% and 54.6 ± 26.4% for twice-daily omeprazole, 24.4 ± 22.8% and 16.8 ± 19.3% for once-daily omeprazole, 16.5 ± 9.0% and 9.6 ± 5.9% for ranitidine, and 9.4 ± 8.0% and 7.0 ± 6.6% for placebo administration. Twice-daily omeprazole treatment significantly increased intragastric pH, whereas pH after once-daily omeprazole and ranitidine treatments did not differ from that of placebo-treated cats. CONCLUSION AND CLINICAL IMPORTANCE: Only twice-daily PO administered omeprazole significantly suppressed gastric acidity in healthy cats, whereas once-daily omeprazole and standard dosages of ranitidine were not effective acid suppressants in cats.