Small Animal Article Summaries – FELINE MEDICINE & SURGERY

January-March 2015

Contributor

ISFM
The International Society of Feline Medicine

Small Animal Article Summaries (SAAS) is a veterinarian resource where a range of article summaries can be accessed in one easy location.

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.

A Deletion in FOXN1 Is Associated with a Syndrome Characterized by Congenital Hypotrichosis and Short Life Expectancy in Birman Cats.


An autosomal recessive syndrome characterized by congenital hypotrichosis and short life expectancy has been described in the Birman cat breed (Felis silvestris catus). We hypothesized that a FOXN1 (forkhead box N1) loss-of-function allele, associated with the nude phenotype in humans, mice and rats, may account for the syndrome observed in Birman cats. To the best of our knowledge, spontaneous mutations in FOXN1 have never been described in non-human, non-rodent mammalian species. We identified a recessive c.1030_1033delCTGT deletion in FOXN1 in Birman cats. This 4-bp deletion was associated with the syndrome when present in two copies. Percentage of healthy carriers in our French panel of genotyped Birman cats was estimated to be 3.2%. The deletion led to a frameshift and a premature stop codon at position 547 in the protein. In silico, the truncated FOXN1 protein was predicted to lack the activation domain and critical parts of the forkhead DNA binding domain, both involved in the interaction between FOXN1 and its targets, a mandatory step to promote normal hair and thymic epithelial development. Our results enlarge the panel of recessive FOXN1 loss-of-function alleles described in mammals. A DNA test is available; it will help owners avoid matings at risk and should prevent the dissemination of this morbid mutation in domestic felines.

Hyperammonaemia in four cats with renal azotaemia.

Hyperammonaemia is well reported in animals with advanced hepatic disease and portosystemic shunts, but is unreported in cats with renal disease. This case series describes four cats with severe renal azotaemia in which elevated ammonia levels were detected during the course of treatment. In two cases hyperammonaemia was detected at a time when neurological signs consistent with encephalopathy had developed. This raises the possibility that hyperammonaemia may play a role in the development of encephalopathy in cats with renal azotaemia.

**Analgesic effects of maxillary and inferior alveolar nerve blocks in cats undergoing dental extractions.**


The aim of this study was to evaluate the analgesic effects of maxillary and/or inferior alveolar nerve blocks with lidocaine and bupivacaine in cats undergoing dental extractions. Twenty-nine cats were enrolled. Using an adapted composite pain scale, cats were pain scored before the dental procedure and 30 mins, and 1, 2 and 4 h after isoflurane disconnection. Cats were sedated with buprenorphine (20 µg/kg), medetomidine (10 µg/kg) and acepromazine (20 µg/kg) intramuscularly. Anaesthesia was induced using alfaxalone (1-2 mg/kg) intravenously and maintained with isoflurane in oxygen. Each cat was randomly assigned to receive maxillary and/or inferior alveolar nerve blocks or no nerve blocks prior to dental extractions. Each nerve block was performed using lidocaine (0.25 mg/kg) and bupivacaine (0.25 mg/kg). Heart rate, systolic arterial blood pressure, respiratory rate, end tidal carbon dioxide and isoflurane vapouriser settings were recorded 5 mins before and after the dental extractions, and the difference calculated. Group mean differences (mean ± SD) for heart rate (-9.7 ± 10.6 vs 7.6 ± 9.5 beats/min [nerve block vs control group, respectively], P <0.0001), systolic arterial blood pressure (-10.33 ± 18.44 vs 5.21 ± 15.23 mmHg, P = 0.02) and vapouriser settings (-0.2 ± 0.2 vs 0.1 ± 0.4, P = 0.023) were significantly different between groups. The control group had higher postoperative pain scores (median [interquartile range]) at 2 h (3 [1.75-4.00] vs 1 [0-2], P = 0.008) and 4 h (4 [2-6] vs 2 [1-2], P = 0.006) after the dental extractions. Maxillary and inferior alveolar nerve blocks with lidocaine and bupivacaine administered prior to dental extractions resulted in a reduction in heart rate and blood pressure while allowing for a reduction in isoflurane. Cats receiving nerve blocks had lower postoperative pain scores than the group without nerve blocks.

**The diagnostic utility of lymph node cytology samples in dogs and cats.**


OBJECTIVES: The aim of this study was to determine common reasons for lymph node fine needle aspirates, cytological diagnoses reported and the frequency and reasons for non-diagnostic samples from dogs and cats. METHODS: Retrospective study of computerised records of fine needle aspirate samples submitted to NationWide Laboratories (UK) between April 2009 and May 2011 to identify lymph node samples. Reason for sampling, sample quality, diagnosis achieved and reason for non-diagnostic samples were assessed. RESULTS: A total of 1473 records were available for review. Of 1274 canine samples, 928 (72 · 8%) were diagnostic and 346 (27 · 2%) were non-diagnostic. Of 199 feline samples, 171 (85 · 9%) samples were diagnostic and 28 (14 · 1%) were non-diagnostic. The most common reasons for sample submission in both species were investigation of lymphadenopathy (alone or in combination with other clinical signs) or tumour staging. In dogs, the most common diagnosis
was lymphoma (351, 27 · 5%), and in cats, reactive hyperplasia (63, 31 · 6%). Absence of cells, cell disruption and low yield were the most common causes of non-diagnostic samples. Submission of the history did not affect the probability of reaching a cytological diagnosis. CLINICAL SIGNIFICANCE: Lymph node cytology is a useful diagnostic procedure but educating veterinarians to improve sampling and smearing may increase diagnostic yield.

Concentrations of anti-Müllerian hormone in the domestic cat. Relation with spay or neuter status and serum estradiol.


Female cats with unknown history can be diagnosed as spayed or intact with a GnRH-stimulation test or an LH test independent of the stage in the estrous cycle. However, although most females are correctly diagnosed with the LH test, the sensitivity and specificity are not 100%. The GnRH-stimulation test, although reliable, requires an injection of buserelin 2 hours before the blood sample is collected. Granulosa cells are the only cell type that produces anti-Müllerian hormone (AMH) in females, whereas Sertoli cells produce AMH in males. Anti-Müllerian hormone has been linked to spay status in dogs and cats and to ovarian and testicular pathology and fertility in different species. Our aim was to evaluate serum AMH concentrations in spayed female cats and in intact female cats of known age and reproductive stage (inactive ovaries or luteal phase). In addition, our aim was to compare serum AMH concentrations in intact and neutered male cats. We analyzed serum AMH concentrations in 15 spayed and 16 intact females and in 15 intact and 12 neutered male cats. Serum AMH was below the lowest standard point (<0.14 ng/mL) in all spayed females and neutered males, ranged between 1.3 and 19.0 ng/mL in the intact females and between 4.8 and 81.3 ng/mL in intact males. Thus, the AMH test had 100% sensitivity and specificity to diagnose the presence or absence of ovaries and testes in this study. In addition, in contrast to serum estradiol, serum AMH was not affected by buserelin stimulation (P = 0.459). Serum AMH was not correlated with serum estradiol before (rs = -0.188, P = 0.519) or after (rs = 0.335, P = 0.242) buserelin stimulation in the intact females. Four 6-month-old intact cats (two females and two males) had the highest AMH concentrations which in the females might represent a prepubertal peak previously described in other species and in males is likely due to high concentrations before puberty. In conclusion, we found that the AMH Gen II ELISA is reliable for diagnosing spay and neuter status of cats and that the domestic cat might be an interesting model for studies on AMH dynamics.

Description of the Anatomy, Surgical Technique, and Outcome of Hemipelvectomy in 4 Dogs and 5 Cats.


OBJECTIVE: To provide (1) a comprehensive description of hemipelvectomy; and (2) report clinical application and outcome of hemipelvectomy in dogs and cats. STUDY DESIGN: Descriptive report and retrospective case series. ANIMALS: Dogs (n = 4) and 5 cats. METHODS: Cadaveric dissection was performed for imaging purposes using 4 mixed breed dogs euthanatized for reasons unrelated to this study. Medical records (2005-2012) were reviewed for dogs and cats that had hemipelvectomy. Data collected included signalment, body weight, body condition score, clinical presentation, diagnostic imaging findings, location and extent of tumor, definitive diagnosis, use of adjuvant therapy, ability to ambulate postoperatively, complications, and survival. RESULTS: The most common
indication for hemipelvectomy in cats was injection site sarcoma (ISS) and in dogs, osteosarcoma or peripheral nerve sheath tumor (PNST). Complete tumor excision was achieved in 6 (67%) cases. Incomplete excision occurred in 2 dogs with lumbosacral PNST and 1 cat having a 2nd surgery for ISS. Complications included intraoperative hemorrhage (n = 2), postoperative soft tissue infection (2), and discharge from the incision site (1). All but 1 animal were ambulatory at the time of discharge. Hospitalization ranged from 1-10 days (median, 4 days). Survival after surgery was individually assessed. CONCLUSION: With in-depth anatomic familiarity, hemipelvectomy can be successful for excision of neoplastic lesions of the proximal aspect of the pelvic limb, with only minor complications.

**Detection of Aspergillus-specific antibodies by agar gel double immunodiffusion and IgG ELISA in feline upper respiratory tract aspergillosis.**


Feline upper respiratory tract aspergillosis (URTA) is an emerging infectious disease. The aims of this study were: (1) to assess the diagnostic value of detection of Aspergillus-specific antibodies using an agar gel double immunodiffusion (AGID) assay and an indirect immunoglobulin G (IgG) ELISA; and (2) to determine if an aspergillin derived from mycelia of Aspergillus fumigatus, Aspergillus niger and Aspergillus flavus can be used to detect serum antibodies against cryptic Aspergillus spp. in Aspergillus section Fumigati. Sera from cats with URTA (group 1: n = 21) and two control groups (group 2: cats with other upper respiratory tract diseases, n = 25; group 3: healthy cats and cats with non-respiratory, non-fungal illness, n = 84) were tested. Isolates from cats with URTA comprised A. fumigatus (n = 5), A. flavus (n = 1) and four cryptic species: Aspergillus felis (n = 12), Aspergillus thermomutatus (Neosartorya pseudofischeri, n = 1), Aspergillus lentulus (n = 1) and Aspergillus udagawae (n = 1). Brachycephalic purebred cats were significantly more likely to develop URTA than other breeds (P = 0.013). The sensitivity (Se) of the AGID was 43% and the specificity (Sp) was 100%. At a cut-off value of 6 ELISA units/mL, the Se of the IgG ELISA was 95.2% and the Sp was 92% and 92.9% for groups 2 and 3 cats, respectively. Aspergillus-specific antibodies against all four cryptic species were detected in one or both assays. Assay Se was not associated with species identity. Detection of Aspergillus-specific antibodies by IgG ELISA has high Se and Sp for diagnosis of feline URTA.

**Morphology of Coronary Ostia in Domestic Shorthair Cat.**


Diagnosis and treatment of heart diseases due to changes in the coronary vascularization need a detailed knowledge on the morphology and possible variations of the aortic valves and coronary ostia. This study was performed to clarify details on morphology of these structures in domestic cats. The tricuspid aortic valve was examined in 65 domestic shorthair cats. The location of coronary ostia was determined either inferior to (26 and 20%, left and right coronary ostium - LCO and RCO), at (65 and 66%) or superior to the intercommissural line (9 and 14%). In 13 cats (20%), accessory ostia were found either for left, right or both coronary arteries (LCA and RCA). Their position varied between specimens. They were located beyond the main ostium, at its edge, or inside just below the edge. In one cat, no main trunk of the LCA was found. In one cat, two accessory ostia next to the RCO were
observed. Coronary ostia in cats show anatomical variants and morphological anomalies. This study provides basic data useful for, for example, angiography performed for diagnosis of cardiac diseases and as a basis for surgical interventions.

Benzalkonium chloride exposure in cats: a retrospective analysis of 245 cases reported to the Veterinary Poisons Information Service (VPIS).


Benzalkonium chloride is commonly found in household products. This retrospective study examined 245 cases of feline exposure to benzalkonium chloride-containing products reported to the Veterinary Poisons Information Service (VPIS). A single route of exposure was reported in 188 cats (ingestion 126, skin 58, buccal 4); 57 cats had multiple routes. The common products involved were household antibacterial cleaners (43.6 per cent), household disinfectants (22.3 per cent) and patio cleaners (17.5 per cent). The most common signs were hypersalivation/drooling (53.9 per cent), tongue ulceration (40.4 per cent), hyperthermia (40.4 per cent) and oral ulceration (22.9 per cent). The mean time recorded for onset of the first clinical sign was 6.4 hours (range five minutes to 48 hours, median 4.5 hours, n=60), however, the VPIS was not contacted until 14.0±13.2 hours after exposure (n=120). This figure also reflects the time of presentation. The most common treatments given were antibiotics (82.0 per cent), fluids (50.2 per cent), analgesia (45.3 per cent), gastroprotectants (31.0 per cent), dermal decontamination (24.1 per cent) and steroids (22.7 per cent). 13 cats (5.3 per cent) received syringe or nasogastric feeding. Of 245 cats, 12 (4.9 per cent) remained asymptomatic, 230 (93.9 per cent) recovered and three died (1.2 per cent). The time to recovery ranged from 1 to 360 hours (n=67) with a mean of 100.4±82.0 hours (4.2±3.4 days, median 72 hours).

Controversies in the use of fresh frozen plasma in critically ill small animal patients.


OBJECTIVE: To review the literature supporting or discouraging the use of fresh frozen plasma (FFP) transfusion in critically ill patients. DATA SOURCES: Human and animal publications were searched using PubMed without time limits and the following keywords were used: “fresh frozen plasma,” “coagulopathy,” “hypocoagulable state,” “hypercoagulable states,” and “critical illness.” HUMAN DATA SYNTHESIS: The commonly used tests of coagulation (e.g., prothrombin time, activated partial thromboplastin time, international normalized ratio) are poorly predictive of clinical bleeding. FFP use in critically ill patients is unlikely to result in improved outcomes and may be associated with increased risks. VETERINARY DATA SYNTHESIS: There is insufficient evidence to make definitive conclusions regarding the use of FFP in critically ill animals, but clinical studies are underway that may provide further data that clarify the optimal use of FFP in animals. CONCLUSIONS: The use of FFP in critically ill patients remains controversial. In the absence of clinical bleeding or a risk for clinical bleeding associated with a planned procedure, treatment use of FFP is not recommended in human patients. There are insufficient data in critically ill animals to enable formulation of recommendations. Further research is warranted in dogs and cats to establish evidence-based guidelines.

Increasing antimicrobial resistance in clinical isolates of Staphylococcus intermedius group bacteria and emergence of MRSP in the UK.

Frequencies of antimicrobial resistance were determined amongst 14,555 clinical Staphylococcus intermedius group (SIG) isolates from UK dogs and cats to estimate resistance trends and quantify the occurrence of meticillin-resistant Staphylococcus pseudintermedius (MRSP). Reports from two diagnostic laboratories (13,313 general submissions, 1242 referral centre only submissions) were analysed retrospectively (2003/2006-2012). MRSP were defined by phenotypic resistance to meticillin and concurrent broad β-lactam resistance; a subset was confirmed genetically (SIG-specific nuc and mecA). Trends were analysed by Cochran-Armitage test. Resistance remained below 10 per cent for cefalexin, amoxicillin-clavulanic acid and the fluoroquinolones. Increasing resistance trends were seen in both laboratories for ampicillin/amoxicillin (both P<0.001), cefovecin (both P<0.046) and enrofloxacin (both P<0.02). Resistance to cefalexin increased over time in referral hospital isolates (P<0.001) to clindamycin (P=0.01) and trimethoprim-sulfamethoxazole (P=0.001) amongst general laboratory submissions. Overall, 106 MRSP were isolated (0.7 per cent of submissions) including 32 (2.6 per cent of submissions, all genetically confirmed) from the referral centre population (inter-laboratory difference P<0.001). Against a background of widely susceptible SIG isolates, a new trend of increasing resistance to important antimicrobials was identified overtime and the emergence of MRSP from UK clinical cases was confirmed. Attention to responsible use of antibacterial therapy in small animal practice is urgently needed.

Molecular characterization of cat factor XII gene and identification of a mutation causing factor XII deficiency in a domestic shorthair cat colony.


Coagulation factor XII (FXII) may be important in cardiovascular and inflammatory diseases. We have identified and characterized a naturally occurring mutation in the feline FXII gene that results in a mutant protein and enzymatic loss of activity. Feline intron/exon gene structure and sequence were acquired by comparing DNA sequences obtained from a fragmented Felis catus genomic sequence and the National Center for Biotechnology Information’s Cross Species Megablast of multiple species’ FXII gene sequences. Fourteen exons ranging in size from 57 to 222 base pairs were confirmed spanning 8 Kb on chromosome A1. The 1828-base pair feline FXII messenger RNA (mRNA) sequence contains an open reading frame that encodes a protein of 609 amino acids with high homology to human FXII protein. Total RNA and mRNA purified from liver tissue of 4 wild-type/normal and 8 FXII-deficient cats confirmed the predicted mRNA sequence and identified one important single-nucleotide polymorphism (SNP). A single base deletion in exon 11 of the FXII coding gene in our colony of cats results in deficient FXII activity. Translation of the mRNA transcript shows a frame shift at L441 (C441fsX119) resulting in a nonsense mutation and a premature stop codon with a predicted 560-amino acid protein. The mutant FXII protein is truncated in the 3’ proteolytic light chain region of the C-terminus, explaining its loss of enzymatic activity. This study is the first molecular characterization of the feline FXII gene and the first identification of an FXII mutation in the domestic cat, providing insights into the origin and nature of feline FXII deficiency.

In vitro interaction of some drug combinations to inhibit rapidly growing mycobacteria isolates from cats and dogs and these isolates’ susceptibility to cefovecin and clofazimine.

**OBJECTIVES:** To investigate whether selected drug combinations used to treat rapidly growing mycobacteria (RGM) have drug-drug interactions that affect efficacy and to investigate each isolate’s susceptibility to cefovecin and clofazimine, individually. **DESIGN:** In vitro susceptibility testing of bacterial isolates. **METHODS:** Initially, five feline isolates and one canine isolate from both Mycobacterium fortuitum and M. smegmatis clusters (n = 12) underwent microbroth susceptibility testing to individual drugs to establish minimum inhibitory concentrations (MIC) of cefovecin, ciprofloxacin, clarithromycin, clofazimine, doxycycline, enrofloxacin, trimethoprim and sulfanilamide (the latter two as a combination). Checkerboard assays were then performed for susceptible M. smegmatis isolates for the following combinations: clarithromycin (one isolate only) versus enrofloxacin, clarithromycin vs doxycycline, clarithromycin vs trimethoprim/sulfanilamide; enrofloxacin vs doxycycline (six isolates); enrofloxacin vs trimethoprim/sulfanilamide (six isolates). Susceptible M. fortuitum isolates were tested against enrofloxacin versus doxycycline (four isolates only). **RESULTS:** All six M. fortuitum isolates were susceptible to enrofloxacin, but only four of six were susceptible to doxycycline. All six M. smegmatis isolates were susceptible to doxycycline, enrofloxacin and trimethoprim/sulfanilamide. A single isolate from the 12, a M. smegmatis isolate, was susceptible to clarithromycin. The fractional inhibitory concentration of each drug ranged from 0.64 to 1.84, indicating that neither synergism nor antagonism was evident. All 12 isolates were resistant to cefovecin. The clofazimine MIC50 to inhibit isolate growth was approximately 3.3 µg/mL for both strains. **CONCLUSION:** Drugs commonly used for treatment of RGM, when tested as combinations, do not appear to antagonise one another in vitro. Cefovecin is not efficacious for treatment of RGM infections.

**Molecular identification of fungal pathogens in nodular skin lesions of cats.**


In a retrospective study, we investigated 52 formalin-fixed, paraffin-embedded (FFPE) samples from cats with histologically confirmed cutaneous and subcutaneous mycoses to determine if the pathogens could be identified by molecular methods. Aim of the study was to obtain a deep understanding of the spectrum of infectious agents, which, as we hypothesized, was not available by histopathology alone. Detection of feline and fungal DNA was achieved in 92.3% and 94.2% of the samples, respectively. Most of the subcutaneous infections in cats were caused by Alternaria spp. (63.5%), followed by Cryptococcus neoformans (7.7%), Histoplasma capsulatum (5.8%), Sporothrix spp. (3.8%), Aspergillus vitricola, Aureobasidium pullulans, Exophiala attenuata, Fusarium oxysporum, Lecythophora cateniformis, Microsporum canis, and Phialophora sp. (1.9% each). The results from molecular identification indicate that correct identifications of the fungal pathogens by histology alone were rarely possible. The spectrum of fungal pathogens identified after DNA extraction from FFPE samples was much broader than that expected by classical histopathology. This was especially noted in alternariosis in that the micromorphological pattern in tissue was misleading and could be confused with that of cryptococcosis. Due to different susceptibilities to antifungal agents, it is important to arrive at a definitive diagnosis, which might be possible by examination of the fungus recovered in culture and/or molecular methods, in addition to the histopathologic techniques.

**Bidimensional and Doppler ultrasonographic evaluation of postpartum uterine involution in the queen.**
Feline Abstracts Jan-Mar 2015

The aim of this study was to describe bidimensional and Doppler ultrasonographic changes of uterine involution during normal feline puerperium. Secondary, the postpartum vaginal discharge was described. Twelve pregnant female cats were included in this study. After queening, vulvar discharge was grossly and microscopically examined daily. Bidimensional and Doppler ultrasonographic examinations of the uterus were performed on Days -4 to -2, 4, 11, 18, and 25 from parturition. Total uterine diameter, uterine wall thickness, uterine lumen contents, peak systolic velocity, end diastolic velocity, and resistance index of uterine arteries were measured. The cats presented serosanguineous vulvar discharge for a mean of 3 ± 1 days after parturition, and the cytology revealed 70% to 80% of erythrocytes, which progressively decreased up to Day 13. Immediately after parturition, there were less than 20% neutrophils, and this percentage gradually diminished to 0% to 1% at the end of the study. Uterine total diameter diminished up to Day 25 (P < 0.01), when ultrasonographic uterine dimensions were similar to that of anestrus. A progressive decrease of uterine wall thickness (P < 0.05), uterine lumen contents (P < 0.01), peak systolic velocity (P < 0.01), and end diastolic velocity (P < 0.01) was found throughout the study period. Conversely, resistance index increased during the first week after parturition (P < 0.01). It is concluded that the uterine artery blood flow progressively decreased during the first 25 days after parturition, which was associated with the bidimensional ultrasonographic regression of the organ. Although lochial discharge disappeared far before ultrasonographic involution, cytologic findings further corroborated the duration of this regression process.

Evaluation of the effect of short-term treatment with the integrase inhibitor raltegravir (Isentress) on the course of progressive feline leukemia virus infection.

Cats persistently infected with the gammaretrovirus feline leukemia virus (FeLV) are at risk to die within months to years from FeLV-associated disease, such as immunosuppression, anemia or lymphoma/leukemia. The integrase inhibitor raltegravir has been demonstrated to reduce FeLV replication in vitro. The aim of the present study was to investigate raltegravir in vivo for its safety and efficacy to suppress FeLV replication. The safety was tested in three naïve specified pathogen-free (SPF) cats during a 15 weeks treatment period (initially 20mg then 40mg orally b.i.d.). No adverse effects were noted. The efficacy was tested in seven persistently FeLV-infected SPF cats attained from 18 cats experimentally exposed to FeLV-A/Glasgow-1. The seven cats were treated during nine weeks (40mg then 80mg b.i.d.). Raltegravir was well tolerated even at the higher dose. A significant decrease in plasma viral RNA loads (∼5×) was found; however, after treatment termination a rebound effect was observed. Only one cat developed anti-FeLV antibodies and viral RNA loads remained decreased after treatment termination. Of note, one of the untreated FeLV-A infected cats developed fatal FeLV-C associated anemia within 5 weeks of FeLV-A infection. Moreover, progressive FeLV infection was associated with significantly lower enFeLV loads prior to infection supporting that FeLV susceptibility may be related to the genetic background of the cat. Overall, our data demonstrate the ability of raltegravir to reduce viral replication also in vivo. However, no complete control of viremia was achieved. Further investigations are needed to find an optimized treatment against FeLV. (250 words).
Retrospective evaluation of continuous rate infusion of regular insulin intravenously for the management of feline diabetic ketoacidosis.


The use and efficacy of continuous rate infusion (CRI) of regular insulin intravenously for the treatment of feline diabetic ketoacidosis was retrospectively evaluated. The study focused on the rate of glucose decline, time to resolution of inappetence, time to long-term injectable insulin, and length of hospital stay. Review of medical records from 2009 to 2011 identified 10 cases that met the inclusion criteria. Six cats were existing diabetics, 3 of whom had recent insulin changes. Five cats had concurrent diseases. The mean time to long-term injectable insulin was 55 hours. The mean length of hospitalization was 3.8 days. Five cats survived to discharge. In 5 patients, an insulin CRI permitted a short hospital stay and transition to long-term injectable insulin. Many cats with diabetic ketosis or diabetic ketoacidosis are prior diabetics with concurrent disease and/or a history of recent insulin changes. Abstract available from the publisher.

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.

The efficacy of a selamectin (Stronghold ®) spot on treatment in the prevention of Bartonella henselae transmission by Ctenocephalides felis in cats, using a new high-challenge model.


Bartonella henselae is the causative agent of cat scratch disease in humans, which is recognized as an emerging zoonotic disease. Ctenocephalides felis is the main vector, and transmission of B. henselae infection between cats and humans occurs mainly through infected flea faeces. Control of feline
infestation with this arthropod vector therefore provides an important strategy for the prevention of infection of both humans and cats. In the present study, a new challenge model is used to evaluate the efficacy of selamectin (Stronghold® spot on) in the prevention of B. henselae transmission by C. felis. In this new challenge model, domestic cats were infected by direct application of B. henselae-positive fleas. The fleas used for infestation were infected by feeding on blood that contained in vitro-cultured B. henselae. The direct application of the fleas to the animals and the use of different B. henselae strains ensured a high and consistent challenge. Two groups of six cats were randomly allocated on pre-treatment flea counts to either control (untreated cats) or the selamectin-treated group with one pipette per cat according to the label instruction. Stronghold (selamectin 6% spot on solution) was administered on days 0 and 32. On days 3, 10, 19, 25, and 31, each cat was infested by direct application of 20 fleas that fed on blood inoculated with B. henselae. Polymerase chain reaction (PCR) on pooled fleas confirmed that the fleas were infected. Blood samples were collected from each cat on days -3 (prior to flea infestation and treatment), 9, 17, 24, 30, 37, and 44 and assayed for B. henselae antibodies using an indirect immunofluorescence (IFA), for the presence of bacteria by bacterial culture and for B. henselae DNA presence by PCR. Cats were also assessed on a daily basis for general health. There were no abnormal health observations during the study and none of the animals required concomitant treatment. None of the cats displayed any clinical signs of bartonellosis during the study. In the untreated group, all cats became bacteremic within 17 to 44 days. None of the selamectin-treated cats became positive during the study. It was concluded that Stronghold® spot on administered to cats was efficacious in the prevention of the transmission of B. henselae by fleas to cats in a high-challenge model.

The prevalence of Giardia infection in dogs and cats, a systematic review and meta-analysis of prevalence studies from stool samples.

Giardia has a wide range of host species and is a common cause of diarrhoeal disease in humans and animals. Companion animals are able to transmit a range of zoonotic diseases to their owners including giardiasis, but the size of this risk is not well known. The aim of this study was to analyse giardiasis prevalence rates in dogs and cats worldwide using a systematic search approach. Meta-analysis enabled to describe associations between Giardia prevalence and various confounding factors. Pooled prevalence rates were 15.2% (95% CI 13.8-16.7%) for dogs and 12% (95% CI 9.2-15.3%) for cats. However, there was very high heterogeneity between studies. Meta-regression showed that the diagnostic method used had a major impact on reported prevalence with studies using ELISA, IFA and PCR reporting prevalence rates between 2.6 and 3.7 times greater than studies using microscopy. Conditional negative binomial regression found that symptomatic animals had higher prevalence rates ratios (PRR) than asymptomatic animals 1.61 (95% CI 1.33-1.94) in dogs and 1.94 (95% CI 1.47-2.56) in cats. Giardia was much more prevalent in young animals. For cats >6 months, PRR=0.47 (0.42-0.53) and in dogs of the same age group PRR=0.36 (0.32-0.41). Additionally, dogs kept as pets were less likely to be positive (PRR=0.56 (0.41-0.77)) but any difference in cats was not significant. Faecal excretion of Giardia is common in dogs and slightly less so in cats. However, the exact rates depend on the diagnostic method used, the age and origin of the animal. What risk such endemic colonisation poses to human health is still unclear as it will depend not only on prevalence rates but also on what assemblages are excreted and how people interact with their pets.
A review of gene therapy in canine and feline models of lysosomal storage disorders.

Lysosomal storage disorders (LSDs) are inherited diseases that result from the intracellular accumulation of incompletely degraded macromolecules. The majority of LSDs affect both the peripheral and central nervous systems and are not effectively treated by enzyme replacement therapy, substrate reduction therapy, or bone marrow transplantation. Advances in adeno-associated virus and retroviral vector development over the past decade have resurfaced gene therapy as a promising therapeutic intervention for these monogenic diseases. Animal models of LSDs provide a necessary intermediate to optimize gene therapy protocols and assess the safety and efficacy of treatment prior to initiating human clinical trials. Numerous LSDs are naturally occurring in large animal models and closely reiterate the lesions, biochemical defect, and clinical phenotype observed in human patients, and whose lifetime is sufficiently long to assess the effect on symptoms that develop later in life. Herein, we review that gene therapy in large animal models (dogs and cats) of LSDs improved many manifestations of disease, and may be used in patients in the near future.

Biomarkers for disease progression and AAV therapeutic efficacy in feline Sandhoff disease.

The GM2 gangliosidoses, Tay-Sachs disease (TSD) and Sandhoff disease (SD), are progressive neurodegenerative disorders that are caused by a mutation in the enzyme β-N-acetylgalactosaminidase (Hex). Due to the recent emergence of novel experimental treatments, biomarker development has become particularly relevant in GM2 gangliosidosis as an objective means to measure therapeutic efficacy. Here we describe blood, cerebrospinal fluid (CSF), magnetic resonance imaging (MRI), and electrodiagnostic methods for evaluating disease progression in the feline SD model and application of these approaches to assess AAV-mediated gene therapy. SD cats were treated by intracranial injections of the thalami combined with either the deep cerebellar nuclei or a single lateral ventricle using AAVrh8 vectors encoding feline Hex. Significantly altered in untreated SD cats, blood and CSF based biomarkers were largely normalized after AAV gene therapy. Also reduced after treatment were expansion of the lysosomal compartment in peripheral blood mononuclear cells and elevated activity of secondary lysosomal enzymes. MRI changes characteristic of the gangliosidoses were documented in SD cats and normalized after AAV gene therapy. The minimally invasive biomarkers reported herein should be useful to assess disease progression of untreated SD patients and those in future clinical trials.

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.

**Impact of nutrition on ageing the process. Bridging the gap: the animal perspective.**


In pets, as in humans, there is increasing interest in interventions that promote ‘health and well-being’ into later life and extend these beyond their current limits. The purpose of this review was to assess the relevance of current knowledge of ageing in humans, described in a companion paper, as well as reviewing recent research on ageing in pet populations. The role of diet and other factors that influence the ageing process and ultimately lifespan in pets are highlighted in this review; in addition, future opportunities and challenges to further our understanding of the ageing process in pets are identified. Advancing knowledge of the fundamental biology of ageing will be key for the development and evaluation of strategies that extend both the quality and the quantity of lifespan in human and pet populations.

**Micturition Disorders.**


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

**An investigation of the breadth of neutralizing antibody response in cats naturally infected with feline immunodeficiency virus.**


Neutralizing antibodies (NAbs) are believed to comprise an essential component of the protective immune response induced by vaccines against feline immunodeficiency virus (FIV) and human immunodeficiency virus (HIV) infections. However, relatively little is known about the role of NAbs in controlling FIV infection and subsequent disease progression. Here, we present studies where we
examined the neutralization of HIV-luciferase pseudotypes bearing homologous and heterologous FIV envelope proteins (n = 278) by sequential plasma samples collected at 6 month intervals from naturally infected cats (n = 38) over a period of 18 months. We evaluated the breadth of the NAb response against non-recombinant homologous and heterologous clade A and clade B viral variants, as well as recombinants, and assessed the results, testing for evidence of an association between the potency of the NAb response and the duration of infection, CD4(+) T lymphocyte numbers, health status and survival times of the infected cats. Neutralization profiles varied significantly between FIV-infected cats and strong autologous neutralization, assessed using luciferase-based in vitro assays, did not correlate with the clinical outcome. No association was observed between strong NAb responses and either improved health status or increased survival time of infected animals, implying that other protective mechanisms were likely to be involved. Similarly, no correlation was observed between the development of autologous NAbs and the duration of infection. Furthermore, cross-neutralizing antibodies were evident in only a small proportion (13 %) of cats.

**Contrasting clinical outcomes in two cohorts of cats naturally infected with feline immunodeficiency virus (FIV).**


Despite over 25 years of feline immunodeficiency virus (FIV) research, relatively little is known about the longitudinal course of FIV infection following natural infection. In contrast to published reports of experimental infections using lethal strains of the virus, clinical signs of naturally acquired FIV infection can be mild or inapparent, rather than life-threatening. In this prospective, longitudinal controlled study, based in Chicago, IL (n=17) and Memphis, TN (n=27), we investigated two cohorts of privately owned, naturally infected cats kept under different housing conditions. Cats in the Chicago cohort (Group 1) were kept in households of ≤2 cats, while the Memphis cohort (Group 2) comprised part of a large multi-cat household of over 60 cats kept indoors only, with unrestricted access to one another. The majority of cats from Group 1 did not display clinical signs consistent with immunodeficiency during the 22-month observation period. In contrast, the outcome of infection in Group 2 was dramatically different; 17/27 (63%) of cats lost a median of 51.3% of their bodyweight (P<0.0005) and died during the study period, with lymphoma being the most common cause of mortality. Although the decrease in CD4+ T cell count between enrolment and terminal disease was significant (P=0.0017), the CD4:CD8 ratio at the time of enrolment did not reliably distinguish FIV-positive cats classified as ‘healthy’ and ‘not healthy’ at either cohort. FIV load at enrolment was significantly lower in Group 1 than in Group 2 (P<0.0001), but there were no significant differences at enrolment between healthy and not healthy cats at either group. In conclusion, the results of this study suggest that management and housing conditions impact on disease progression and survival times of FIV-positive cats.

**Neutralising antibody response in domestic cats immunised with a commercial feline immunodeficiency virus (FIV) vaccine.**

Across human and veterinary medicine, vaccines against only two retroviral infections have been brought to market successfully, the vaccines against feline leukaemia virus (FeLV) and feline immunodeficiency virus (FIV). FeLV vaccines have been a global success story, reducing virus prevalence in countries where uptake is high. In contrast, the more recent FIV vaccine was introduced in 2002 and the degree of protection afforded in the field remains to be established. However, given the similarities between FIV and HIV, field studies of FIV vaccine efficacy are likely to advise and inform the development of future approaches to HIV vaccination. Here we assessed the neutralising antibody response induced by FIV vaccination against a panel of FIV isolates, by testing blood samples collected from client-owned vaccinated Australian cats. We examined the molecular and phenotypic properties of 24 envs isolated from one vaccinated cat that we speculated might have become infected following natural exposure to FIV. Cats vaccinated against FIV did not display broadly neutralising antibodies, suggesting that protection may not extend to some virulent recombinant strains of FIV circulating in Australia.

Presence of [i]Toxocara[/i] spp. eggs in children’s recreation areas with varying degrees of access for animals.

INTRODUCTION AND OBJECTIVE: The contamination, seasonal and vertical distributions of Toxocara eggs in children’s recreation areas were estimated with respect to their accessibility to domestic and stray animals. MATERIALS AND METHODS: During autumn 2011 and spring 2012, a total 88 composite samples of soil/sand (300g each) were taken twice, from 2 depths, from 11 sandpits and 11 play areas situated in the city of Łódź, Poland. From the collected material, 528 samples (20g) were tested using the flotation method. Half the sample sites were secured from access to dogs and cats, while the other half were not. RESULTS: The difference in the numbers of positive samples from sandpits and playing areas was significant ($c^2 = 13.72, p = 0.0002$). The highest rate of contamination was observed in poorly-secured play areas (15.8% of positive samples and 1.2 eggs/100 g of soil/sand). The average density of Toxocara eggs in secured play areas was 6 times less than that found in unsecured areas, while secured sandpits were 3 times less contaminated than those unsecured. The contamination rate was similar in autumn 2011 and spring 2012 (6.4% and 6.8%, respectively). An inverse relationship between the sand/soil depth and number of recovered Toxocara eggs was observed. Additionally, other intestinal helminth eggs (Ancylostomidae, Ascaris spp., and Trichuris spp.) and oocysts of Isospora spp. were also detected from soil samples collected from playing fields. CONCLUSIONS: The number of Toxocara eggs recovered decreased following fence construction around the examined children’s play areas, but it did not sufficiently prevent the contamination by eggs. These data indicate the necessity for educational programmes which should be implemented for the protection of the local child population from zoonotic infection.

Evaluation of an indirect ELISA using recombinant granule antigen Gra7 for serodiagnosis of Toxoplasma gondii infection in cats.

The precise detection of Toxoplasma gondii infection in cats has important public health significance. In the present study, recombinant granule antigen protein GRA7 was evaluated as a potential diagnostic
marker for T. gondii infection in cats by an indirect enzyme-linked immunosorbent assay (ELISA), using the classified serum samples from cats, by immunofluorescence assay (IFA) and by modified agglutination test (MAT). There was a perfect agreement (97.2%) between GRA7-ELISA and MAT/IFA (Kappa = 0.92; 95% confidence interval [CI], 0.85 to 0.99), and GRA7-ELISA had a sensitivity of 94.9% and a specificity of 97.9%. No significant difference (P > 0.05) was observed between the detection results by GRA7- and Toxoplasma lysate antigen-based ELISA. Receiver operating characteristic analysis showed a relative sensitivity and specificity of 89.7 and 92.5% at the cut-off value of 0.1 for GRA7-ELISA. These data demonstrate that GRA7 is a promising serodiagnostic marker for T. gondii infection in cats.

High prevalence of the liver fluke Amphimerus sp. in domestic cats and dogs in an area for human amphimeriasis in Ecuador.


BACKGROUND: Amphimerus sp. is a liver fluke which recently has been shown to have a high prevalence of infection among an indigenous group, Chachi, who reside in a tropical rainforest in the northwestern region of Ecuador. Since it is unknown which animals can act as a reservoir and/or definitive hosts for Amphimerus sp. in this endemic area, a study was done to determine the prevalence of infection in domestic cats and dogs. This information is important to understand the epidemiology, life cycle and control of this parasite. METHODOLOGY/FINDINGS: In July 2012, three Chachi communities located on Rio Cayapas, province of Esmeraldas, were surveyed. A total of 89 of the 109 registered households participated in the study. Of the 27 cats and 43 dogs found residing in the communities, stool samples were collected from 14 cats and 31 dogs (total of 45 animals) and examined microscopically for the presence of Amphimerus eggs. The prevalence of infection was 71.4% in cats and 38.7% in dogs, with similar rates of infection in all three communities. Significantly more cats were infected than dogs (p = 0.042). CONCLUSIONS/SIGNIFICANCE: The data show a high rate of Amphimerus sp. infection in domestic cats and dogs residing in Chachi communities. It can be concluded that these animals act as definitive and reservoir hosts for this liver fluke and that amphimeriasis is a zoonotic disease. These findings provide important epidemiological data which will aid in the development and implementation of control strategies against the transmission of Amphimerus.

Lower Urinary Tract Cancer.


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


The knowledge of the size and demographic structure of animal populations is a necessary prerequisite for any population-based epidemiological study, especially to ascertain and interpret prevalence data, to implement surveillance plans in controlling zoonotic diseases and, moreover, to provide accurate estimates of tumours incidence data obtained by population-based registries. The main purpose of this study was to provide an accurate estimate of the size and structure of the canine population in Veneto region (north-eastern Italy), using the Lincoln-Petersen version of the capture-recapture methodology. The Regional Canine Demographic Registry (BAC) and a sample survey of households of Veneto Region were the capture and recapture sources, respectively. The secondary purpose was to estimate the size and structure of the feline population in the same region, using the same survey applied for dog population. A sample of 2465 randomly selected households was drawn and submitted to a questionnaire using the CATI technique, in order to obtain information about the ownership of dogs and cats. If the dog was declared to be identified, owner’s information was used to recapture the dog in the BAC. The study was conducted in Veneto Region during 2011, when the dog population recorded in the BAC was 605,537. Overall, 616 households declared to possess at least one dog (25%), with a total of 805 dogs and an average per household of 1.3. The capture-recapture analysis showed that 574 dogs (71.3%, 95% CI: 68.04-74.40%) had been recaptured in both sources, providing a dog population estimate of 849,229 (95% CI: 814,747-889,394), 40% higher than that registered in the BAC. Concerning cats, 455 of 2465 (18%, 95% CI: 17-20%) households declared to possess at least one cat at the time of the telephone interview, with a total of 816 cats. The mean number of cats per household was equal to 1.8, providing an estimate of the cat population in Veneto region equal to 663,433 (95% CI: 626,585-737,159). The estimate of the size and structure of owned canine and feline populations in Veneto region provide useful data to perform epidemiological studies and monitoring plans in this area.

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
as the Sertoli (cm(3); 0.1 + 0.02 vs. 0.24 + 0.05; P < 0.01) cells were diminished in the DA cats. Gonadotropin-releasing hormone agonist endocrine disruption during the neonatal critical reproductive time window may have a potential as a contraceptive agent in domestic felids.

Comparison of surgical variables and pain in cats undergoing ovariohysterectomy, laparoscopic-assisted ovariohysterectomy, and laparoscopic ovariectomy.


Laparoscopy is an established modality in veterinary medicine. To date, laparoscopy in feline surgery is rarely reported. The objectives of this study were to compare surgical time, complications, and postoperative pain in a group of cats undergoing laparoscopic ovariectomy (LOVE), laparoscopic-assisted ovariohysterectomy (LAOVH), and ovariohysterectomy via celiotomy (COVH). Eighteen healthy cats were randomly assigned to undergo LOVE, LAOVH, or COVH. Severity of pain was monitored 1, 2, 3, and 4 hr after surgery. Surgical time was significantly longer for LAOVH (mean ± standard deviation [SD], 51.6 ± 7.7 min) compared to COVH (mean ± SD, 21.0 ± 7.1 min) and LOVE (mean ± SD, 34.2 ± 11.2 min). There were no major intraoperative complications, although minor complications were more common in both laparoscopic groups. Cats sterilized via laparoscopy (LOVE and LAOVH) were statistically less painful than cats spayed via celiotomy (COVH) 4 hr following surgery. Results suggested that LOVE in cats is safe, can be performed in a comparable amount of time as COVH, and may result in less postoperative discomfort.

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.

Liver, biliary and pancreatic injuries in pancreaticobiliary maljunction model in cats.

BACKGROUND: Pancreaticobiliary maljunction is a high risk factor of pancreatitis and biliary tract cancer. How this maljunction affects the liver remains obscure. This study aimed to examine the effects of pancreaticobiliary maljunction on the liver, pancreas and gallbladder in a cat model. METHODS: A model of choledocho-pancreatic side-to-side ductal anastomosis was created in ten cats. Before the procedure, a small piece of tissue from the liver, pancreas and gallbladder was collected as a control. The common channel formation was checked by cholecystography. The livers, pancreases and gallbladders of these cats were harvested for histological examination. The expression of proliferating cell nuclear antigen in the gallbladder was examined with immunohistochemistry. RESULTS: Seven of the 10 cats survived for 6 months after surgery. The color of the liver was darker in the PBM model than the control specimen, with nodules on the surface. Histological examination showed ballooning changes and inflammatory infiltrations and the histopathological score increased significantly (P<0.05). Also, mitochondria swelling and lipid droplet in cytoplasm were observed under an electron microscope. The pancreas also appeared darker in the PBM model than the control specimen and dilated pancreatic ducts were found in three cats. Histopathological examination revealed vascular proliferation and inflammatory infiltration with numerous neutrophils. Gallbladder epithelial cells were featured by expanded endoplasmic reticulum, increased intercellular space and cellular nucleus deformation. The positive cells of proliferating cell nuclear antigen were increased significantly (P<0.05). CONCLUSION: The present study demonstrated that pancreaticobiliary maljunction can lead to the injuries of the liver, pancreas and gallbladder.

Comparison of risk factors for seropositivity to feline immunodeficiency virus and feline leukemia virus among cats: a case-case study.


BACKGROUND: Feline immunodeficiency virus (FIV) and feline leukemia virus (FeLV) are reported to have similar risk factors and similar recommendations apply to manage infected cats. However, some contrasting evidence exists in the literature with regard to commonly reported risk factors. In this study, we investigated whether the known risk factors for FIV and FeLV infections have a stronger effect for either infection. This retrospective study included samples from 696 cats seropositive for FIV and 593 cats seropositive for FeLV from the United States and Canada. Data were collected during two cross sectional studies, where cats were tested using IDEXX FIV/FeLV ELISA kits. To compare the effect of known risk factors for FIV infection compared to FeLV, using a case-case study design, random intercept logistic regression models were fit including cats’ age, sex, neuter status, outdoor exposure, health status and type of testing facility as independent variables. A random intercept for testing facility was included to account for clustering expected in testing practices at the individual clinics and shelters. RESULTS: In the multivariable random intercept model, the odds of FIV compared to FeLV positive ELISA results were greater for adults (OR = 2.09, CI: 1.50-2.92), intact males (OR = 3.14, CI: 1.85-3.76), neutered males (OR = 2.68, CI: 1.44- 3.14), cats with outdoor access (OR = 2.58, CI: 1.85-3.76) and lower for cats with clinical illness (OR = 0.60, 95% CI: 0.52-0.90). The variance components obtained from the model indicated clustering at the testing facility level. CONCLUSIONS: Risk factors that have a greater effect on FIV seropositivity include adulthood, being male (neutered or not) and having access to outdoors, while clinical illness was a stronger predictor for FeLV seropositivity. Further studies are warranted to assess the implications of these results for the management and control of these infections.
Molecular evolution of kobuviruses in cats.

Aichi virus, a causative agent of human gastroenteritis, is one of a number of animal viruses belonging to the genus Kobuvirus within the family Picornaviridae. The kobuvirus genome encodes several structural and nonstructural proteins; the capsid proteins encoded by the VP1 gene are key immunogenic factors. Here, we used the VP1 region to determine substitution rates and the time to the most recent common ancestor (TMRCA) by comparing feline kobuvirus (FKoVs) sequences with kobuvirus sequences isolated from members of other species. The substitution rate for FKoVs was $1.29 \times 10^{-2}$ substitutions/site/year (s/s/y) and the TMRCA was 5.3 years.

Evaluation of polybrominated diphenyl ethers (PBDEs) in matched cat sera and house dust samples: investigation of a potential link between PBDEs and spontaneous feline hyperthyroidism.

The cause of feline hyperthyroidism (FH), a common endocrinopathy of domestic cats, is unknown. A potential association between exposure to environmental contaminants polybrominated diphenyl ethers (PBDEs) and FH was investigated. The median serum level for the sum of congeners BDE-47, BDE-99, BDE-153, BDE-154 and BDE-183 ($\Sigma 5$) in hyperthyroid and euthyroid cats was 82 and 174 ng g$^{-1}$lw respectively with no significant difference in PBDE levels or profiles between groups. Overall, the median (min to max) concentration of PBDEs in cat serum (n=65) was 118 ng g$^{-1}$lw (5-5260 ng g$^{-1}$lw), which is approximately 10 times higher than that observed in the Australian human population. Furthermore, congener composition in feline serum samples was dominated by congener BDE-99, followed by BDE-47 then BDE-153 which differs from results of human biomonitoring. There was no correlation between PBDE levels in feline serum samples and matched house dust samples (n=25). However the similarity of BDE-47/99 ratio in each matrix suggests dust is likely the dominant exposure. Calculation of the daily exposure dose via dust ingestion for cats equated to a mean of 33 ng kg$^{-1}$ bw d$^{-1}$ (0.2-150 ng kg$^{-1}$ bw d$^{-1}$). Differences in exposure estimates for Australian and US cats, based on dust ingestion alone, are consistent with the observed differences in body burdens. Our results do not support a role for PBDE exposure in the aetiopathogenesis of FH.

Impaired cardiac mitochondrial oxidative phosphorylation and enhanced mitochondrial oxidative stress in feline hypertrophic cardiomyopathy.

Mitochondrial dysfunction and oxidative stress are important players in the development of various cardiovascular diseases, but their roles in hypertrophic cardiomyopathy (HCM) remain unknown. We examined whether mitochondrial oxidative phosphorylation (OXPHOS) capacity was impaired with enhanced mitochondrial oxidative stress in HCM. Cardiac and skeletal muscles were obtained from nine domestic cats with spontaneously occurring HCM with preserved left ventricular systolic function and from 15 age-matched control cats. Mitochondrial OXPHOS capacities with non-fatty-acid and fatty-acid substrates in permeabilized fibers and isolated mitochondria were assessed by using high-
resolution respirometry. Reactive oxygen species (ROS) release originating from isolated mitochondria was assessed by spectrofluorometry. Thiobarbituric acid reactive substances (TBARS) were also measured as a marker of oxidative damage. Mitochondrial ADP-stimulated state 3 respiration with complex I-linked non-fatty-acid substrates and with fatty-acid substrates, respectively, was significantly lower in the heart of HCM cats compared with control cats. Mitochondrial ROS release during state 3 with complex I-linked substrates and TBARS in the heart were significantly increased in cats with HCM. In contrast, there were no significant differences in mitochondrial OXPHOS capacity, mitochondrial ROS release, and oxidative damage in the skeletal muscle between groups. Mitochondrial OXPHOS capacity with both non-fatty-acid substrates and fatty-acid substrates was impaired with increased mitochondrial ROS release in the feline HCM heart. These findings provide new insight into the pathophysiology of HCM and support the hypothesis that restoration of the redox-state in the mitochondria is beneficial in the treatment of HCM.

Prioritization of Companion Animal Transmissible Diseases for Policy Intervention in Europe.


A number of papers have been published on the prioritization of transmissible diseases in farm animals and wildlife, based either on semiquantitative or truly quantitative methods, but there is no published literature on the prioritization of transmissible diseases in companion animals. In this study, available epidemiological data for diseases transmissible from companion animals to man were analysed with the aim of developing a procedure suitable for their prioritization within a European framework. A new method and its associated questionnaire and scoring system were designed based on methods described by the World Organisation for Animal Health (OIE). Modifications were applied to allow for the paucity of specific information on companion animal transmissible diseases. The OIE method was also adapted to the subject and to the regional scope of the interprofessional network addressing zoonotic diseases transmitted via companion animals in Europe: the Companion Animals multisectorial Interdisciplinary Strategic Think tank On zoonoses (CALLISTO). Adaptations were made based on information collected from expert groups on viral, bacterial and parasitic diseases using a structured questionnaire, in which all questions were closed-ended. The expert groups were asked to select the most appropriate answer for each question taking into account the relevance and reliability of the data available in the scientific literature. Subsequently, the scoring of the answers obtained for each disease covered by the questionnaire was analysed to obtain two final overall scores, one for human health impact and one for agricultural economic impact. The adapted method was then applied to select the 15 most important pathogens (five for each pathogen group: viral, bacterial and parasitic) on the basis of their overall impact on public health and agriculture. The result of the prioritization exercise was a joint priority list (available at www.callistoproject.eu) of relevant pathogens according to these two criteria. As the scope of CALLISTO was comprehensive in terms of geographical area, animal species involved and impact of the diseases, the list of prioritized diseases had to accommodate the realities in different European countries and the differences in biology and animal-human relationships in a wide range of species including cats and dogs, pet pigs and sheep as well as captive reptiles. The methodology presented in this paper can be used to generate accurate priority lists according to narrower and more specific objectives.

Neuropathology of Natural *Cytauxzoon felis* Infection in Domestic Cats.

Cytauxzoonosis is a tick-borne disease of felids caused by the protozoan *Cytauxzoon felis*. This article characterizes the neuropathologic changes in 8 cases of natural *C. felis* infection in domestic cats with typical clinical signs and pathologic changes in multiple organs. Histologic changes in the brain included intravascular schizont-laden macrophages in leptomeningeal and parenchymal arterioles and venules. Small capillaries throughout the gray and white matter and choroid plexus also appeared occluded. Affected vessels were often surrounded by small to moderate numbers of lymphocytes and plasma cells and multiple areas of hemorrhage. Vasculitis and fibrin thrombi were occasionally present. Parenchymal changes consisted of variable degrees of vacuolation of the gray and white matter, with microgliosis, astrocytosis, astrogliosis, and multiple microhemorrhages. Multiple well-demarcated areas of necrosis observed in 4 cases were characterized by marked vacuolation of the gray or white matter, with necrotic neurons containing shrunken hyper eosinophilic cytoplasm and pyknotic nuclei, nuclear debris, swollen axons, and scattered foamy macrophages. The changes in the brains of affected cats were attributed to vascular occlusion and secondary ischemia caused by the protozoal infection.

**Controversies in the management of feline urethral obstruction.**


OBJECTIVE: To discuss areas of differing opinion in the management of feline urethral obstruction and present current evidence to either support or refute common practices. ETIOLOGY: Urethral obstruction may occur as a result from a functional obstruction (idiopathic obstruction) or a physical obstruction, such as mucous plugs or calculi within the urethra. Potential risk factors for obstruction in cats include predominantly indoor status, decreased water intake, and increased body weight. DIAGNOSIS: The diagnosis is most commonly made based on history and initial physical examination, straining to urinate, vocalizing, signs of systemic illness, moderate to large firm bladder on abdominal palpation. THERAPY: Treatment is based on available evidence. The type of IV isotonic crystalloid used does not seem to matter and rate should be determined by need for fluid resuscitation, and replacement of deficit and ongoing losses. Though controversial, cystocentesis appears to be safe and may offer some benefits in initial management. There is evidence to suggest a smaller urethral catheter (3.5 Fr) may be associated with decreased risk of reobstruction. Routine use of antimicrobial agents in hospital is not recommended; they should be dispensed based on culture performed at the time of catheter removal. Though commonly used, evidence in support of antispasmodics is limited and further prospective investigation is needed. PROGNOSIS: Feline urethral obstruction is associated with 90-95% survival, with reported recurrence rates of 15-40%. Potential factors affecting recurrence include size or duration of indwelling urinary catheter, use of antispasmodic agents, patient age, and indoor-outdoor lifestyle; however, different studies offer conflicting results. Increased water intake and environmental modification do seem to decrease risk of recurrence.

**Retrospective evaluation of risk factors and outcome predictors in cats with diabetic ketoacidosis (1997-2007): 93 cases.**


OBJECTIVES: To determine risk factors and outcome predictors in cats with diabetic ketoacidosis (DKA). DESIGN: Retrospective study. Inclusion in the DKA group required blood glucose
concentration > 13.9 mmol/L (250 mg/dL), venous pH < 7.35, and urine or serum acetoacetate concentration greater than 1.5 mmol/L (15 mg/dL). Signalment and weight were recorded in all cats with uncomplicated diabetes mellitus (DM) without DKA and in all other nondiabetic cats examined during the study period. Clinicopathologic variables, concurrent disorders, and initial insulin intravenous (IV) continuous-rate infusion (CRI) concentration of 1.1 or 2.2 U/kg/240 mL bag of 0.9% NaCl, were examined for a possible association with outcome. SETTING: University teaching hospital. ANIMALS: Ninety-three cats with DKA, 682 cats with uncomplicated DM, and 16,926 cats without DM or DKA. INTERVENTIONS: None. MEASUREMENTS AND MAIN RESULTS: Cats with DKA were younger (median age 9.4 years; range, 1-17.9 years) than cats with uncomplicated DM (median 11.6 years; range 0.7-19.5 years, P < 0.0003). Siamese cats were overrepresented in the DKA group compared to the uncomplicated DM or nondiabetic group (P = 0.038 and P = 0.01, respectively). Poor outcome (defined as death due to disease or by euthanasia) in 36 cats with DKA (39%) was associated with increased initial creatinine, BUN, total serum magnesium, and total bilirubin concentrations (P = 0.007, P = 0.005, P = 0.03, P = 0.03, respectively). Cats treated with a higher concentration of insulin were less likely to have a poor outcome compared to cats treated with a lower concentration of insulin (odds ratio 0.14, 95% confidence interval 0.02-1.16, P = 0.02).

CONCLUSIONS: Cats with DKA are more likely to be Siamese than cats with uncomplicated DM. Poor outcome of cats with DKA is associated with increased initial creatinine, BUN, total magnesium, and total bilirubin concentrations. Good outcome was associated with a higher concentration of IV insulin CRI.

Poisoning of dogs and cats by drugs intended for human use.

One of the main causes of poisoning of small animals is exposure to drugs intended for human use. Poisoning may result from misuse by pet owners, off-label use of medicines or, more frequently, accidental ingestion of drugs that are improperly stored. This review focuses on classes of drugs intended for human use that are most commonly involved in the poisoning of small animals and provides an overview of poisoning episodes reported in the literature. To perform this review a comprehensive search of public databases (PubMed, Web of Science, Scopus, Google Scholar) using key search terms was conducted. Additionally, relevant textbooks and reference lists of articles pertaining to the topic were reviewed to locate additional related articles. Most published information on small animal poisoning by drugs intended for human use was from animal and human poison control centres or from single case reports. The dog was the species most frequently poisoned. The major drugs involved included analgesics (nonsteroidal anti-inflammatory drugs), antihistamines (H1-antihistamines), cardiovascular drugs (calcium channel blockers), central nervous system drugs (selective serotonin reuptake inhibitors, baclofen, benzodiazepines and zolpidem), gastrointestinal drugs (loperamide), nutritional supplements (vitamin D and iron salts) and respiratory drugs (β2-adrenergic receptor agonists).

Adjuvant chemotherapy with mitoxantrone for cats with mammary carcinomas treated with radical mastectomy.
OBJECTIVES: The purpose of this study was to investigate the disease-free interval, survival time and adverse events of a combined treatment approach in cats with mammary malignant tumors using radical mastectomy and adjuvant mitoxantrone. METHODS: All cats underwent surgery to remove the mammary chain containing the tumors. A 3 cm margin was obtained around removed tumors. For staging purposes, regional inguinal lymphadenectomy was performed in all cases. After histopathology, cats were staged according to the World Health Organization’s (WHO) staging system. Chemotherapy with mitoxantrone was started 15-30 days after surgery (6 mg/m(2) IV every 21 days for four cycles) with the objective of delaying metastasis. RESULTS: Three cats were intact, one cat was early spayed, four cats were late spayed and four cats were spayed at an unknown age. Based on the WHO’s staging system, six cats were classified as stage I and six cats as stage III. The median disease-free interval and survival time were 360 and 480 days, respectively. Four (33%) cats received four doses of mitoxantrone, four (33%) cats received three doses and four (33%) cats received only one dose. The most frequent adverse effects of chemotherapy were azotemia, anorexia, leukopenia and vomiting. CONCLUSIONS AND RELEVANCE: Adjuvant mitoxantrone chemotherapy may be an option for feline mammary tumors. Further, sufficiently powered, randomized prospective trials are necessary to determine if mitoxantrone is superior, inferior or equivalent to doxorubicin in the adjuvant setting.

Clinical findings, diagnosti cs and outcome in 33 cats with adrenal neoplasia (2002-2013).

OBJECTIVES: The objective of this retrospective study was to describe the clinical signs and diagnostic findings in cats with histopathologically confirmed adrenal neoplasms, and to assess correlations with survival data. METHODS: Study data were acquired by reviewing medical records for all cats diagnosed with adrenal neoplasms at seven referral institutions between 2002 and 2013. Inclusion criteria required a histopathologic diagnosis of an adrenal neoplasm (ante-mortem or on necropsy). RESULTS: Thirty-three cats met the inclusion criteria for the study. The most common presenting complaints included weakness (n = 12), respiratory signs (n = 4), blindness (n = 4) or gastrointestinal signs (n = 3). Laboratory abnormalities included hypokalemia (n = 18), alkalemia (n = 12), elevated creatine kinase (>3000, n = 5) and azotemia (n = 4). In addition, hypertension was noted in 13 cats. Thirty cats were diagnosed with cortical tumors (17 carcinomas, 13 adenomas) and three cats were diagnosed with pheochromocytomas. Twenty-five cats underwent tests to evaluate the function of the adrenal tumors; 19/25 cats had functional tumors (hyperaldosteronism [n = 16], hypercortisolemia [n = 1], high estradiol [n = 1], and hypersecretion of aldosterone, estradiol and progesterone [n = 1]). Twenty-six cats underwent adrenalectomy, one cat was medically managed and six were euthanized without treatment. Long-term survival postoperatively ranged from 4-540 weeks, with 20 (77%) cats surviving the perioperative period of 2 weeks. The only variable that was found to be negatively associated with survival was female sex. The most common complications noted during the perioperative period were hemorrhage and progressive lethargy and anorexia. CONCLUSIONS AND RELEVANCE: Surgical treatment for feline adrenal tumors (regardless of tumor type) resulted in good long-term survival. Given that pre- and postoperative hypocortisolemia was identified in this study, and, in addition, hypersecretion of more than one adrenal hormone occurred in one cat, adrenal panels prior to surgery may be beneficial as part of the preoperative work-up.

Diabetes mellitus and pancreatitis--cause or effect?

Diabetes mellitus and pancreatitis are two distinct diseases encountered commonly in small animal practice. Whilst the clinical signs of diabetes mellitus are usually unmistakeable, a firm diagnosis of pancreatitis can prove more elusive, as clinical signs are often variable. Over the past 10 to 15 years, despite the fact that the clinical signs of diabetes mellitus are remarkably consistent, it has become more apparent that the underlying pathology of diabetes mellitus in dogs and cats is heterogeneous, with exocrine pancreatic inflammation accompanying diabetes mellitus in a number of cases. However, the question remains as to whether the diabetes mellitus causes the pancreatitis or whether, conversely, the pancreatitis leads to diabetes mellitus—as there is evidence to support both scenarios. The concurrence of diabetes mellitus and pancreatitis has clinical implications for case management as such cases may follow a more difficult clinical course, with their glycaemic control being “brittle” as a result of variation in the degree of pancreatic inflammation. Problems may also arise if abdominal pain or vomiting lead to anorexia. In addition, diabetic cases with pancreatitis are at risk of developing exocrine pancreatic insufficiency in the following months to years, which can complicate their management further.

**Recommendations on vaccination for Asian small animal practitioners: a report of the WSAVA Vaccination Guidelines Group.**


In 2012 and 2013, the World Small Animal Veterinary Association (WSAVA) Vaccination Guidelines Group (VGG) undertook fact-finding visits to several Asian countries, with a view to developing advice for small companion animal practitioners in Asia related to the administration of vaccines to dogs and cats. The VGG met with numerous first opinion practitioners, small animal association leaders, academic veterinarians, government regulators and industry representatives and gathered further information from a survey of almost 700 veterinarians in India, China, Japan and Thailand. Although there were substantial differences in the nature and magnitude of the challenges faced by veterinarians in each country, and also differences in the resources available to meet those challenges, overall, the VGG identified insufficient undergraduate and postgraduate training in small companion animal microbiology, immunology and vaccinology. In most of the countries, there has been little academic research into small animal infectious diseases. This, coupled with insufficient laboratory diagnostic support, has limited the growth of knowledge concerning the prevalence and circulating strains of key infectious agents in most of the countries visited. Asian practitioners continue to recognise clinical infections that are now considered uncommon or rare in western countries. In particular, canine rabies virus infection poses a continuing threat to animal and human health in this region. Both nationally manufactured and international dog and cat vaccines are variably available in the Asian countries, but the product ranges are small and dominated by multi-component vaccines with a licensed duration of immunity (DOI) of only 1 year, or no description of DOI. Asian practitioners are largely unaware of current global trends in small animal vaccinology or of the WSAVA vaccination guidelines. Consequently, most practitioners continue to deliver annual revaccination with both core and non-core vaccines to adult animals, with little understanding that “herd immunity” is more important than frequent revaccination of individual animals within the population. In this paper, the VGG presents the findings of this project and makes key recommendations for the Asian countries. The VGG recommends that (1) Asian veterinary schools review and increase as needed the amount of instruction in small animal vaccinology within their undergraduate curriculum and increase the
availability of pertinent postgraduate education for practitioners; (2) national small animal veterinary associations, industry veterinarians and academic experts work together to improve the scientific evidence base concerning small animal infectious diseases and vaccination in their countries; (3) national small animal veterinary associations take leadership in providing advice to practitioners based on improved local knowledge and global vaccination guidelines; (4) licensing authorities use this enhanced evidence base to inform and support the registration of improved vaccine product ranges for use in their countries, ideally with DOI for core vaccines similar or equal to those of equivalent products available in western countries (i.e. 3 or 4 years). The VGG also endorses the efforts made by Asian governments, non-governmental organisations and veterinary practitioners in working towards the goal of global elimination of canine rabies virus infection. In this paper, the VGG offers both a current pragmatic and future aspirational approach to small animal vaccination in Asia. As part of this project, the VGG delivered continuing education to over 800 Asian practitioners at seven events in four countries. Accompanying this document is a list of 80 frequently asked questions (with answers) that arose during these discussions. The VGG believes that this information will be of particular value to Asian veterinarians as they move towards implementing global trends in small companion animal vaccinology.

**Prospects for vaccination against the ticks of pets and the potential impact on pathogen transmission.**


Diseases transmitted by arthropod vectors such as ticks greatly impact human and animal health. In particular, many diseases of dogs and cats are potentially transmissible to people by arthropod vectors and therefore their control is important for the eradication of vector-borne diseases (VBD). Vaccination is an environmentally friendly alternative for vector control that allows control of several VBD by targeting their common vector. Recent results have shown that it is possible to use vector protective antigens for the control of arthropod vector infestations and pathogen infection. However, as reviewed in this paper, very little progress has been made for the control of ectoparasite infestations and VBD in pets using vaccination with vector protective antigens. The growing interaction between pets and people underlines the importance of developing new interventions for the monitoring and control of VBD.

**Treatment of acquired nasopharyngeal stenosis using a removable silicone stent.**


The aim of this prospective study was to characterise patient characteristics and the histories of cats with acquired nasopharyngeal stenosis (ANS), and to describe the use of a removable silicone stent for treatment. ANS was diagnosed in 15 cats with clinical signs present for a median of 4 months. Clinical signs included stertor and inspiratory difficulty, nasal discharge, sneezing, dysphagia, regurgitation, vomiting and anorexia. Radiographs revealed a dorsal deviation or deformation of the caudal part of the soft palate in 10 of the cats, a soft tissue density across the cranial nasopharynx in four and no abnormality in one. The stenosis was initially dilated with a Kelly forceps in 10 of the cats and by balloon dilatation in five. A segment of a 24 Fr silicone thoracic catheter was used for the stent in five cats; in the other 10 cats a segment of a 28 Fr catheter was used. The stent was removed after 3 weeks
in 12 cats and after 4 weeks in the other three. Endoscopy revealed an adequate nasopharyngeal diameter in all of the cats. At both 3 and 10 months after surgery the response was considered to be satisfactory, with complete resolution of clinical signs in 14 cats and improvement in the remaining cat. The treatment of ANS by stenosis dilatation followed by temporary stenting with a silicone stent is a rapid, safe, economical and effective procedure.

Cryosurgery in association with itraconazole for the treatment of feline sporotrichosis.

OBJECTIVES: We evaluated the efficacy of cryosurgery in association with itraconazole for the treatment of feline sporotrichosis. We also compared the length of treatment protocol to others reported in the literature. METHODS: Cats naturally infected with fungi of the Sporothrix schenckii complex were evaluated. Diagnosis was confirmed by cytology and fungal culture. Prior to the cryosurgical procedure, every animal was receiving itraconazole 10 mg/kg/day PO, for different time periods. The same protocol was maintained until 4 weeks after complete healing of the lesions. RESULTS: Eleven of 13 cats were considered clinically cured. The treatment duration ranged from 14-64 weeks (median 32 weeks). CONCLUSIONS AND RELEVANCE: The combination of cryosurgery and itraconazole was effective in treating cases of feline sporotrichosis and decreased treatment length compared with protocols using only medication.

Perioperative anaesthetic care of the cat undergoing dental and oral procedures: Key considerations.

CLINICAL CHALLENGES: Anaesthesia for dental and oral procedures in cats can be challenging and many factors need to be taken into consideration. Often it is older patients requiring these procedures and, while old age itself is not a contraindication for general anaesthesia, older patients tend to have limited homeostatic reserves and are, therefore, more prone to anaesthesia-induced insults of vital organs. Most sedative and anaesthetic agents have cardiovascular side effects, which may result in detrimental consequences in older patients in which organ reserves are likely reduced. AIMS: The need for good patient assessment and management during the entire perianaesthetic period cannot be overemphasised. This article describes how both anaesthetic protocol and intravenous fluid therapy should be tailored to the individual cat’s needs. Application of a multimodal analgesic protocol (the combination of different analgesic agents) and a balanced anaesthetic technique incorporating local nerve blocks is highly recommended and a particular focus of the review. The use of local anaesthetic agents for the latter not only provides optimal pre-emptive analgesia, but also reduces the amount of analgesic agents needed to maintain an adequate level of anaesthesia and, therefore, limits their side effects. Other key aspects of perianaesthetic care of the feline dental and oral patient include airway protection, monitoring and maintenance of body temperature, eye protection, and analgesia extending well into the post-anaesthetic period. EVIDENCE BASE: The authors draw on their clinical experience and the referenced literature to provide a practical overview of this critical but often-overlooked aspect of feline dentistry.
Gut microbiota of humans, dogs and cats: current knowledge and future opportunities and challenges.


High-throughput DNA sequencing techniques allow for the identification and characterisation of microbes and their genes (microbiome). Using these new techniques, microbial populations in several niches of the human body, including the oral and nasal cavities, skin, urogenital tract and gastrointestinal tract, have been described recently. Very little data on the microbiome of companion animals exist, and most of the data have been derived from the analysis of the faeces of healthy laboratory animals. High-throughput assays provide opportunities to study the complex and dense populations of the gut microbiota, including bacteria, archaea, fungi, protozoa and viruses. Our laboratory and others have recently described the predominant microbial taxa and genes of healthy dogs and cats and how these respond to dietary interventions. In general, faecal microbial phylogeny (e.g. predominance of Firmicutes, Bacteroidetes, Proteobacteria and Actinobacteria) and functional capacity (e.g. major functional groups related to carbohydrate, protein, DNA and vitamin metabolism; virulence factors; and cell wall and capsule) of the canine and feline gut are similar to those of the human gut. Initial sequencing projects have provided a glimpse of the microbial super-organism that exists within the canine and feline gut, but leaves much to be explored and discovered. As DNA provides information only about potential functions, studies that focus on the microbial transcriptome, metabolite profiles, and how microbiome changes affect host physiology and health are clearly required. Future studies must determine how diet composition, antibiotics and other drug therapies, breed and disease affect or are affected by the gut microbiome and how this information may be used to improve diets, identify disease biomarkers and develop targeted disease therapies.

The feline oral microbiome: a provisional 16S rRNA gene based taxonomy with full-length reference sequences.


The human oral microbiome is known to play a significant role in human health and disease. While less well studied, the feline oral microbiome is thought to play a similarly important role. To determine roles oral bacteria play in health and disease, one first has to be able to accurately identify bacterial species present. 16S rRNA gene sequence information is widely used for molecular identification of bacteria and is also useful for establishing the taxonomy of novel species. The objective of this research was to obtain full 16S rRNA gene reference sequences for feline oral bacteria, place the sequences in species-level phylotypes, and create a curated 16S rRNA based taxonomy for common feline oral bacteria. Clone libraries were produced using “universal” and phylum-selective PCR primers and DNA from pooled subgingival plaque from healthy and periodontally diseased cats. Bacteria in subgingival samples were also cultivated to obtain isolates. Full-length 16S rDNA sequences were determined for clones and isolates that represent 171 feline oral taxa. A provisional curated taxonomy was developed based on the position of each taxon in 16S rRNA phylogenetic trees. The feline oral microbiome curated taxonomy and 16S rRNA gene reference set will allow investigators to refer to precisely defined bacterial taxa. A provisional name such as “Propionibacterium sp. feline oral taxon FOT-327” is an anchor to which clone, strain or GenBank names or accession numbers can point. Future next-generation-sequencing studies of feline oral bacteria will be able to map reads to taxonomically curated full-length 16S rRNA gene sequences.
Retrospective study on the occurrence of the feline lungworms Aelurostrongylus abstrusus and Troglostrongylus spp. in endemic areas of Italy.


Aelurostrongylus abstrusus is a metastrongyloid nematode infesting the respiratory system of domestic cats worldwide. Troglostrongylus brevior and Troglostrongylus subcrenatus, two lungworms thought to infest wild felids, have been found recently in domestic cats from Spain and Italy. These unexpected findings have raised doubts about the assumed past and present occurrence of Troglostrongylus spp., especially T. brevior, in domestic hosts and suggest that there may have been missed detection or misdiagnosis. The present retrospective study evaluated the presence of lungworms in cats from Italy with a diagnosis of respiratory parasitism or with compatible lung lesions from 2002 to 2013. Sixty-eight samples of DNA and larvae from cats with a diagnosis of aelurostrongylosis, and 53 formalin-fixed paraffin-embedded lung samples from cats confirmed as lungworm infested or with compatible lesions, were investigated using two DNA-based assays specific for A. abstrusus or T. brevior. All DNA and larval samples were positive for A. abstrusus and one was additionally positive for T. brevior. Most paraffin-embedded lung tissues were positive only for A. abstrusus, but two samples tested positive for both lungworms and one for T. brevior only. This study supports the major role of A. abstrusus in causing feline respiratory parasitism in endemic areas of Italy.

Treatment of Troglostrongylus brevior (Metastrongyloidea, Crenosomatidae) in mixed lungworm infections using spot-on emodepside.


Feline lungworms have long been known as pathogens of cats. However, an increased incidence of clinical cases in some areas has been the focus of a number of recent epidemiological and clinical studies. While Aelurostrongylus abstrusus causes respiratory signs in cats all over the world, Troglostrongylus brevior has recently been found in domestic cats from Spain and Italy (where it often causes severe clinical signs). Capillaria aerophila, a parasite that infects many wild carnivores, may cause respiratory distress in cats. A variety of treatment options are known for A abstrusus, while almost no information is available on the treatment of troglostrongylosis and capillariosis. This series describes two mixed infections in clinically affected kittens with T brevior, one with concurrent A abstrusus and the other with C aerophila. In both cases, the nematodes were identified and confirmed by copromicroscopic examination and specific DNA-based assays. Kittens showed respiratory signs that resolved after one or two administrations of a spot-on solution containing emodepside. Larval (T brevior and A abstrusus) and egg (C aerophila) shedding was also eliminated 2-4 weeks after treatment. New clinical insights into these parasitoses are discussed.

Detection of feline kobuviruses in diarrhoeic cats, Italy.

Kobuviruses have been identified in the enteric tract of several mammalian species but their role as enteric pathogens is still not defined. In this study, feline kobuviruses were found in 13.5% of cats with diarrhoea, but not in asymptomatic animals. In the full-length genome, one such strain, TE/52/13/ITA, displayed the highest nucleotide identity (96.0%) to the prototype strain FK-13. These results provide firm evidence that kobuviruses are common constituents of feline enteric viroma and that they are not geographically restricted to the Asian continent, where they were first signalled.

**Contrast-enhanced ultrasonography of the pancreas in healthy cats.**


BACKGROUND: This study describes the pattern of ultrasonographic contrast enhancement of the pancreatic body and left lobe using a second-generation commercial contrast medium (Sonovue) in 10 clinically healthy cats. RESULTS: Following contrast medium administration, microbubbles were observed within the splenic artery. This was followed by an inflow of contrast medium into the pancreatic capillary beds, providing a uniformly contrast-enhanced pancreas at peak intensity (PI). At the time of PI, a replenishment of the splenic and portal veins started and increased progressively during the wash-out phase. During the wash-out phase, the echogenicity of the pancreatic parenchyma decreased progressively. Perfusion parameters included arrival time (4.69 ± 1.26 s), time to peak from injection (7.52 ± 1.88 s), time to peak from initial rise (2.84 ± 0.88 s), peak intensity (6.58 ± 2.66 a.u.), and wash-in rate (2.11 ± 1.79 a.u./s). CONCLUSIONS: This perfusion pattern of normal pancreatic parenchyma may be useful for characterising cats with exocrine pancreatic disorders.

**Detection of feline coronavirus in cerebrospinal fluid for diagnosis of feline infectious peritonitis in cats with and without neurological signs.**


OBJECTIVES: The objective of this study was to evaluate the sensitivity and specificity of a real-time reverse transcriptase polymerase chain reaction (real-time RT-PCR) detecting feline coronavirus (FCoV) RNA in cerebrospinal fluid (CSF) of cats with and without neurological and/or ocular signs for the diagnosis of feline infectious peritonitis (FIP). METHODS: This prospective case-control study included 34 cats. Nineteen cats had a definitive histopathological diagnosis of FIP (seven of these with neurological and/or ocular signs), and 15 cats had other diseases but similar clinical signs (three of these with neurological and/or ocular signs). Real-time RT-PCR was performed on the CSF of all cats, and sensitivity, specificity, and positive (PPV) and negative predictive values (NPV) were calculated. RESULTS: Real-time RT-PCR of CSF showed a specificity of 100% in diagnosing FIP, a sensitivity of 42.1%, a PPV of 100% and an NPV of 57.7%. The sensitivity of the real-time RT-PCR of CSF in cats with neurological and/or ocular signs was 85.7%. CONCLUSIONS AND RELEVANCE: Although it is known that RT-PCR can give false positive results, especially if performed using serum or plasma, this real-time RT-PCR detecting FCoV RNA in CSF can be considered as a reliable specific tool for the diagnosis of FIP. If only cats with neurological involvement are evaluated, the sensitivity of this real-time RT-PCR in CSF is also high.
Clinical and Pathologic Study of Feline Merkel Cell Carcinoma With Immunohistochemical Characterization of Normal and Neoplastic Merkel Cells.


The authors herein describe the morphologic and immunohistochemical features of normal Merkel cells as well as the clinicopathologic findings of Merkel cell carcinoma in cats. Merkel cells were characterized as vacuolated clear cells and were individually located in the epidermal basal layer of all regions examined. Clusters of Merkel cells were often observed adjacent to the sinus hair of the face and carpus. Immunohistochemically, Merkel cells were positive for cytokeratin (CK) 20, CK18, p63, neuron-specific enolase, synaptophysin, and protein gene product 9.5. Merkel cell carcinoma was detected as a solitary cutaneous mass in 3 aged cats (13 to 16 years old). On cytology, large lymphocyte-like cells were observed in all cases. Histologic examinations of surgically resected tumors revealed nests of round cells separated by various amounts of a fibrous stroma. Tumor cells were commonly immunopositive for CK20, CK18, p63, neuron-specific enolase, and synaptophysin, representing the characteristics of normal Merkel cells.

Bacterial species isolated from cats with lower urinary tract infection and their susceptibilities to cefovecin.


BACKGROUND: The aim of this study was to determine the bacterial species recovered from 61 cats with lower urinary tract infection (LUTI), and their susceptibility to cefovecin in vitro. RESULTS: The clinical signs and final clinical diagnosis for cats with confirmed LUTI were also reported. After physical examination of the cats, urine samples including ≥5-6 leucocytes in microscopic evaluation were cultured using bacteriological techniques. The isolates were identified by conventional microbiological methods and tested for in vitro susceptibility using the Kirby-Bauer disc diffusion method recommended by the Clinical Laboratory Standards Institute. Bacterial growth was observed in 16 of 61 urine samples. Antimicrobial susceptibility tests showed that 13 of 16 (81%) isolates were susceptible to cefovecin. The most frequently isolated bacterium from cats with signs of lower urinary tract infection, was Escherichia coli. CONCLUSION: Cefovecin was found to be effective in cats with LUTI. Because cefovecin is a new antimicrobial agent in veterinary medicine, there are only few studies about urine culture of cats with LUTI. It is the first study on in vitro activity of cefovecin against bacterial isolates from cats with lower urinary infections in Istanbul, Turkey.

Feline urinary tract pathogens: prevalence of bacterial species and antimicrobial resistance over a 10-year period.


The purpose of this retrospective study was to identify bacterial species in cats with bacterial urinary tract infections (UTIs) and to investigate their antimicrobial susceptibilities over a 10-year period. Three hundred and thirty cultures from 280 cats were included in the study. The mean age of affected cats was 9.9 years; female cats with bacterial UTIs were significantly older than male cats with UTIs. The most common pathogen identified was Escherichia coli (42.3 per cent), followed by Streptococcus.
species (19.3 per cent), Staphylococcus species (15.6 per cent), Enterococcus species (6.6 per cent) and Micrococcaceae (5.8 per cent). Forty specimens (12.1 per cent) yielded growth of more than one isolate. Streptococcus and Enterococcus isolates were resistant to a significantly higher number of antimicrobial agents than E. coli and Staphylococcus species isolates. Applying the formula to select rational antimicrobial therapy, bacterial isolates were most likely to be susceptible to nitrofurantoin, amoxicillin clavulanic acid, enrofloxacin and gentamicin. The antimicrobial impact factor for nitrofurantoin increased significantly over the 10-year period, whereas there was no significant change in antimicrobial impact factors for doxycycline, trimethoprim-sulfamethoxazole, gentamicin, enrofloxacin, cephalothin and amoxicillin clavulanic acid. The detected changes in vitro antimicrobial efficacy could help to develop hospital-specific guidelines for antimicrobial use to prevent the further development of resistance in feline uropathogens.

**Feline rehabilitation.**


Cats have orthopedic problems, including osteoarthritis, fractures, and luxations that are positively impacted by physical rehabilitation. Most cats have an independent behavior that requires using a tactful approach to rehabilitation. Cats often do well with manual therapy and electrophysical modalities. Feline rehabilitation sessions may be shorter than canine rehabilitation sessions. Cats do best with therapeutic exercises when these exercises are linked to hunting, playing, or feeding.

**Selecting representative microsatellite loci for genetic monitoring and analyzing genetic structure of an outbred population of orange tabby cats in China.**


We optimized a panel of microsatellite markers from cat and tiger genetic data for efficient genetic monitoring and used it to analyze the genetic structure of an outbred cat stock in China. We selected a set of rich polymorphic microsatellite loci from 131 cat microsatellite loci and 3 Sumatran tiger microsatellite loci using agarose gel electrophoresis. Next, the set of optimized genetic markers was used to analyze the genetic variation in an outbred population of orange tabby cats in China by simple-tandem repeat scanning. Thirty-one loci rich in polymorphisms were selected and the highest allele number in a single locus was 8. Analysis of the orange tabby cat population illustrated that the average observed number of alleles, mean effective allele number, mean Shannon’s information index, mean expected heterozygosity, and observed heterozygosity were 3.8387, 2.4027, 0.9787, 0.5565, and 0.5528, respectively. The 31 microsatellite markers used were polymorphic and suitable for analyzing the genetic structure of cats. The population of orange tabby cats was confirmed to be a well-outbred stock.

**Comparison of anaesthesia ‘Day 1 skills’ expectations between veterinary anaesthetists and general practitioners.**

Day One Skills (DOS) were introduced by the Royal College of Veterinary Surgeons (RCVS) in 2006 as a guideline for minimum skills required by a veterinary graduate. However, the RCVS anaesthesia DOS are broad and do not specify differences in skills required for different species. The aims of this study were: (1) to determine which anaesthesia skills were considered essential for day one practice by UK-based veterinary practitioners (GPs) and anaesthetists; and (2) to explore current opinions on veterinary undergraduate anaesthesia training. Questionnaires for veterinary GPs (QGPs) and veterinary anaesthetists (QVAs) were developed which asked general information on expectations of anaesthesia skills as well as specific expectations for the common veterinary species. Fifty-five UK-based members of the Association of Veterinary Anaesthetists responded, with a random sample of veterinary practices stratified by UK county generating 234 responses and a convenience sample targeted at more specialist veterinary specialities in the UK generating 161 responses. There was close overall agreement between the two groups of GPs and anaesthetists on essential anaesthesia DOS. However, expectations varied with species-greatest in cats and dogs, lowest in exotics. Many respondents commented that new veterinary graduates lack practical skills and should not be expected to be omnicompetent across all species. In conclusion, anaesthesia undergraduate training should prioritise essential practical DOS.

**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.

**2015 AAHA/AAFP Pain Management Guidelines for Dogs and Cats.**

RATIONALE: The robust advances in pain management for companion animals underlie the decision of the American Animal Hospital Association (AAHA) and American Association of Feline Practitioners (AAFP) to expand on the information provided in the 2007 AAHA/AAFP Pain Management Guidelines. The 2015 Guidelines summarize and offer a discriminating review of much of this new knowledge. RELEVANCE: Pain management is central to veterinary practice, alleviating pain, improving patient outcomes, and enhancing both quality of life and the veterinarian-client-patient relationship. These Guidelines support veterinarians in incorporating pain management into practice, improving patient care. APPROACHES: The management of pain requires a continuum of care that includes anticipation, early intervention, and evaluation of response on an individual patient basis. A team-oriented approach, including the owner, is essential for maximizing the recognition, prevention and treatment of pain in animals. EVIDENCE BASE: The Guidelines include both pharmacologic and non-pharmacologic modalities to manage pain; they are evidence-based insofar as possible and otherwise represent a consensus of expert opinion. Behavioral changes are currently the principal indicator of pain and its course of improvement or progression, and the basis for recently validated pain scores. Post-surgical pain is eminently predictable but a strong body of evidence exists supporting strategies to mitigate adaptive as well as maladaptive forms. Chronic pain is dominated by degenerative joint disease (DJD), which is one of the most significant and under-diagnosed diseases of cats and dogs. DJD is ubiquitous, found in pets of all ages, and inevitably progresses over time; evidence-based strategies for management are established in dogs, and emerging in cats.

**Evaluation of accelerated collagen cross-linking for the treatment of melting keratitis in ten cats.**


OBJECTIVES: Melting keratitis is a serious condition presenting a high risk of permanent blindness and is caused by infectious or noninfectious factors. In humans, the clinical efficacy of collagen cross-linking (CXL) has been described in the treatment of refractory infectious keratitis by arresting keratomalacia. The aim of this study was to evaluate the efficacy of accelerated CXL for the treatment of melting keratitis in cats. ANIMALS STUDIED: Ten cats were treated for unilateral melting keratitis by accelerated CXL. PROCEDURE: Corneas were irradiated by UVA (370 nm) at 30 mW/cm² irradiance for 3 min after soaking with 0.1% riboflavin in 20% dextran for 30 min (D1). Follow-up was conducted 3, 7, 14, and 30 days after treatment. RESULTS: Pain improvement was noted for all cases at D4 examination. Epithelial healing was observed at D8 for 9 of 10 cases and at D15 for 1 of 10 cases. Resolution of cellular infiltration was observed for all cases at D8 examination. The corneal vascularization was reduced for 9 of 10 cats by D31. At D31, all cases presented a variable degree of corneal fibrosis, but all eyes had visual function. No recurrent infection was observed. CONCLUSION: Accelerated CXL appears to be a valuable option for the treatment of melting keratitis in cats. All the cases have reached a satisfactory outcome despite the individual differences in the conditions prior to the CXL treatment and the variable presence of infectious agents.

**Assessment of a carbon dioxide laser for the measurement of thermal nociceptive thresholds following intramuscular administration of analgesic drugs in pain-free female cats.**

OBJECTIVE: To assess the potential of a thermal carbon dioxide (CO2) laser to explore antinociception in pain-free cats. STUDY DESIGN: Experimental, prospective, blinded, randomized study. ANIMALS: Sixty healthy adult female cats with a (mean ± standard deviation) weight of 3.3 ± 0.6 kg. METHODS: Cats were systematically allocated to one of six treatments: saline 0.2 mL per cat; morphine 0.5 mg kg(-1); buprenorphine 20 µg kg(-1); medetomidine 2 µg kg(-1); tramadol 2 mg kg(-1), and ketoprofen 2 mg kg(-1). Latency to respond to thermal stimulation was assessed at baseline and at intervals of 15-30, 30-45, 45-60, 60-75, 90-105 and 120-135 minutes. Thermal thresholds were assessed using time to respond behaviourally to stimulation with a 500 mW CO2 laser. Within-treatment differences in response latency were assessed using Friedman’s test. Differences amongst treatments were assessed using independent Kruskal-Wallis tests. Where significant effects were identified, pairwise comparisons were conducted to elucidate the direction of the effect. RESULTS: Cats treated with morphine (χ(2) = 12.90, df = 6, p = 0.045) and tramadol (χ(2) = 20.28, df = 6, p = 0.002) showed significant increases in latency to respond. However, subsequent pairwise comparisons indicated that differences in latencies at specific time-points were significant (p < 0.05) only for tramadol at 60-75 and 90-105 minutes after administration (21.9 and 43.6 seconds, respectively) in comparison with baseline (11.0 seconds). No significant pairwise comparisons were found within the morphine treatment. Injections of saline, ketoprofen, medetomidine or buprenorphine showed no significant effect on latency to respond. CONCLUSIONS AND CLINICAL RELEVANCE: The CO2 laser technique may have utility in the assessment of thermal nociceptive thresholds in pain-free cats after analgesic administration and may provide a simpler alternative to existing systems. Further exploration is required to examine its sensitivity and comparative utility.

Acoustic radiation force impulse (ARFI) elastography of the spleen in healthy adult cats - a preliminary study.


OBJECTIVES: To evaluate the splenic stiffness of healthy adult cats using acoustic radiation force impulse elastography to determine the quality (greyscale images and tissue deformity) and quantity (shear velocity) standards. METHODS: Fifteen healthy, adult shorthair cats were selected. The echotexture, echogenicity, size and edges of the spleen were assessed via mode-B ultrasound. Using qualitative elastography, specific portions of the spleen were evaluated according to homogeneity, presence of deformities and white and dark regions. The shear velocities in different portions of the spleen were quantitatively evaluated. RESULTS: The echotexture, echogenicity, size and edges of the spleen were normal on B-mode ultrasound in all cats. On qualitative elastography, the evaluated splenic portions were not deformable, and the images presented as homogeneous dark areas. On quantitative elastography, the mean shear velocity values were 1·98 m/s for the head portion, 1·77 m/s for the body portion and 2·03 m/s for the tail portion. These were not significantly different. CLINICAL SIGNIFICANCE: Quantitative and qualitative acoustic radiation force impulse elastography of the spleen in healthy adult cats was easily implemented and this study may provide baseline data for this organ to allow the future use of this technique in evaluating cats with splenic disease.

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.

**Determination of extracellular fluid volume in healthy and azotemic cats.**


BACKGROUND: Methods for determining extracellular fluid volume (ECFV) are important clinically for cats. Bromide dilution has been studied in cats to estimate ECFV. Markers of GFR also distribute in ECFV and can be used for its measurement. HYPOTHESIS/OBJECTIVES: The primary objective was to develop a method of determining ECFV from iohexol clearance in cats and evaluate agreement with that determined using bromide dilution. Additional objectives were to compare ECFV between azotemic and nonazotemic cats and evaluate appropriate methods of standardizing ECFV. ANIMALS: Client-owned cats with varying renal function. METHODS: Validation of ECFV determined from slope-intercept iohexol clearance was performed in 18 healthy nonazotemic cats. ECFV was then determined using the validated method and bromide dilution and agreement assessed. Appropriateness of standardization to body weight (BW) and body surface area (BSA) was evaluated. RESULTS: Extracellular fluid volume determined from slope-intercept iohexol clearance and bromide dilution was 0.84 ± 0.32 L and 0.85 ± 0.19 L (mean ± SD), respectively. There were wide limits of agreement between the methods (-0.58 to 0.54 L) and therefore, agreement was considered to be poor. ECFV did not differ significantly between azotemic and nonazotemic cats (P = .177). BSA was found to be the best method for standardizing ECFV measurement in cats. CONCLUSIONS AND CLINICAL IMPORTANCE: This study developed a method for determining ECFV from slope-intercept iohexol clearance which provides simultaneous assessment of renal function and an estimate of ECFV. ECFV does not differ between azotemic and nonazotemic cats, which suggests fluid volume loss or overload is not an important clinical feature in cats with mild chronic kidney disease.

**Computed tomography or rhinoscopy as the first-line procedure for suspected nasal tumor: a pilot study.**
Feline Abstracts Jan-Mar 2015


There are no evidence-based guidelines as to whether computed tomography (CT) or endoscopy should be selected as the first-line procedure when a nasal tumor is suspected in a dog or a cat and only one examination can be performed. Computed tomography and rhinoscopic features of 17 dogs and 5 cats with a histopathologically or cytologically confirmed nasal tumor were retrospectively reviewed. The level of suspicion for nasal neoplasia after CT and/or rhinoscopy was compared to the definitive diagnosis. Twelve animals underwent CT, 14 underwent rhinoscopy, and 4 both examinations. Of the 12 CT examinations performed, 11 (92%) resulted in the conclusion that a nasal tumor was the most likely diagnosis compared with 9/14 (64%) for rhinoscopies. Computed tomography appeared to be more reliable than rhinoscopy for detecting nasal tumors and should therefore be considered as the first-line procedure. Abstract available from the publisher.

Relationship of body size to metabolic markers and left ventricular hypertrophy in cats.

BACKGROUND: Cats with hypertrophic cardiomyopathy (HCM) are larger and have higher insulin-like growth factor-1 (IGF-1) concentrations than cats without HCM. HYPOTHESIS/OBJECTIVES: The aim of this study was to assess echocardiographic findings in a colony of adult cats to determine the relationship between early growth and left ventricular hypertrophy (LVH). ANIMALS: Twenty-eight neutered adult cats (20 males, 8 females) from a colony ≥ 3 years of age for which growth curves were available. METHODS: Case-control study. Physical examination and echocardiography were performed, and body weight, body condition score (BCS), and head length and width were measured. Circulating glucose, insulin, N-terminal pro-B-type natriuretic peptide (NT-proBNP), and IGF-1 concentrations were measured and growth data were collected. Stepwise multivariate analyses were performed. RESULTS: Mean age was 5.2 ± 1.1 years. Current BCSs ranged from 4 to 9 (median, 6) and mean body weight was 4.88 ± 1.29 kg. Variation in body weight was apparent by 6 (mean = 3.26 ± 0.80 kg) and 12 months of age (mean = 4.02 ± 1.02 kg). Cardiac abnormalities included a cardiac murmur (n = 7; 24%), gallop (n = 3; 10%), and arrhythmia (n = 1; 4%). Fourteen of 28 cats (50%) had echocardiographic evidence of LVH. Head width (P = .017), body weight (P <.001), NT-proBNP (P = .023), and IGF-1 (P =.013-.022) were significantly associated with selected measures of LVH. CONCLUSIONS AND CLINICAL IMPORTANCE: Potential associations between body size, IGF-1, LVH, and HCM warrant future prospective studies.

Can clinical signs, clinicopathological findings and abdominal ultrasonography predict the site of histopathological abnormalities of the alimentary tract in cats?

OBJECTIVES: Many cats with gastrointestinal signs have coexisting abnormalities in the intestine, liver and pancreas. Investigations typically involve clinicopathological tests, diagnostic imaging and biopsy, either at coeliotomy or by non-invasive means. While exploratory coeliotomy enables all organs to be sampled simultaneously, it is invasive and might not be necessary. The aim of the current study was to assess the performance of preliminary clinical information in predicting the histopathological presence of abnormalities in alimentary tract organs in cats. METHODS: The records of 38 cats with alimentary tract signs, which had ultimately undergone exploratory coeliotomy and
surgical biopsy, were reviewed. The clinical signs, clinicopathological findings, diagnostic imaging findings and histopathology results were reviewed. RESULTS: On histopathological analysis, lesions were detected in 29/37 (78%) liver biopsies, in 29/35 (83%) gastrointestinal biopsies and in 17/37 (46%) pancreatic samples, the majority of which were inflammatory in nature. Clinical signs were generally poor markers of the presence of lesions in the alimentary tract. Further, while liver enzyme activity was relatively specific (88-100%) for detecting histopathological abnormalities in the liver, sensitivity was poor (11-50%). Pancreatic histopathological abnormalities were present in 1/3 of the cats with a positive pancreas-specific lipase result, and in 6/8 cats with a negative result. While relatively specific (57-100%) for both intestinal (57-100%) and hepatic (71-80%) histopathological abnormalities, abdominal ultrasonography lacked sensitivity for both organs (intestine 50-80%; liver 20-25%). In contrast, ultrasonography was relatively sensitive (50-80%), but not specific (17-22%) for detecting pancreatic lesions. CONCLUSIONS AND RELEVANCE: Clinical signs, and clinicopathological and ultrasonographic abnormalities lack precision for hepatic and pancreatic histopathological lesions in cats with alimentary tract signs, and cannot reliably predict from which organs biopsies should be collected. Arguably, therefore, exploratory coeliotomy is necessary to determine the site of histopathological abnormalities in feline alimentary tract disorders.

Local pulmonary immune responses in domestic cats naturally infected with Cytauxzoon felis.
Cytauxzoonosis is a hemoprotozoal disease of cats and wild felids in the South and Southeastern United States caused by Cytauxzoon felis. Although the causative agent has been recognized since the seventies, no study has examined the local immune response in affected organs, such as the lung, and compared them to the lungs of uninfected domestic cats. Previous studies have suggested that the histopathologic findings in the lungs of C. felis-infected cats are caused by the release of pro-inflammatory mediators, such as cytokines and increased production of inducible nitric oxide synthase (iNOS), by the infected macrophages. Our laboratory had previously found an upregulation of the adhesion molecule CD18, which can stimulate the release of these pro-inflammatory mediators. The objective of this study was to characterize local pulmonary immune responses in cats naturally infected with C. felis. Immunohistochemistry was performed to detect tumor necrosis factor-α (TNF-α), interleukin (IL)-1β, IL-6, iNOS, and major histocompatibility complex (MHC) II in 19 lungs from affected cats that died between 2005 and 2013. Results showed increased expression of all of these molecules when compared to lungs from uninfected, healthy cats. Furthermore, MHC II is expressed in the endothelium of C. felis naturally infected cats. These results support that there is a marked, local, pro-inflammatory immune response that can contribute to the pathogenesis of cytauxzoonosis in the lungs.

A pilot study comparing a protocol using intermittent administration of glargine and regular insulin to a continuous rate infusion of regular insulin in cats with naturally occurring diabetic ketoacidosis.
OBJECTIVE: The goal of this pilot study was to compare regular insulin administered by continuous rate infusion (CRI) to an approach using insulin glargine and regular insulin administered
intermittently. DESIGN: Prospective randomized clinical trial. SETTING: University teaching hospital. ANIMALS: Sixteen cats with diabetic ketoacidosis (DKA). INTERVENTIONS: Cats with DKA were randomized to either low-dose regular insulin CRI (CRI group; n = 8) or intermittent short- and long-acting insulin injections (subcutaneous [SC] glargine plus intramuscular [IM] regular insulin; SC/IM group; n = 8). MEASUREMENTS AND MAIN RESULTS: Time of normalization of pH, bicarbonate, hyperglycemia, ketonemia, and appetite, as well as duration of hospitalization were recorded. Eleven of 16 cats (59%) survived to discharge, with no difference in survival between groups (P = 0.99). Times of resolution of hyperglycemia (P = 0.02) and ketonemia (P = 0.04), and normalization of pH (P = 0.04), and bicarbonate (P = 0.03) were significantly shorter in the SC/IM group. Cats in the SC/IM group also had a significantly shorter duration of hospitalization (SC/IM: median = 54 hr [range, 19-118 hr]; CRI: median = 111 hr [range, 58-271 hr]; P = 0.04). Time of first meal was not significantly different between groups. CONCLUSIONS: Although further research is required, an approach using intermittent short- and long-acting insulin injections appeared to be an effective option for treatment of DKA in cats.

Retrospective study of the perioperative management and complications of ureteral obstruction in 37 cats.
OBJECTIVES: To describe perioperative management and complications, risk factors and mortality rates in cats anaesthetized for treatment of ureteral obstruction. STUDY DESIGN: Retrospective, clinical, cohort study. ANIMALS: Thirty-seven client-owned cats anaesthetized for ureteral surgery. METHODS: Records with sufficient data for cats treated between March 2010 and March 2013 were examined for breed, age, gender, history, concurrent diseases, pre- and post-anaesthetic biochemical and haematological parameters, American Society of Anesthesiologists classification, anaesthetic protocol, surgical technique, surgeon, perioperative complications and mortality within 48 hours after extubation. Associations between risk factors and outcome variables were evaluated using univariable analysis. Sensitivity and specificity using receiving operator characteristic curve analysis were calculated for creatinine, potassium level and standard base excess (SBE) to denote survival or non-survival. RESULTS: Preoperatively, all cats were azotaemic: mean ± SD urea was 31.6 ± 26.9 mmol L(-1) and median (range) creatinine was 562 µmol L(-1) (95 µmol L(-1) to off scale). Thirteen cats were hyperkalaemic (K(+) > 6.5 mmol L(-1)). Anaesthesia-related complications included bradycardia (n = 8, 21.6%), hypotension (n = 15, 40.5%) and hypothermia (n = 32, 86.5%). Seven cats (18.9%) died postoperatively. Non-survivors were significantly (p = 0.011) older (9.8 ± 1.9 years) than survivors (6.4 ± 3.1 years) and had higher potassium concentrations (p = 0.040). Risk factors associated with mortality were ASA classes IV and V (p = 0.022), emergency procedures (p = 0.045) and bicarbonate administration (p = 0.002). Non-survivors had higher creatinine concentrations (p = 0.021) and lower SBE (p = 0.030). CONCLUSION AND CLINICAL RELEVANCE: Intraoperative anaesthetic complications were common; increased age, poor health status, preoperative bicarbonate administration, hyperkalaemia and increased creatinine were associated with increased risk for death and can be used to predict risk for complications.

Whole genotype constellation of prototype feline rotavirus strains FRV-1 and FRV64 and their phylogenetic relationships with feline-like human rotavirus strains.

Feline rotaviruses, members of the species Rotavirus A, are an infrequent source of zoonotic infections, and were previously shown by RNA-RNA hybridization assays to possess two distinct genomic RNA constellations, represented by strains FRV-1 and FRV64. Due to the lack of whole genome sequence information for FRV-1, human rotavirus strain AU-1 has been used as a surrogate for the genotype constellation of feline rotaviruses. The aim of this study was to determine the whole genome sequence of FRV-1 and FRV64 to help understand the genetic relationships among existing feline rotaviruses from the evolutionary perspective. The genotype constellations of FRV-1 and FRV64 were G3-P[9]-I3-R3-C3-M3-A3-N3-T3-E3-H3 and G3-P[3]-I3-R3-C2-M3-A9-N2-T3-E3-H6, respectively. FRV-1 has a genotype constellation identical to that of the AU-1 strain. Although for individual genes they shared lineages, with the exception of genes encoding VP2, VP6 and VP7, the sequence identity between FRV-1 and AU-1 was considered to be sufficiently high for the AU-1 to be regarded as an example of the direct transmission of a feline rotavirus to a child. On the other hand, the FRV64 strain was not only similar in all the 11 genome segments to another feline rotavirus strain, Cat97, but also to canine rotavirus strains (K9 and CU-1) and feline/canine-like human rotavirus strains (Ro1845 and HCR3A).

In conclusion, this study revealed intermingled sharing of genotypes and lineages among feline rotaviruses, suggesting the occurrence of frequent reassortment events over the course of evolution to emerge in four genotype constellations represented by FRV-1, FRV64/Cat97, Cat2 and BA222 strains.

Molecular epidemiology of rotavirus in cats in the United Kingdom.


Rotaviruses are leading causes of gastroenteritis in the young of many species. Molecular epidemiological studies in children suggest that interspecies transmission contributes to rotavirus strain diversity in people. However, population-based studies of rotaviruses in animals are few. We investigated the prevalence, risk factors for infection, and genetic diversity of rotavirus A in a cross-sectional survey of cats housed within 25 rescue catteries across the United Kingdom. Morning litter tray fecal samples were collected during the winter and summer in 2012 from all pens containing kittens and a random sample of those housing adult cats. Group A rotavirus RNA was detected by real-time reverse transcription-PCR, and positive samples were G and P genotyped using nested VP4 and VP7 PCR assays. A total of 1,727 fecal samples were collected from 1,105 pens. Overall, the prevalence of rotavirus was 3.0% (95% confidence interval [CI], 1.2 to 4.9%). Thirteen out of 25 (52%; 95% CI, 31.3 to 72.2%) centers housed at least one rotavirus-positive cat. The prevalence of rotavirus was associated with season (odds ratio, 14.8 [95% CI, 1.1 to 200.4]; P = 0.04) but not age or diarrhea. It was higher during the summer (4.7%; 95% CI, 1.2 to 8.3%) than in winter (0.8%; 95% CI, 0.2 to 1.5%). Asymptomatic epidemics of infection were detected in two centers. G genotypes were characterized for 19 (33.3%) of the 57 rotavirus-positive samples and P genotypes for 36 (59.7%). Two rotavirus genotypes were identified, G3P[9] and G6P[9]. This is the first population-based study of rotavirus in cats and the first report of feline G6P[9], which questions the previous belief that G6P[9] in people is of bovine origin.

Biological validation of feline serum cystatin C: The effect of breed, age and sex and establishment of a reference interval.
Ghys L.F., Paepe D., Duchateau L., Taffin E.R., Marynissen S., Delanghe J. & Daminet S. (2015) *Vet J* 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.

**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 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.
Corneal anesthesia following application of 0.4% oxybuprocaine hydrochloride ophthalmic solution to normal feline eyes.


OBJECTIVE: To evaluate the loss and recovery of corneal sensitivity after instillation of 0.4% oxybuprocaine hydrochloride solution in the normal feline eye. ANIMAL STUDIED: Eighteen European shorthair cats free of ocular disease PROCEDURES: Baseline corneal touch threshold (CTT) readings were obtained bilaterally with a Cochet-Bonnet aesthesiometer prior to treatment. Subsequently, each cat received a single drop of 0.4% oxybuprocaine ophthalmic solution in the right eye and one drop of sterile 0.9% NaCl in the left eye to serve as control. The corneal touch threshold (CTT) of both eyes was then measured 1 min after drug administration and every 5 min for 60 min. The potential for ocular irritation following oxybuprocaine application was also evaluated. RESULTS: Baseline CTT readings were not significantly different (P > 0.05) between the control and oxybuprocaine-treated eyes with values of 1.75 ± 0.31 cm and 1.75 ± 0.30 cm, respectively. In control eyes, mean CTT did not significantly change (P > 0.05) during the study period. By contrast, after oxybuprocaine application mean CTT was significantly reduced from baseline (P < 0.05) for 45 min. Maximal corneal anesthesia, with a CTT value of 0, was achieved at 1 and 5 min in all treated eyes. A markedly reduced mean CTT of 0.14 ± 0.23 cm was still present at 20 min. Age and gender did not significantly affect corneal anesthesia. No clinically relevant ocular side effects occurred during the observation period. CONCLUSION: This is the first study that provides objective information on the depth and duration of corneal anesthesia following instillation of oxybuprocaine in healthy feline eyes.

Tooth resorption in cats: Pathophysiology and treatment options.


PRACTICAL RELEVANCE: Tooth resorption is common in the domestic cat and the incidence has been reported to increase with increasing age. Cats with clinically missing teeth have also been found to be more likely to have tooth resorption. All types of teeth in the feline dentition may be affected, but lesions seem to be more common in certain teeth. CLINICAL CHALLENGES: Tooth resorption can be difficult to detect, with cats often masking signs of oral discomfort or pain. Routine radiography is required for timely diagnosis, as clinical (visual and tactile) methods only detect late-stage lesions - that is, when they become evident in the crown. The aetiology of many tooth resorptions is not clear. A large number of lesions appear to be idiopathic and, to date, there is no known treatment that prevents the development and/or progression of this category of tooth resorption. Tooth extraction is the gold standard treatment but teeth with resorptive lesions are notoriously difficult to extract and coronal amputation is often indicated. Determining the best treatment option in an individual case again relies on radiography. AUDIENCE: This review is aimed at feline and general practitioners, as well as veterinarians with expertise in dentistry. EVIDENCE BASE: The author draws on the published literature and her clinical experience and own research to review current thinking about the epidemiology, aetiology and pathogenesis of tooth resorptions, and to offer advice on diagnosis and treatment options.

Glycemic status and predictors of relapse for diabetic cats in remission.

BACKGROUND: It is unknown if diabetic cats in remission have persistent abnormalities of glucose metabolism and should be considered prediabetic, or have normal glucose tolerance. OBJECTIVE: To characterize glycemic status of diabetic cats in remission and to determine predictors of relapse. ANIMALS: A total of 21 cats in diabetic remission and 28 healthy control cats. METHODS: At a median of 107 days after remission, screening blood glucose concentration was measured on entry to the clinic. After a 24-hour fast in hospital, fasting blood glucose, fructosamine and feline pancreatic lipase concentrations were measured, and 3 hours later, a simplified IV glucose tolerance test (1 g glucose/kg) performed. Twenty cats were monitored for relapse for at least 9 months. RESULTS: Of the 21 cats in remission, 19% (4/21) had impaired fasting glucose concentration and 76% (16/21) had impaired glucose tolerance. Of cats followed up for 9 months after testing, 30% (6/20) had relapsed and required insulin treatment. Fasting blood glucose concentration ≥ 7.5 mmol/L (≥ 135 mg/dL) (odds ratio [OR] = 12.8) and severely impaired glucose tolerance (≥ 5 hours to return to <6.5 mmol/L or <117 mg/dL; OR = 15.2) were significantly associated with relapse. Blood glucose concentration >14 mmol/L; 252 mg/dL at 3 hours was significantly associated with relapse (OR = 10.1). CONCLUSION AND CLINICAL IMPORTANCE: Most cats in diabetic remission have impaired glucose tolerance and a minority have impaired fasting glucose concentration and should be considered prediabetic. More severe glucose intolerance and impaired fasting glucose concentration are predictors of relapse. Ongoing glucose monitoring of diabetic cats in remission is recommended.

Influence of the observer’s level of experience on systolic and diastolic arterial blood pressure measurements using Doppler ultrasonography in healthy conscious cats.


The objective of this study was to determine the influence of the observer’s level of experience on within- and between-day variability, and the percentage of successful systolic (SAP) and diastolic arterial blood pressure (DAP) measurements obtained by Doppler ultrasonography (DU) in awake cats. For this purpose, six healthy conscious cats were used and four observers with different levels of training performed 144 SAP and DAP measurements on 4 days using DU. Measurements were recorded five consecutive times, and mean values were used for statistical analysis. Only the two most skilled observers - a PhD student in cardiology and a Dipl ECVIM-CA (cardiology) - had within- and between-day coefficients of variation (CVs) for SAP ≤16% (13-16%). Conversely, the two less experienced observers - a fifth-year student and an assistant - had high between-day CVs (61% and 73%). For DAP, only the most experienced observer (Dipl ECVIM-CA) succeeded in 100% of the attempts, with within- and between-day CVs of 11% and 4%, respectively. Conversely, DAP could not be measured by the other three observers in 8%, 19% and 56% of attempts (from the highest to the lowest level of experience); therefore, the corresponding CV values could not be calculated. In conclusion, SAP may be assessed using DU in healthy awake cats with good repeatability and reproducibility by a well-trained observer. Measurement of DAP is more difficult than of SAP, and needs a longer training period, which represents one of the limitations of DU in cats.

Feline sporotrichosis: epidemiological and clinical aspects.

Feline sporotrichosis, which is caused by species of the Sporothrix schenckii complex, is endemic to Rio de Janeiro, Brazil. More than 4000 cases of the disease were diagnosed at Fundação Oswaldo Cruz, Brazil, between 1998 and 2012. Sporotrichosis in cats has been reported in several countries, but nowhere has an outbreak of animal sporotrichosis been as large as that seen in Brazil. The clinical manifestations of the disease range from an isolated skin lesion that can progress to multiple skin lesions and even fatal systemic involvement. Nodules and ulcers are the most common types of lesions, and respiratory signs and mucosa involvement are frequent. The definitive diagnosis depends on isolation of the etiologic agent in culture. Cytology, histopathology, and serology are useful tools for preliminary diagnosis. Severe pyogranulomatous inflammatory infiltrate, high fungal load, and extension of lesions to mucosa, cartilage, and bone in the nose of cats are indicative of an agent of high virulence in this endemic region. Itraconazole is the drug of choice, while, in refractory cases, amphotericin B or potassium iodide might be alternative treatments; however, recurrence after discharge may occur. Sporotrichosis persists as a neglected disease in Rio de Janeiro, and the treatment of cats remains a challenging and long-term endeavor.

Antimicrobial stewardship in small animal veterinary practice: from theory to practice.

Despite the increasing recognition of the critical role for antimicrobial stewardship in preventing the spread of multidrug-resistant bacteria, examples of effective antimicrobial stewardship programs are rare in small animal veterinary practice. This article highlights the basic requirements for establishing stewardship programs at the clinic level. The authors provide suggestions and approaches to overcome constraints and to move from theoretic concepts toward implementation of effective antimicrobial stewardship programs in small animal clinics.

Coxofemoral joint kinematics using video fluoroscopic images of treadmill-walking cats: development of a technique to assess osteoarthritis-associated disability.

The objectives of this pilot study were to develop a video fluoroscopy kinematics method for the assessment of the coxofemoral joint in cats with and without osteoarthritis (OA)-associated disability. Two non-OA cats and four cats affected by coxofemoral OA were evaluated by video fluoroscopy. Video fluoroscopic images of the coxofemoral joints were captured at 120 frames/s using a customized C-arm X-ray system while cats walked freely on a treadmill at 0.4 m/s. The angle patterns over time of the coxofemoral joints were extracted using a graphic user interface following four steps: (i) correction for image distortion; (ii) image denoising and contrast enhancement; (iii) frame-to-frame anatomical marker identification; and (iv) statistical gait analysis. Reliability analysis was performed. The cats with OA presented greater intra-subject stride and gait cycle variability. Three cats with OA presented a left-right asymmetry in the range of movement of the coxofemoral joint angle in the sagittal plane (two with no overlap of the 95% confidence interval, and one with only a slight overlap) consistent with their painful OA joint, and a longer gait cycle duration. Reliability analysis revealed an absolute variation in the coxofemoral joint angle of 2°-6°, indicating that the two-dimensional video fluoroscopy technique provided reliable data. Improvement of this method is recommended: variability would likely be reduced if a larger field of view could be recorded, allowing the identification and tracking of each
femoral axis, rather than the trochanter landmarks. The range of movement of the coxofemoral joint has the potential to be an objective marker of OA-associated disability.

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.

Acute motor and sensory polyganglioradiculoneuritis in a cat: clinical and histopathological findings.
Polyneuropathies can have a variety of clinical presentations and tend to be rare in cats. In this report we describe a 6-year-old domestic shorthair cat with an acute and rapidly progressive onset of lower motor neuron and sensory signs affecting the spinal and cranial nerves. Histopathological examination revealed moderate-to-severe multifocal inflammatory infiltrates at the ventral and dorsal nerve roots, and dorsal spinal ganglia at the level of the L4 and cauda equina. The type and severity of inflammation varied between nerve roots, being composed of mainly neutrophils in some and mainly lymphocytes and macrophages in others. Immunohistochemistry showed a combination of neutrophils, macrophages and lymphocytes infiltrating the nerve roots and ganglia. The majority of the lymphocytes were T lymphocytes; only a few B lymphocytes were seen. Neurons within the affected ganglia showed
Feline Abstracts Jan-Mar 2015

Central chromatolysis and necrosis. Wallerian-like degeneration and demyelination were observed in the nerve roots. A sensory and motor polyganglioradiculoneuritis was diagnosed. An autoimmune process similar to the acute motor and sensory neuropathy subtype of Guillain-Barré syndrome in humans or an infection by an unidentified agent were considered most likely.

High-field fMRI reveals tonotopically-organized and core auditory cortex in the cat.

As frequency is one of the most basic elements of sound, it is not surprising that the earliest stages of auditory cortical processing are tonotopically organized. In cats, there are four known tonotopically organized cortical areas: the anterior (AAF), posterior (PAF), and ventral posterior (VPAF) auditory fields and primary auditory cortex (A1). Electrophysiological and anatomical evidence have suggested that AAF and A1 form core auditory cortex. The purpose of this investigation was to determine if high-field functional magnetic resonance imaging (fMRI) could be used to define the borders of all four tonotopically organized areas, identify core auditory cortex, and demonstrate tonotopy similar to that found using more invasive techniques. Five adult cats were examined. Eight different pure tones or one broad-band noise (BBN) stimuli were presented in a block paradigm during continuous fMRI scanning. Analysis was performed on each animal individually using conservative familywise error thresholds. Group analysis was performed by extracting data from fMRI analysis software and performing a battery of statistical tests. In auditory cortex, a reversal of the tonotopic gradient is known to occur at the borders between tonotopically organized areas. Therefore, high and low tones were used to delineate these borders. Activations in response to BBN as opposed to tonal stimulation demonstrated that core auditory cortex consists of both A1 and AAF. Finally, tonotopy was identified in each of the four known tonotopically organized areas. Therefore, we conclude that fMRI is effective at defining all four tonotopically organized cortical areas and delineating core auditory cortex.

Outcome of male cats managed for urethral obstruction with decompressive cystocentesis and urinary catheterization: 47 cats (2009-2012).

OBJECTIVE: To characterize the duration of urinary catheterization, length of hospitalization, complications and clinical outcome in cats with urethral obstruction managed with decompressive cystocentesis and subsequent urinary catheterization. DESIGN: Retrospective, observational, descriptive study. SETTING: University teaching hospital. ANIMALS: Forty-seven client-owned male cats diagnosed with urethral obstruction. MEASUREMENTS AND MAIN RESULTS: The medical records of 47 cats diagnosed with urethral obstruction were reviewed. Treatment of all cats included decompressive cystocentesis, placement of an indwelling urinary catheter and hospitalization for a minimum of 6 hours. Collected data included signalment, body weight, body condition score, owner-reported clinical signs, duration of clinical signs, vital signs, and venous blood gas or chemistry values. Mean duration of urinary catheterization was 27.9 hours, median length of hospitalization was 40 hours, and survival to discharge was 91%. Of 34 cats that had survey abdominal radiographs, 56% (19/34) had loss of peritoneal detail consistent with abdominal effusion. No cat was diagnosed with a ruptured bladder during hospitalization. CONCLUSIONS: Decompressive cystocentesis, in cats with urethral obstruction, followed by placement of an indwelling urinary catheter, did not result in a diagnosis of bladder rupture in any cat. The source of and clinical significance of the reported
abdominal effusion is not known. Survival to discharge, duration of catheterization, and length of hospitalization were similar to previously reported populations.

**Treatment of ionized hypercalcemia in 12 cats (2006-2008) using PO-administered alendronate.**

**BACKGROUND:** Long-term treatment of cats with ionized hypercalcemia using alendronate has not been evaluated. **HYPOTHESIS/OBJECTIVES:** Alendronate is well tolerated in treatment of ionized hypercalcemia in cats. **ANIMALS:** A total of 12 cats with ionized hypercalcemia. **METHODS:** Prospective study of 12 cats with ionized hypercalcemia of idiopathic origin was identified by telephone and email communication with a convenience sample of consulting veterinarians. Cats were treated with alendronate at a dose of 5-20 mg per feline PO q7d. Serum ionized calcium concentration (iCa) was measured before beginning treatment with alendronate, and after 1, 3, and 6 months of treatment. Alendronate dosage was adjusted according to iCa. Evaluation included physical examination, CBC, biochemistry profile, and diagnostic imaging. The owners and referring veterinarians were questioned about any observed adverse effects. The Wilcoxon matched-pairs signed rank test was used to compare baseline iCa to iCa at different time periods. **RESULTS:** Alendronate treatment resulted in a decrease in iCa in all 12 cats. The median percentage change in iCa was -13.2%, -15.9%, and -18.1% (range, -29.6 to +7.6; -30.5 to -1.9; -45.8 to +1.5%) at the 1, 3, and 6 month time points, respectively. Baseline iCa was significantly different from 1 month (P =.0042), 3 months (P =.0005), and 6 months (P =.0015). No adverse effects were reported for any of the cats. **CONCLUSIONS AND CLINICAL IMPORTANCE:** Alendronate was well tolerated and decreased iCa in most cats for the 6-month period of observation.

**Application of fast-track surgery principles to evaluate effects of atipamezole on recovery and analgesia following ovariohysterectomy in cats anesthetized with dexmedetomidine-ketamine-hydromorphone.**

**Objective**-To evaluate the effects of atipamezole hydrochloride on recovery and analgesia following ovariohysterectomy in cats anesthetized with a dexmedetomidine hydrochloride, ketamine hydrochloride, and hydromorphone hydrochloride combination, in accordance with fast-track surgery principles. **Design**-Prospective, randomized, clinical trial. **Animals**-44 cats. **Procedures**-Cats were anesthetized with a combination of dexmedetomidine (15 µg/kg [6.8 µg/lb]), ketamine (5 mg/kg [2.3 mg/lb]), and hydromorphone (0.05 mg/kg [0.023 mg/lb]), IM, supplemented with isoflurane in oxygen. Immediately after ovariohysterectomy, cats received meloxicam (0.2 mg/kg [0.09 mg/lb]) SC and either atipamezole (75 µg/kg [34.1 µg/lb]) or an equivalent volume of saline (0.9% NaCl) solution IM. Pain and sedation were scored at baseline (prior to surgery) and at predetermined intervals after surgery. Time to sternal recumbency was recorded. **Results**-The atipamezole group recovered to sternal recumbency faster (median, 15 minutes; range, 5 to 60 minutes) than the saline solution group (median, 60 minutes; range, 15 to 90 minutes). Pain scores did not differ between groups or at any time, compared with baseline, and were below the intervention threshold for most cats. Sedation scores were significantly greater in the saline solution group (median, 0; range, 0 to 2) at 2 hours after surgery, compared with the atipamezole group (median, 0; range, 0 to 0). **Conclusions and Clinical Relevance**-
Results indicated that administration of atipamezole, compared with saline solution, allowed for a faster recovery from anesthesia with dexmedetomidine-ketamine-hydromorphone in cats following ovariohysterectomy without compromising analgesia. These findings have implications for the provision of appropriate postoperative analgesia following ovariohysterectomy in cats. (J Am Vet Med Assoc 2015;246:645-653).

Abnormalities in Expression of Structural, Barrier, and Differentiation Related Proteins and Chondroitin Sulfate in the Urothelium of Cats with Feline Interstitial Cystitis Mimic Those Seen in Human Interstitial Cystitis.


PURPOSE: The urothelium of cats diagnosed with feline interstitial cystitis (FIC) was analyzed to determine if abnormalities in protein expression patterns could be detected, and whether the pattern of expression was similar to that observed in human Interstitial Cystitis/Bladder Pain Syndrome (IC) patients. The proteins that were analyzed are involved in cell adhesion, barrier function, comprise the glycosaminoglycan (GAG) layer, or are markers of differentiation. METHODS: Formalin-fixed biopsies from 8 cats with FIC and 7 healthy controls were labeled using immunohistochemistry and scored using a modified version of a system previously used for human samples. Cluster analysis was performed to investigate relationships between the markers and samples. RESULTS: The results showed that 89% of the FIC bladders displayed abnormal protein expression and chondroitin sulfate (CS) patterns, whereas only 27% of the normal tissues exhibited slight abnormalities. Abnormalities were found in most of the FIC samples, biglycan (87.5%), CS (100%), decorin (100%), E-cadherin (100%), keratin-20 (K20, 100%), uroplakin (50%), ZO-1 (87.5%). In the FIC bladders, about 75% of the CS, biglycan, and decorin samples displayed absence of luminal staining or no staining. Results from the cluster analysis revealed that the FIC and normal samples fell into two clearly separate groups, demonstrating that the urothelium of cats with FIC is altered from normal. CONCLUSIONS: FIC produces similar changes in luminal GAG and several proteins as is seen in human patients, suggesting some commonality in mechanism and supporting the use of FIC as a model for human IC.

Long-term follow up of feline leukemia virus infection and characterization of viral RNA loads using molecular methods in tissues of cats with different infection outcomes.


It is a remarkable feature for a retrovirus that an infection with feline leukemia virus (FeLV) can result in various outcomes. Whereas some cats contain the infection and show a regressive course, others stay viremic and succumb to the infection within a few years. We hypothesized, that differences in the infection outcome might be causally linked to the viral RNA and provirus loads within the host and these loads therefore may give additional insight into the pathogenesis of the virus. Thus, the goals of the present study were to follow-up on experimentally infected cats and investigate tissues from cats with different infection outcomes using sensitive, specific TaqMan real-time PCR and reverse transcriptase (RT)-PCR. Nineteen experimentally FeLV-A/Glasgow-1-infected cats were categorized into having regressive, progressive or reactivated FeLV infection according to follow-up of FeLV p27 antigen detection in the blood. Remarkably, regressively infected cats showed detectable provirus and
viral RNA loads in almost all of the 27 tested tissues, even many years after virus exposure. Moreover, some regressively infected cats reactivated the infection, and these cats had intermediate to high viral RNA and provirus tissue loads. The highest loads were found in viremic cats, independent of their health status. Tissues that represented sites of virus replication and shedding revealed the highest viral RNA and provirus loads, while the lowest loads were present in muscle and nerve tissues. A supplementary analysis of 20 experimentally infected cats with progressive infection revealed a median survival time of 3.1 years (range from 0.6 to 6.5 years); ∼70% (n=14) of these cats developed lymphoma, while leukemia and non-regenerative anemia were observed less frequently. Our results demonstrate that the different infection outcomes are associated with differences in viral RNA and provirus tissue loads. Remarkably, no complete clearance of FeLV viral RNA or provirus was detected in cats with regressive infection, even up to 12 years after exposure. In several cases FeLV reactivation could be observed. Thus, retroviruses integrated as provirus into the host’s genome, could not be eliminated completely by the host and maintained their full potential for replication and reactivation.

**No benefit of therapeutic vaccination in clinically healthy cats persistently infected with feline leukemia virus.**


Therapeutic vaccinations have a potential application in infections where no curative treatment is available. In contrast to HIV, efficacious vaccines for a cat retrovirus, feline leukemia virus (FeLV), are commercially available. However, the infection is still prevalent, and no effective treatment of the infection is known. By vaccinating persistently FeLV-infected cats and presenting FeLV antigens to the immune system of the host, e.g., in the form of recombinant and/or adjuvanted antigens, we intended to shift the balance toward an advantage of the host so that persistent infection could be overcome by the infected cat. Two commercially available FeLV vaccines efficacious in protecting naïve cats from FeLV infection were tested in six experimentally and persistently FeLV-infected cats: first, a canarypox-vectored vaccine, and second, an adjuvanted, recombinant envelope vaccine was repeatedly administered with the aim to stimulate the immune system. No beneficial effects on p27 antigen and plasma viral RNA loads, anti-FeLV antibodies, or life expectancy of the cats were detected. The cats were unable to overcome or decrease viremia. Some cats developed antibodies to FeLV antigens although not protective. Thus, we cannot recommend vaccinating persistently FeLV-infected cats as a means of improving their FeLV status, quality of life or life expectancy. We suggest testing of all cats for FeLV infection prior to FeLV vaccination.

**Rehabilitation and physical therapy for selected orthopedic conditions in veterinary patients.**


A specific diagnosis is needed to perform optimal rehabilitation of orthopedic problems. A well-planned rehabilitation program is important for orthopedic patients when surgical repairs are mechanically weak (eg, when repairing fractures in skeletally immature patients or when repairing tendons or ligaments). Joint immobilization is sometimes used to protect weak surgical repairs. The duration of immobilization should be minimized, particularly in situations with potential loss of joint motion. Evidence-based information regarding specific modalities and techniques for rehabilitation of
injured dogs and cats is generally lacking. The choice of modalities and techniques must be based on common sense, knowledge of rehabilitation techniques, and clinical experience.

**Protective immunity against infection with Mycoplasma haemofelis.**


Hemoplasmas are potentially zoonotic mycoplasmal pathogens, which are not consistently cleared by antibiotic therapy. Mycoplasma haemofelis is the most pathogenic feline hemoplasma species. The aim of this study was to determine how cats previously infected with M. haemofelis that had recovered reacted when rechallenged with M. haemofelis and to characterize the immune response following de novo M. haemofelis infection and rechallenge. Five specific-pathogen-free (SPF)-derived naive cats (group A) and five cats that had recovered from M. haemofelis infection (group B) were inoculated subcutaneously with M. haemofelis. Blood M. haemofelis loads were measured by quantitative PCR (qPCR), antibody response to heat shock protein 70 (DnaK) by enzyme-linked immunosorbent assay (ELISA), blood lymphocyte cell subtypes by flow cytometry, and cytokine mRNA levels by quantitative reverse transcriptase PCR. Group A cats all became infected with high bacterial loads and seroconverted, while group B cats were protected from reinfection, thus providing the unique opportunity to study the immunological parameters associated with this protective immune response against M. haemofelis. First, a strong humoral response to DnaK was only observed in group A, demonstrating that an antibody response to DnaK is not important for protective immunity. Second, proinflammatory cytokine interleukin-6 (IL-6) mRNA levels appeared to increase rapidly postinoculation in group B, indicating a possible role in protective immunity. Third, an increase in IL-12p35 and -p40 mRNA and decrease in the Th2/Th1 ratio observed in group A suggest that a Th1-type response is important in primary infection. This is the first study to demonstrate protective immunity against M. haemofelis reinfection, and it provides important information for potential future hemoplasma vaccine design.

**Percutaneous absorption of methimazole: an in vitro study of the absorption pharmacokinetics for two different vehicles.**


The use of transdermal medications in cats has become popular in veterinary medicine due to the ease of administration compared to oral medication. However, the research to support systemic absorption of drugs applied to the pinna after transdermal administration in cats is limited. The aim of this study was to characterize the percutaneous absorption pharmacokinetics of methimazole in a lipophilic vehicle compared to methimazole in Pluronic® lecithin organogel (PLO) using a finite dose applied to feline ear skin in an in vitro Franz cell model. The two formulations of methimazole (10 mg) were applied to the inner stratum corneum of six pairs of feline ears. The receptor medium was sampled up to 30 h post-administration, and methimazole concentrations were measured using high-performance liquid chromatography (HPLC). Histological examination of all ears was undertaken as small differences in the thickness of ear skin may have contributed to inter-individual differences in methimazole absorption between six cats. Methimazole was absorbed more completely across the
Regional variations in percutaneous absorption of methimazole: an in vitro study on cat skin.

The use of transdermal gel medications in cats has become popular in veterinary medicine due to the ease of administration compared to oral medication. The research to support systemic absorption of drugs after transdermal gel administration and the preferred skin region to apply these drugs in cats is limited. The aim of this study was to characterize the effect of different skin regions on the percutaneous absorption pharmacokinetics of a commercially available transdermal methimazole after a finite dose was applied to feline skin in vitro. A commercial formulation of methimazole (10 mg) was applied to four skin regions (the inner stratum corneum of the ear, groin, neck, and thorax regions) from six cats. The receptor medium was sampled up to 36 h postapplication, and methimazole concentrations were measured using high-performance liquid chromatography. Methimazole was absorbed more completely across the pinnal skin, compared to the groin, neck, and thorax (P < 0.001), which justifies application to the pinna to maximize efficacy and also to minimize the effects of grooming.

Trans-pinnal movement of methimazole: an in vitro study showing that methimazole can cross from the inner to outer pinna of cats.

OBJECTIVES: To determine if methimazole applied in a transdermal formulation to the internal pinna will cross to the external pinna in an in vitro Franz cell model. METHODS: The ears from six cats were harvested soon after death. Whole ears were mounted onto Franz-type diffusion cells with the stratum corneum of the inner pinnae uppermost. A commercial transdermal preparation containing methimazole (0.1 ml/10 mg) was applied to the inner pinnae. At 1, 2, 4, 6, 8, 12, 18, 24 and 30 h, a 200 µl sample of reservoir solution was removed to determine the methimazole concentration by high-performance liquid chromatography. The ears were then dissected, separating the internal pinna from the cartilage and the external pinna, before the methimazole concentration was measured at each site. The thickness of the different regions of the ear was measured on paraffin histology sections. RESULTS: Mean ± SD methimazole concentrations at 30 h for the right and left ear, respectively, were: inner ear, 1.25 ± 0.53 mg/g, 0.39 ± 0.26 mg/g; cartilage, 1.36 ± 0.47 mg/g, 0.33 ± 0.20 mg/g; and outer ear, 1.0 ± 0.32 mg/g, 0.33 ± 0.14 mg/g. There was a difference between the left and right ears (P <0.001). Minimal methimazole concentrations were detected in the receptor fluid. The mean methimazole concentration absorbed by the skin after application of 10 mg was, for the right ear, 3.65 ± 1.27 mg/g and, for the left, 1.08 ± 0.27 mg/g. There was no correlation between methimazole concentrations and thickness of each region of the ear. CONCLUSIONS AND RELEVANCE: Methimazole in a lipophilic vehicle applied to the internal pinna will penetrate to the outer pinna of cats in an in vitro model, which may have safety implications for humans associated with cats treated with transdermal methimazole. Substantial inter-individual variation was found. Further research is required in the area of transdermal penetration of drugs in cats.
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.

Insulin detemir treatment in diabetic cats in a practice setting.


Insulin detemir is a long-acting insulin analogue and may represent a valuable treatment option for diabetic cats. So far, only one study addressing detemir treatment of diabetic cats has been published, and this was based on an intensive blood glucose monitoring protocol. The aim of the current, retrospective study was to evaluate the effect of detemir therapy in diabetic cats in a general clinical setting. Fourteen diabetic cats with a follow-up period of at least 3 months were included. Data were collected from medical records at the University Hospital for Companion Animals, University of Copenhagen, Denmark. Thirteen of 14 cats achieved moderate or excellent control of clinical symptoms within the initial 3 months of detemir therapy, including five cats previously treated unsuccessfully with other types of insulin. Clinical improvements were noted after 1 month of therapy and continued over time. Three cats achieved remission within the initial 3 months and none experienced a diabetic relapse during the study period. One cat achieved remission after 13 months of therapy. Improvements in clinical symptoms were markedly better than indicated by blood glucose and serum fructosamine concentrations. The safety of detemir was very high, with only two reported episodes of clinical hypoglycaemia, neither of which required veterinary attention. Based on these results detemir can be recommended for the treatment of diabetic cats, including cats previously treated unsuccessfully with other types of insulin.

Standards of care for feline urethral catheters in the UK.

OBJECTIVES: This study aimed to determine the standards of care for urethral catheters (UCs) placed in male cats for treatment of urethral obstruction (UO). It also assessed whether these standards were influenced by year of graduation of the veterinary surgeon (VS). METHODS: One hundred veterinary practices were randomly selected, and a telephone survey was conducted with a VS in the practice. Regarding the last urethral catheterisation performed for a male cat with UO, the VS was asked about the use of antibiotics while the catheter was in situ, whether a closed urinary collection system was used, whether aseptic skin preparation of the patient was performed and whether aseptic hand preparation was performed. A χ² test was used to determine whether there were significant differences in these percentages when considering year of graduation. RESULTS: Twenty-seven percent of VSs did not use antibiotics while the urethral catheter was in place, 44% used closed urinary collection systems, 41% performed aseptic skin preparation of the patient and 60% aseptically prepared their hands and wore sterile gloves. There was a statistically significant (P <0.01) difference in antibiotic usage, closed collection system usage and aseptic hand preparation across graduation year groups. CONCLUSIONS AND RELEVANCE: Non-sterile urethral catheter placement with open urinary drainage and antibiotic prophylaxis is still a widespread practice among VSs; however, more recent graduates are more likely to perform the procedure aseptically with a closed urinary collection system and withholding of antibiotics. There is a need for further education for postgraduate veterinarians in the prevention of catheter-associated urinary tract infections in cats and further research to provide evidence-based guidelines for feline urethral catheter care.

Porencephaly in dogs and cats: relationships between magnetic resonance imaging (MRI) features and hippocampal atrophy.


Porencephaly is the congenital cerebral defect and a rare malformation and described few MRI reports in veterinary medicine. MRI features of porencephaly are recognized the coexistence with the unilateral/bilateral hippocampal atrophy, caused by the seizure symptoms in human medicine. We studied 2 dogs and 1 cat with congenital porencephaly to characterize the clinical signs and MRI, and to discuss the associated MRI with hippocampal atrophy. The main clinical sign was the seizure symptoms, and all had hippocampal atrophy at the lesion side or the larger defect side. There is association between hippocampal atrophy or the cyst volume and the severe of clinical signs, and it is suggested that porencephaly coexists with hippocampal atrophy as well as humans in this study.

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.
Systemic absorption and adverse ocular and systemic effects after topical ophthalmic administration of 0.1% diclofenac to healthy cats.


OBJECTIVE: To quantify plasma concentrations and determine adverse ocular, renal, or hepatic effects associated with repeated topical ophthalmic application of 0.1% diclofenac to healthy cats.

ANIMALS: 8 healthy sexually intact male cats. PROCEDURES: A randomized, placebo-controlled crossover study was conducted. A topical formulation of 0.1% diclofenac was administered 4 times/d for 7 days to 4 cats, and artificial tear (control) solution was administered to the other 4 cats. After a 12-day washout period, cats received the other treatment. Ophthalmic examinations were performed daily. Plasma samples were obtained on days 1 and 7 for pharmacokinetic analysis. A CBC, serum biochemical analysis, urinalysis, determination of urine protein-to-creatinine ratio, and determination of glomerular filtration rate were performed before the start of the study and after each 7-day treatment period.

RESULTS: Mild conjunctival hyperemia was the only adverse ocular effect detected. Maximal drug concentration and area under the curve were significantly higher on day 7 than on day 1. Diclofenac-treated cats had a significantly lower glomerular filtration rate than did control-treated cats after the second but not after the first treatment period, presumably associated with iatrogenic hypovolemia. CONCLUSIONS AND CLINICAL RELEVANCE: Topical ophthalmic administration of 0.1% diclofenac was well tolerated in healthy cats, with only mild signs of ocular irritation. Detectable systemic concentrations of diclofenac were achieved with accumulation over 7 days. Systemic absorption of diclofenac may be associated with reduced glomerular filtration rate, particularly in volume-contracted animals. Topical ophthalmic 0.1% diclofenac should be used with caution in volume-contracted or systemically ill cats.

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.

Whole genome sequencing and phylogenetic analysis of feline anelloviruses.

Torque teno felis virus (FcTTV) was detected in the cat population in the Czech Republic. A total of 110 serum samples were tested by a nested PCR technique using specific primers, situated in the highly conserved untranslated region of the virus genome. The frequency of feline TT virus in the Czech Republic was found to be 33.63%. Sequencing of PCR product from several virus strains showed that all of them are closely related and belong to the same virus species. Whole genome sequencing of three strains was performed to compare overall genetic heterogeneity of feline TT viruses. One of these three strains showed more than 10% difference at the nucleotide level. Furthermore, we didn’t find any correlation between FcTTV infection and sex or health status of examined animals.

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 and 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® RCPCh FeLV, a non-adjuvanted vaccine against feline rhinotracheitis, calicivirus, infectious panleucopenia, chlamydiosis 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® 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.

Effect of tooth extraction on stomatitis in cats: 95 cases (2000-2013).


Objective-To evaluate long-term response of cats with stomatitis to tooth extraction. Design-Retrospective case series. Animals-95 cats with stomatitis. Procedures-Medical records of cats with stomatitis that was treated with tooth extraction during a 14-year period were reviewed. Demographic information and diagnostic results were recorded as well as surgical procedure, including full-mouth extraction (FME) versus partial-mouth extraction (PME), and specifics of medical management. Patients were categorized according to response to treatment. Results-Median postoperative follow-up
time was 231 days (range, 33 to 2,655 days). Of 95 cats, 6 (6.3%) had no improvement and 25 (26.3%) had little improvement in stomatitis following tooth extraction and extended medical management (EMM). Following tooth extraction, 37 (39.0%) cats had substantial clinical improvement and 27 (28.4%) cats had complete resolution of stomatitis; of these 64 cats, 44 (68.8%) required EMM for a finite period to achieve positive outcomes. Extent of tooth extraction (PME vs FME) was not associated with overall response to treatment. At initial recheck examination, a better long-term response to tooth extraction was observed in patients with resolution of abnormal behavior (OR, 7.2), decrease in oral inflammation (OR, 3.5), and lack of need for follow-up medical management with antimicrobials (OR, 3.7). Conclusions and Clinical Relevance-Extraction of teeth in areas of oral inflammation provided substantial improvement or complete resolution of stomatitis in more than two-thirds of affected cats. Full-mouth extraction did not appear to provide additional benefit over PME. Most cats with stomatitis may require EMM to achieve substantial clinical improvement or complete resolution. (J Am Vet Med Assoc 2015;246:654-660).

Evaluation and diagnostic potential of serum ghrelin in feline hypersomatotropism and diabetes mellitus.

BACKGROUND: Ghrelin is a growth hormone secretagogue. It is a potent regulator of energy homeostasis. Ghrelin concentration is down-regulated in humans with hypersomatotropism (HS) and increases after successful treatment. Additionally, ghrelin secretion seems impaired in human diabetes mellitus (DM). HYPOTHESIS: Serum ghrelin concentration is down-regulated in cats with HS-induced DM (HSDM) compared to healthy control cats or cats with DM unrelated to HS and increases after radiotherapy. ANIMALS: Cats with DM (n = 20) and with HSDM (n = 32), 13 of which underwent radiotherapy (RT-group); age-matched controls (n = 20). METHODS: Retrospective cross-sectional study. Analytical performance of a serum total ghrelin ELISA was assessed and validated for use in cats. Differences in serum ghrelin, fructosamine, IGF-1 and insulin were evaluated. RESULTS: Ghrelin was significantly higher (P <.001) in control cats (mean ± SD: 12.9 ± 6.8 ng/mL) compared to HSDM- (7.9 ± 3.3 ng/mL) and DM-cats (6.7 ± 2.3 ng/mL), although not different between the HSDM and DM-cats. After RT ghrelin increased significantly (P =.003) in HSDM-cats undergoing RT (from 6.6 ± 1.9 ng/mL to 9.0 ± 2.2 ng/mL) and the after RT ghrelin concentrations of HSDM cats were no longer significantly different from the serum ghrelin concentration of control cats. Serum IGF-1 did not significantly change in HSDM-cats after RT, despite significant decreases in fructosamine and insulin dose. CONCLUSION AND CLINICAL IMPORTANCE: Ghrelin appears suppressed in cats with DM and HSDM, although increases after RT in HSDM, suggesting possible presence of a direct or indirect negative feedback system between growth hormone and ghrelin. Serum ghrelin might therefore represent a marker of treatment effect.

Effect of antibiotic treatment in canine and feline urinary tract infections: A systematic review.

Urinary tract infection (UTI) is a major reason for antibiotic prescription in small animal practice. Optimal antibiotic treatment strategies have not been established for veterinary species, especially when considering duration of treatment, which is often considerably longer than for human patients
with UTI. The aims of this study were (1) to identify and assess evidence related to the efficacy of antibiotic treatment in canine and feline UTIs; and (2) to compare the efficacy of short (<5 days) and standard (≥7 days) duration of antibiotic treatment for canine uncomplicated UTI. An electronic literature search was conducted for publications to 1 May 2014. Fourteen peer-reviewed prospective and controlled studies were retrieved, 10 of which evaluated antibiotic treatment in dogs and four in cats. Of the 14 studies, seven were clinical trials and five of those were randomised controlled trials. Most (12/14) studies were not considered to contribute sufficient evidence to evaluate treatment strategies. There were no clinical studies examining the effect of duration of the same drug. Of the short duration regimens evaluated, the efficacy of 3 day antibiotic therapy with trimethoprim-sulphonamide (females only) or high-dose enrofloxacin in dogs with uncomplicated UTIs was supported by fair evidence, as these treatment strategies were non-inferior to medium duration (10-14 days) therapy with β-lactam antimicrobials. In conclusion, there is little published evidence relating to antibiotic treatment of UTIs in dogs and cats. Well-designed clinical trials focusing on the duration of treatment are warranted to create evidence-based treatment protocols.

**Effect of active immunization against GnRH-I on the reproductive function in cat.**


This study was designed to explore the effect of active immunization against maltose binding protein-gonadotropin releasing hormone I hexamer (MBP-GnRH-I6) on the reproductive function in cats. Each immunized cat was administered twice intramuscularly in the neck at 16 and 20 weeks old. The concentrations of the testosterone and estradiol and the level of anti-GnRH-I antibody in the serum were measured by radioimmunoassay and ELISA, respectively. The results showed that the weight and size of testicles and ovaries, and the concentrations of serum testosterone and estradiol in the immunized animals were lower than those of the control cats (P < 0.05), but that the levels of anti-GnRH-I antibody were significant higher compared to control animals (P < 0.05). Testicular tissues from the immunized male cats showed that seminiferous tubules were depauperate with the lumen relatively empty and that the differentiation of spermatogonia was not obvious. Tissues from the immunized female cats showed that the ovaries had many primordial follicles and primary follicles, but no secondary follicle was observed. These results showed active immunization against MBP-GnRH-I6 could make the gonads atrophy and reduce the concentrations of gonadal hormones, which suggested that MBP-GnRH-I6 was a very effective immunogen in the cat.

**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: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.

The prevalence of Trichuris spp. infection in indoor and outdoor cats on St. Kitts.
INTRODUCTION: The present study was conducted to evaluate the prevalence of Trichuris spp. and other intestinal parasitic infections in owned cats on St. Kitts. METHODOLOGY: The feces of 41 non-feral cats (23 indoor only; 18 indoor/outdoor) were examined for the presence of Trichuris spp. eggs. RESULTS: Nine (22%) of the cats were positive for Trichuris spp. Prevalence of trichuriasis in indoor cats was 26.0% as compared to 16.7% in outdoor cats. Other parasites identified included Ancylostoma spp. (10%; 4 cats), Toxocara cati (2%; 1 cat), Platynosomum spp. (22%; 9 cats), Mammomonogamus spp. (2%; 1 cat) and coccidia (7%; 3 cats). CONCLUSION: On St. Kitts, indoor cats are as likely to have parasite infections as outdoor cats. Given the zoonotic potential of some of the identified parasites, periodic anthelmintic treatment should be provided to both indoor and outdoor cats.

Myocardial collagen deposition and inflammatory cell infiltration in cats with pre-clinical hypertrophic cardiomyopathy.
The histological features of feline hypertrophic cardiomyopathy (HCM) have been well documented, but there are no reports describing the histological features in mild pre-clinical disease, since cats are rarely screened for the disease in the early stages before clinical signs are apparent. Histological changes at the early stage of the disease in pre-clinical cats could contribute to an improved understanding of disease aetiology or progression. The aim of this study was to evaluate the histological features of HCM in the left ventricular (LV) myocardium of cats diagnosed with pre-clinical HCM. Clinically healthy cats with normal (n = 11) and pre-clinical HCM (n = 6) were identified on the basis of echocardiography; LV free wall dimensions (LVFWd) and/or interventricular septal wall (IVSd) dimensions during diastole of 6-7 mm were defined as HCM, while equivalent dimensions <5.5 mm were defined as normal. LV myocardial sections were assessed and collagen content and inflammatory cell infiltrates were quantified objectively. Multifocal areas of inflammatory cell infiltration, predominantly lymphocytes, were observed frequently in the left myocardium of cats with pre-clinical HCM. Tissue from cats with pre-clinical HCM also had a higher number of neutrophils and a greater collagen content than the myocardium of normal cats. The myocardium variably demonstrated other features characteristic of HCM, including arteriolar mural hypertrophy and interstitial fibrosis and, to a lesser extent, myocardial fibre disarray and cardiomyocyte hypertrophy. These results suggest that an inflammatory process could contribute to increased collagen content and the myocardial fibrosis known to be associated with HCM.

Characteristics of the bacterial flora in the conjunctival sac of cats from Poland.

OBJECTIVES: To assess the bacterial flora of the conjunctival sac in clinically healthy cats and cats with signs of conjunctivitis. METHODS: A total of 324 conjunctival swabs were examined between 2011 and 2012 taken from 60 animals, 30 of which were clinically healthy and 30 with signs of chronic conjunctivitis. The samples were taken three times at 4-week intervals from the clinically healthy cats. The samples from the cats with conjunctivitis were taken before and 4 weeks after cessation of successful therapy. Swabs from both the right and left eye of each cat were subjected to microbiological examination and polymerase chain reaction for the presence of DNA of Chlamyphila felis and Mycoplasma felis. RESULTS: There was no qualitative difference in the eye microflora between the clinically healthy animals and those with signs of conjunctivitis. Staphylococcus epidermidis (21.9%) was the most common microorganism isolated and it was more commonly detected in swabs from cats with conjunctivitis (*P* < 0.0001) as was Staphylococcus aureus (*P* = 0.07). The presence of C. felis was significantly correlated with (*P* < 0.0001) signs of conjunctivitis and was detected in 25% of swabs collected from both conjunctival sacs. No DNA of M. felis was detected in any swab. None of the animals had sterile conjunctival sacs in all consecutive bacteriological tests. CLINICAL SIGNIFICANCE: The conjunctival sac in cats was sterile in over 50% of the clinically healthy cats and 25% of the cats with conjunctivitis. The sterility did not persist for longer than 4 weeks. Positive bacterial cultures occur in cats with and without clinical signs of conjunctivitis.

**Greater virulence of highly pathogenic H5N1 influenza virus in cats than in dogs.**


Highly pathogenic H5N1 influenza virus continues to infect animals and humans. We compared the infectivity and pathogenesis of H5N1 virus in domestic cats and dogs to find out which animal is more susceptible to H5N1 influenza virus. When cats and dogs were infected with the H5N1 virus, cats suffered from severe outcomes including death, whereas dogs did not show any mortality. Viruses were shed in the nose and rectum of cats and in the nose of dogs. Viruses were detected in brain, lung, kidney, intestine, liver, and serum in the infected cats, but only in the lung in the infected dogs. Genes encoding inflammatory cytokines and chemokines, Toll-like receptors, and apoptotic factors were more highly expressed in the lungs of cats than in those of dogs. Our results suggest that the intensive monitoring of dogs is necessary to prevent human infection by H5N1 influenza virus, since infected dogs may not show clear clinical signs, in contrast to infected cats.

**Exploration of paclitaxel (Taxol) as a treatment for malignant tumors in cats: a descriptive case series.**


Paclitaxel, an effective chemotherapeutic agent in human oncology, has received little evaluation in feline patients. The diluent used to solubilize paclitaxel, polyoxyethylated castor oil (Cremophor EL), causes anaphylactoid reactions in human and dogs, which limits enthusiasm for use of this agent in veterinary oncology. Nine feline patients with measurable malignant tumors were treated with paclitaxel at a dosage of 80 mg/m(2) intravenously every 21 days for up to two doses. Adverse effects, including evidence of toxicity and anaphylactoid reactions, were assessed. Tumor response,
progression and patient time to progression (TTP) were also recorded. Adverse effects included grade III and IV thrombocytopenia, grade III gastrointestinal signs (vomiting and constipation) and hypersensitivity reactions, seen in a total of five patients. Anaphylactoid reactions resolved with appropriate management. Stable disease and partial response were observed in 56% of feline patients. Median TTP was 28 days (range 15-45 days). Intravenous paclitaxel is a safe treatment option for feline malignant tumor patients. Future investigation is warranted to explore the effectiveness and appropriate application of this agent for specific tumor types.

**Broad-Spectrum Inhibitors against 3C-Like Proteases of Feline Coronavirus 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.
Beyond-use date determination of buprenorphine buccal solution using a stability-indicating high-performance liquid chromatographic assay.


OBJECTIVES: The objectives of this study included developing and validating a stability-indicating high-performance liquid chromatographic (HPLC) method with ultraviolet (UV) detection for the determination of buprenorphine in a buccal solution for veterinary use, and applying that method to determine the stability of a 3 mg/ml buprenorphine preparation in room temperature and refrigerated storage conditions. This preparation, intended for buccal administration in feline patients, plays an important role in pain management in cats. METHODS: A stability-indicating HPLC method was developed and validated for system suitability, accuracy, repeatability, intermediate precision, specificity, linearity and robustness based on US Pharmacopeia (USP) General Chapter <1225>. The method was then applied to the study of potency changes over 90 days in a buccal buprenorphine solution stored at two temperatures. RESULTS: All HPLC-UV method data met acceptable criteria for the quantification of buprenorphine in a buccal solution formulation. The buprenorphine concentrations found in each stability sample remained within the 90-110% of label claim throughout the 90 days of study. All stability test bottles of the buprenorphine buccal solution retained their original appearance. For the room temperature bottles, some white particulate matter was noted in the threads of the container bottles starting at day 21. The pH of the preparations during the course of the study was in the range of 3.57-4.06 and 4.01-4.16 for the room temperature and refrigerated samples, respectively. CONCLUSIONS AND RELEVANCE: Pharmacists have compounded a concentrated 3 mg/ml buccal solution to use easily in the home care or outpatient setting for treatment of feline pain. Prior to this investigation, pharmacists empirically assigned beyond-use dates to this formulation based on standards in USP General Chapter <795> Pharmaceutical Compounding - Nonsterile Preparations. This study of a 3 mg/ml buprenorphine buccal solution indicates stability through 90 days.

Free-ranging farm cats: home range size and predation on a livestock unit in northwestern Georgia.


This study’s objective was to determine seasonal and diurnal vs. nocturnal home range size, as well as predation for free-ranging farm cats at a livestock unit in North Georgia. Seven adult cats were tracked with attached GPS units for up to two weeks for one spring and two summer seasons from May 2010 through August 2011. Three and five cats were tracked for up to two weeks during the fall and winter seasons, respectively. Feline scat was collected during this entire period. Cats were fed a commercial cat food daily. There was no seasonal effect (P > 0.05) on overall (95% KDE and 90% KDE) or core home range size (50% KDE). Male cats tended (P = 0.08) to have larger diurnal and nocturnal core home ranges (1.09 ha) compared to female cats (0.64 ha). Reproductively intact cats (n = 2) had larger (P < 0.0001) diurnal and nocturnal home ranges as compared to altered cats. Feline scat processing separated scat into prey parts, and of the 210 feline scats collected during the study, 75.24% contained hair. Of these 158 scat samples, 86 contained non-cat hair and 72 contained only cat hair. Other prey components included fragments of bone in 21.43% of scat and teeth in 12.86% of scat. Teeth were used to identify mammalian prey hunted by these cats, of which the Hispid cotton rat (Sigmodon hispidus) was the primary rodent. Other targeted mammals were Peromyscus sp., Sylvilagus sp. and Microtus sp. Invertebrates and birds were less important as prey, but all mammalian prey identified in this study consisted of native animals. While the free-ranging farm cats in this study
did not adjust their home range seasonally, sex and reproductive status did increase diurnal and nocturnal home range size. Ultimately, larger home ranges of free-ranging cats could negatively impact native wildlife.

**Bilateral Dentate Gyrus Structural Alterations in a Cat Associated With Hippocampal Sclerosis and Intraventricular Meningioma.**


A 13-year-old cat had a history of seizures for 3 years that resembled temporal lobe epilepsy. Histologic examination of the brain revealed bilateral hippocampal alterations, including hypergyration and broadening of the dentate gyrus associated with hippocampal sclerosis and an intraventricular meningioma near the hippocampal region. The findings in the dentate gyrus were interpreted as a congenital malformation; however, it could not be ruled out that the alterations were induced by the seizures. Similar changes of the dentate gyrus have not been previously described in cats.

**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 (IF) 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 for FmoPV.
Real-time PCR genotyping assay for feline erythrocyte pyruvate kinase deficiency and mutant allele frequency in purebred cats in Japan.


Erythrocyte pyruvate kinase (PK) deficiency is an inherited glycolytic erythroenzymopathy caused by mutations of the PKLR gene. A causative mutation of the feline PKLR gene was originally identified in Abyssinian and Somali cats in the U.S.A. In the present study, a TaqMan probe-based real-time PCR genotyping assay was developed and evaluated for rapid genotyping and large-scale screening for this mutation. Furthermore, a genotyping survey was carried out in a population of four popular purebred cats in Japan to determine the current mutant allele frequency. The assay clearly displayed all genotypes of feline PK deficiency, indicating its suitability for large-scale survey as well as diagnosis. The survey demonstrated that the mutant allele frequency in Abyssinian and Somali cats was high enough to warrant measures to control and prevent the disease. The mutant allele frequency was relatively low in Bengal and American shorthair cats; however, the testing should still be carried out to prevent the spread of the disease. In addition, PK deficiency should always be considered in the differential diagnosis of anemia in purebred cats in Japan as well as worldwide.

Retained and persistent deciduous teeth in cats.


Renal fibrosis in feline chronic kidney disease: known mediators and mechanisms of injury.


Chronic kidney disease (CKD) is a common medical condition of ageing cats. In most cases the underlying aetiology is unknown, but the most frequently reported pathological diagnosis is renal tubulointerstitial fibrosis. Renal fibrosis, characterised by extensive accumulation of extra-cellular matrix within the interstitium, is thought to be the final common pathway for all kidney diseases and is the pathological lesion best correlated with function in both humans and cats. As a convergent pathway, renal fibrosis provides an ideal target for the treatment of CKD and knowledge of the underlying fibrotic process is essential for the future development of novel therapies. There are many mediators and mechanisms of renal fibrosis reported in the literature, of which only a few have been investigated in the cat. This article reviews the process of renal fibrosis and discusses the most commonly cited mediators and mechanisms of progressive renal injury, with particular focus on the potential significance to feline CKD.

Genetic analysis shows low levels of hybridization between African wildcats (Felis silvestris lybica) and domestic cats (F. s. catus) in South Africa.
Hybridization between domestic and wild animals is a major concern for biodiversity conservation, and as habitats become increasingly fragmented, conserving biodiversity at all levels, including genetic, becomes increasingly important. Except for tropical forests and true deserts, African wildcats occur across the African continent; however, almost no work has been carried out to assess its genetic status and extent of hybridization with domestic cats. For example, in South Africa it has been argued that the long-term viability of maintaining pure wildcat populations lies in large protected areas only, isolated from human populations. Two of the largest protected areas in Africa, the Kgalagadi Transfrontier and Kruger National Parks, as well as the size of South Africa and range of landscape uses, provide a model situation to assess how habitat fragmentation and heterogeneity influences the genetic purity of African wildcats. Using population genetic and home range data, we examined the genetic purity of African wildcats and their suspected hybrids across South Africa, including areas within and outside of protected areas. Overall, we found African wildcat populations to be genetically relatively pure, but instances of hybridization and a significant relationship between the genetic distinctiveness (purity) of wildcats and human population pressure were evident. The genetically purest African wildcats were found in the Kgalagadi Transfrontier Park, while samples from around Kruger National Park showed cause for concern, especially combined with the substantial human population density along the park’s boundary. While African wildcat populations in South Africa generally appear to be genetically pure, with low levels of hybridization, our genetic data do suggest that protected areas may play an important role in maintaining genetic purity by reducing the likelihood of contact with domestic cats. We suggest that approaches such as corridors between protected areas are unlikely to remain effective for wildcat conservation, as the proximity to human settlements around these areas is projected to increase the wild/domestic animal interface. Thus, large, isolated protected areas will become increasingly important for wildcat conservation and efforts need to be made to prevent introduction of domestic cats into these areas.

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.

Genotyping coronaviruses associated with feline infectious peritonitis.

Feline coronavirus (FCoV) infections are endemic amongst cats worldwide. The majority of infections are asymptomatic, or result only in 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 fecal samples from healthy cats and three from tissue lesion samples from cats with confirmed FIP. The six samples were obtained over a period of eight weeks at a single-site cat rescue and rehoming center in the UK. We found amino acid differences are located at 44 positions across an alignment of the six virus translatomes and, at 21 of these positions, the differences fully or partially discriminate between the genomes derived from the fecal samples and the genomes derived from tissue lesion samples. In this study, two amino acid differences fully discriminate the two classes of genomes; these are 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.

**Functional phenotype and its correlation with therapeutic response and inflammatory type of bronchoalveolar lavage fluid in feline lower airway disease.**


BACKGROUND: Currently, functional assessment to monitor therapeutic response in feline lower airway disease (FLAD) has limited application. OBJECTIVES: To evaluate if expiratory indices derived from pseudo-tidal breathing flow-volume loop (pTBFVL) representing lower airway obstruction would decrease after clinical improvement and to investigate the correlation between functional phenotype and inflammatory cell type in bronchoalveolar lavage (BAL) fluid. ANIMALS: Nineteen client-owned cats with FLAD. METHODS: Prospective observational study. Functional assessment with pTBFVL indices (eg, peak to mid-expiratory flow; PEF/EF50) and conventional barometric whole body plethysmography (BWBP) parameters (eg, enhanced pause) was carried out before receiving treatment. BAL was performed to analyze inflammatory cell types. Signs were assessed by scoring. The cats were treated with glucocorticoids daily and functional testing was repeated. RESULTS: Loop indices PEF/EF50 and PEF/EF25 were significantly decreased after treatment (P <.001). Conventional BWBP parameters were not significantly different before and after treatment. Cats with PEF/EF50 > 1.51 before treatment had a significantly higher granulocyte (eosinophil plus neutrophil) percentage in BAL fluid (P =.014). Granulocyte percentage in BAL fluid was strongly correlated with PEF/EF25 (P =.001, rs = 0.74) and moderately correlated with PEF/EF50 (P =.022, rs = 0.57), whereas eosinophil or neutrophil percentage alone had no significant correlation with functional parameters. CONCLUSIONS AND CLINICAL IMPORTANCE: Functional parameters including PEF/EF50 and PEF/EF25 can be used for monitoring therapeutic response. The presence of airflow limitation during mid- to late expiration is affected by the overall extent of granulocyte infiltration.

**Nonthymoma-associated exfoliative dermatitis in 18 cats.**

BACKGROUND: Exfoliative dermatitis has been described in cats as a paraneoplastic skin disease associated with thymoma. There are anecdotal reports of cases without thymoma, with various suspected aetiologies. HYPOTHESIS/OBJECTIVES: To identify common features, underlying causes, response to therapy and outcome of nonthymoma-associated exfoliative dermatitis in cats. METHODS: Retrospective analysis was carried out of cases presented to dermatology referral centres or cases submitted for histopathological examination. Detailed historical and clinical data were obtained and evaluated statistically. Histopathology was reviewed in a blinded fashion by three dermatopathologists, and PCR for herpesvirus was performed. RESULTS: Eighteen cats fulfilled all inclusion criteria. There was no sex, age or breed predisposition. All cats presented with severe generalized (77%) or multifocal exfoliation (23%); 12 cats were severely depressed. In all cats, thymoma was excluded radiographically and feline leukaemia virus tests were negative. Additional imaging procedures in 14 cats and postmortem examination in two cats did not detect neoplasia. Histopathology revealed interface dermatitis, mural interface folliculitis and sebaceous adenitis indistinguishable from findings in thymoma-associated cases. PCR for herpes DNA was negative. No aetiology was identified. Treatment in 12 cases consisted of immunosuppressive doses of corticosteroids and/or ciclosporin; one responded to antibiotics, one to shampoo, two went into spontaneous remission, and two did not receive any therapy and were euthanized. CONCLUSIONS AND CLINICAL IMPORTANCE: Nonthymoma-associated exfoliative dermatitis in cats is clinically and histopathologically indistinguishable from thymoma-associated cases. Most cases benefit from immunosuppressive therapy; therefore, an immunopathological response to an undefined trigger is suspected.

Clinical and antiviral effect of a single oral dose of famciclovir administered to cats at intake to a shelter.

Although famciclovir is efficacious in feline herpesvirus type 1 (FHV-1)-infected cats, effects of a single dose early in disease course have not been reported. In this two part, randomized, masked, placebo controlled study, cats received a single dose of 125 mg famciclovir (n = 43) or placebo (n = 43; pilot study), or 500 mg famciclovir (n = 41) or placebo (n = 40; clinical trial) on entering a shelter. FHV-1 PCR testing was performed, bodyweight and food intake were recorded, and signs of respiratory disease were scored prior to and 7 days following treatment. FHV-1 DNA was detected in 40% of cats in both parts at study entry. In the pilot study, ocular and nasal discharge scores increased from days 1 to 7 in famciclovir and placebo treated cats. Sneezing scores increased and bodyweight decreased in famciclovir-treated cats. The proportion of cats in which FHV-1 DNA was detected increased over time in all cats in the pilot study. In the clinical trial, food intake and median clinical disease scores for nasal discharge and sneezing increased from days 1 to 7 in both groups and demeanor scores worsened in famciclovir-treated cats. The proportion of cats shedding FHV-1 DNA was greater on day 7 than on day 1 in cats receiving 500 mg famciclovir. A single dose of famciclovir (125 or 500 mg) administered at shelter intake was not efficacious in a feline population in which 40% were already shedding FHV-1.

Moxidectin steady state prior to inoculation protects cats from subsequent, repeated infection with Dirofilaria immitis.
BACKGROUND: Infection of cats with Dirofilaria immitis causes seroconversion on antibody tests and pulmonary pathology, often without subsequent development of adult heartworms. Consistent administration of topical 10% imidacloprid-1% moxidectin has been shown to result in sustained plasma levels of moxidectin in cats after three to five treatments, a pharmacokinetic behavior known as “steady state”. METHODS: To evaluate the ability of moxidectin at “steady state” to protect cats from subsequent infection with D. immitis, cats (n = 10) were treated with the labeled dose of topical 10% imidacloprid-1% moxidectin for four monthly treatments. Each cat was inoculated with 25 third-stage larvae of D. immitis 7, 14, 21, and 28 days after the last treatment; non-treated cats (n = 9) were inoculated on the same days, serving as infection controls. Blood samples were collected from each cat from 1 month prior to treatment until 7 months after the final inoculation and tested for antibody to, and antigen and microfilaria of, D. immitis. RESULTS: Measurement of serum levels of moxidectin confirmed steady state in treated cats. Cats treated with topical 10% imidacloprid-1% moxidectin prior to trickle inoculation of D. immitis L3 larvae throughout the 28 day post-treatment period remained negative on antibody and antigen tests throughout the study and did not develop gross or histologic lesions characteristic of heartworm infection. A majority of non-treated cats tested antibody positive by 3-4 months post infection (6/9) and, after heat treatment, tested antigen positive by 6-7 months post-infection (5/9). Histologic lesions characteristic of D. immitis infection, including intimal and medial thickening of the pulmonary artery, were present in every cat with D. immitis antibodies (6/6), although adult D. immitis were confirmed in only 5/6 antibody-positive cats at necropsy. Microfilariae were not detected at any time. CONCLUSIONS: Taken together, these data indicate that prior treatment with 10% imidacloprid-1% moxidectin protected cats from subsequent infection with D. immitis for 28 days, preventing both formation of a detectable antibody response and development of pulmonary lesions by either immature stages of D. immitis or young adult heartworms.

Perioperative physiology and pharmacology in the obese small animal patient.


OBJECTIVE: To review the available literature concerning the physiologic and pharmacologic alterations induced by obesity in canine and feline patients and their relevance to perioperative care. STUDY DESIGN: Literature review. DATABASES: PubMed, CAB, Web of Science. CONCLUSIONS: Obesity of cats and dogs is a chronic inflammatory condition that is increasingly prevalent. Similar to the situation in humans, small animal obesity may be associated with changes in endocrine, respiratory, and cardiovascular function. In addition, alteration of body composition in obesity can affect pharmacokinetic variables. Modifications in perioperative care may need to be made for obese dogs and cats, including attention to respiratory and cardiovascular supportive care and drug dose adjustments.

DNA mutations of the cat: The good, the bad and the ugly.


PRACTICAL RELEVANCE: The health of the cat is a complex interaction between its environment (nurture) and its genetics (nature). Over 70 genetic mutations (variants) have been defined in the cat, many involving diseases, structural abnormalities and clinically relevant health concerns. As more of the cat’s genome is deciphered, less commonly will the term ‘idiopathic’ be used regarding the diagnosis of diseases and unique health conditions. State-of-the-art health care will include DNA
profiling of the individual cat, and perhaps its tumor, to establish the best treatment approaches. Genetic testing and eventually whole genome sequencing should become routine diagnostics for feline health care. GLOBAL IMPORTANCE: Cat breeds have disseminated around the world. Thus, practitioners should be aware of the breeds common to their region and the mutations found in those regional populations. Specific random-bred populations can also have defined genetic characteristics and mutations. AUDIENCE: This review of ‘the good, the bad and the ugly’ DNA variants provides the current state of knowledge for genetic testing and genetic health management for cats. It is aimed at feline and general practitioners wanting to update and review the basics of genetics, what tests are available for cats and sources for genetic testing. The tables are intended to be used as references in the clinic. Practitioners with a high proportion of cat breeder clientele will especially benefit from the review. EVIDENCE BASE: The data presented is extracted from peer-reviewed publications pertaining to mutation identification, and relevant articles concerning the heritable trait and/or disease. The author also draws upon personal experience and expertise in feline genetics.

Demonstration of uniformity of calcium absorption in adult dogs and cats.

A meta-analysis was conducted to understand quantitative aspects of calcium (Ca) and phosphorus (P) absorption in adult dogs and cats. 34 studies in dogs and 14 studies in cats met the criteria for inclusion in the meta-analysis. Intake and faecal excretion values of Ca and P were subjected to a modified Lucas test and subsequent regression analyses. According to the current scientific consensus, Ca true digestibility (absorption) should increase at low Ca intake and decrease at high Ca intake. If true, this should result in a nonlinear relationship between the percentage of Ca excreted and dietary Ca intake. The present meta-analysis showed a highly significant linear relationship (p < 0.0001) between Ca intake and Ca excretion suggesting a lack of systematic quantitative adaptation in true Ca digestibility. This finding suggests either that the time period covered by standard digestion trials is too short to induce adaptation mechanisms or that dogs and cats at maintenance will not efficiently alter quantitative Ca absorption percentage according to the amount ingested. If the latter is true, a dietary Ca supply differing greatly from the recommended dietary intake might impair the health of cats and dogs when fed long term. The data plots for P intake and faecal excretion were less uniform suggesting other factors not just dietary intake influence faecal P excretion. In adult cats, the dietary Ca:P ratio strongly influenced the true digestibility of P, whereas this effect was less marked in adult dogs. Faecal P excretion was significantly correlated to faecal Ca excretion in both species (p < 0.0001), and surprisingly, the level of P intake did not appear to be an important determinant of true digestibility of P.

Identification of Cytauxzoon felis infection in domestic cats from southern Illinois.

OBJECTIVES: The objective of this study was to document Cytauxzoon felis infection in domestic cats from southern Illinois. METHODS: Diagnosis of cytauxzoonosis was based upon clinical signs of illness and detection of prioplasms within erythrocytes on peripheral blood smears or schizonts in internal organs consistent with Cytauxzoon infection. Additionally, genomic DNA was extracted from histologic sections of splenic tissue from two cats. RESULTS: The internal transcribed spacer region-1
(ITS-1) and ITS-2 of the C felis genome were successfully sequenced, confirming infection with the organism. CONCLUSIONS AND RELEVANCE: Sequence analysis of C felis DNA isolated from histologic lesions in two domestic cats from southern Illinois show either mixed infection or possible heterozygosity (cytosine and thymine) in ITS-2 at the position equivalent to nucleotide 76 (thymine) in the most commonly isolated C felis ITS-2 sequence. Identification of C felis infection in domestic cats from southern Illinois is a critical finding that raises awareness of this often fatal disease process in an area of the USA where, previously, the disease was only anecdotally reported.

Urinary albumin and transferrin as early diagnostic markers of chronic kidney disease.


Feline renal diseases are increasingly noted in veterinary practice. It is important to diagnose and identify the pathological basis of renal dysfunction accurately at an early stage, but there are only a few reports on this area in clinical veterinary medicine. We investigated the efficacy of measurement of urinary albumin (u-Alb) and urinary transferrin (u-Tf) for early diagnosis using 5-µl urine samples collected noninvasively by catheterization from normal (IRIS stage I) cats and cats with stage I chronic kidney disease (CKD). The u-Alb levels in normal and stage I CKD cats were 6.0 ± 4.5 and 11.2 ± 8.4 mg/dl, respectively, and the u-Tf levels were 0.09 ± 0.42 and 0.52 ± 0.79 mg/dl, respectively. Based on ROC curve analysis, the sensitivity and specificity of u-Alb and u-Tf were higher than those of the currently used biomarker, the plasma creatinine level. The sensitivity of u-Alb was higher than that of u-Tf, whereas the specificity of u-Tf was higher than that of u-Alb. The validity of the threshold albumin level (20 mg/dl) was confirmed by measurements using SDS-PAGE. Since leakage of u-Tf in urine precedes leakage of u-Alb, inclusion of u-Tf in biochemistry tests may be appropriate for IRIS staging as a diagnostic marker of early diagnosis of renal disorder in cats.

Bacterial and protozoal agents of canine vector-borne diseases in the blood of domestic and stray dogs from southern Portugal.


BACKGROUND: The so-called canine vector-borne diseases (CVBD) are caused by a wide range of pathogens transmitted by arthropods. In addition to their veterinary importance, many of these canine vector-borne pathogens can also affect the human population due to their zoonotic potential, a situation that requires a One Health approach. As the prevalence of vector-borne pathogens in cats from southern Portugal has been recently evaluated, the aim of the present study was to assess if the same agents were present in dogs living in the same area, and to assess positivity-associated risk factors. METHODS: One thousand and ten dogs (521 domestic and 489 stray) from veterinary medical centres and animal shelters in southern Portugal were enrolled. Anaplasma spp./Ehrlichia spp., Bartonella spp., Borrelia burgdorferi sensu lato, Babesia spp., Hepatozoon spp. and Leishmania infantum infections were evaluated by polymerase chain reaction (PCR) assays in blood samples. RESULTS: Sixty-eight (6.7%) dogs were PCR-positive to at least one of the tested CVBD agent species, genera or complex, including one dog found positive to two different genera. Nineteen (1.9%) dogs were positive to Anaplasma spp./Ehrlichia spp., eight (0.8%) to B. burgdorferi s.l., 31 (3.1%) to Hepatozoon spp. and 11 (1.1%) to
L. infantum. Anaplasma platys, Ehrlichia canis, B. burgdorferis.l. and Hepatozoon canis were identified by DNA sequencing, including one animal confirmed with both A. platys and H. canis. Furthermore, Wolbachia spp. was amplified in blood from four dogs. None of the tested dogs was positive by PCR for Bartonella spp. or Babesia spp. CONCLUSIONS: The molecular identification of CVBD agents in southern Portugal, some of them with zoonotic concern, reinforces the importance to alert the veterinary community, owners and public health authorities to prevent the risk of transmission of vector-borne pathogens among dogs and to other vertebrate hosts including humans. The prevalence of the selected pathogens was lower than that previously found in cats from the same region, probably because veterinarians and owners are more aware of them in the canine population and control measures are used more often.

**Fighting Fire with Fire: Endogenous Retrovirus Envelopes as Restriction Factors.**

A considerable portion of vertebrate genomes are made up of endogenous retroviruses (ERVs). While aberrant or uncontrolled ERV expression has been perceived as a potential cause of disease, there is mounting evidence that some ERVs have become integral components of normal host development and physiology. Here, we revisit the longstanding concept that some of the gene products encoded by ERVs and other endogenous viral elements may offer to the host protection against viral infection. Notably, proteins produced from envelope (env) genes have been shown to act as restriction factors against related exogenous retroviruses in chickens, sheep, mice, and cats. Based on the proposed mode of restriction and the domain architecture of known antiretroviral env, we argue that many more env gene-derived restriction factors await discovery in vertebrate genomes, including the human genome.

**Benzalkonium chloride intoxication in cats.**

**A retrospective molecular study of select intestinal protozoa in healthy pet cats from Italy.**

The feline gut can harbour a number of protozoan parasites. Recent genetic studies have highlighted new epidemiological findings about species of Cryptosporidium, assemblages of Giardia duodenalis and Toxoplasma gondii. Furthermore, epidemiological studies suggest the occurrence of *Tritrichomonas foetus* in cats is on the increase worldwide. The prevalence of selected intestinal protozoa was determined by PCR using DNA previously extracted from the faeces of 146 privately owned healthy cats from Italy. Molecular genotyping on *T* gondii, *G* duodenalis and *C*ryptosporidium DNA was achieved. PCR assays were positive in 32 (22.9%) samples. Three animals (2.0%) were positive for *T* foetus and Cryptosporidium DNA, 15 specimens (10.3%) were positive for *T* gondii and 11 (7.5%) for *G* duodenalis. Co-infections were never observed. Results of the typing analysis allowed the identification of *Cryptosporidium felis* in all cases. The specimens positive for *T* gondii hinted at clonal genotype I (n = 7), genotype II (n = 1) and genotype III (n = 7). The *G* duodenalis isolates were
Cytology of endoscopically obtained biopsies for the diagnosis of chronic intestinal diseases in cats.

OBJECTIVE: To evaluate the diagnostic value of cytology of endoscopically obtained biopsies in cats presented for chronic gastrointestinal complaints with emphasis on the diagnosis of low-grade alimentary lymphoma (LGAL). MATERIALS AND METHODS: Data of endoscopically obtained duodenal biopsies from 137 cats were evaluated retrospectively. Cytology was performed using the squash smear technique with subsequent Diff Quick® staining. Pathological findings were categorized according to type and grade of the inflammatory infiltrate. Moreover, reports were reviewed with regard to diagnosis of LGAL. Histopathology reports were analysed correspondingly and compared to cytology results. Histopathological samples were further evaluated by immunohistochemistry (IHC) if a diagnosis of LGAL had been expressed. RESULTS: Squash smear preparation of intestinal biopsies was adequate for cytological examination in >97% of cases. Using histopathology as gold standard, with cytology, a sensitivity and specificity for detection of a pathologic process in feline intestinal biopsies of 68.1% and 70.6% were calculated, respectively. Regarding the detection of lymphoplasmacytic (LPE) and eosinophilic enteritis a statistically significant correlation with histopathology (p<0.05) was observed. With regard to grade of the inflammatory infiltrate, a weak correlation was calculated (r=0.482). Of 21 cats diagnosed or suspected with LGAL by cytology, IHC confirmed nine cases whereas 11 cases were reclassified as LPE. None of the confirmed LGAL had been missed with histopathology. A sensitivity of 60.0% and specificity of 90.6% for cytological detection of feline LGAL was obtained. CONCLUSION AND CLINICAL RELEVANCE: The sensitivity of cytology to diagnose LGAL is low and it has no additional significance to histological biopsies.

Comparison of intranasal and intramuscular ketamine-midazolam combination in cats.

OBJECTIVE: The aim of the present study was to compare intranasal (INS) and intramuscular (IM) routes of administration of a ketamine-midazolam combination in cats. STUDY DESIGN: Randomized block design. ANIMALS: Twelve healthy mixed breed cats (six males and six females). METHODS: The drug combination was ketamine (14 mg kg(-1)) and midazolam (0.5 mg kg(-1)). In the IM group, drugs were injected into quadratus femoris muscle; in the INS. group, the combination dropped equally into the two nostrils. Pulse and respiratory rates, peripheral haemoglobin oxygen saturation (SpO2) and rectal temperature were monitored before and at intervals after drug administration. Time to onset and duration of sedation and, during recovery to head up, sternal recumbency and recovery were recorded. RESULTS: There were no significant differences between the groups in any time measured except for recovery to sternal recumbency, where time was lower in the INS than in the IM (p = 0.034). Respiratory rate was greater in the INS than in the IM group (p = 0.029), but there was no difference between groups in other physiological parameters. In both groups SpO2 was low before and fell further
during sedation. CONCLUSIONS: The results substantiated that INS ketamine-midazolam can produce effective sedation in cats. CLINICAL RELEVANCE: Intranasal (INS) administration of ketamine-midazolam is atraumatic, and its use may avoid the pain of injection of ketamine combinations when this drug is used to induce sedation in cats.

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.

Effect of gantacurium on evoked laryngospasm and duration of apnea in anesthetized healthy cats.


OBJECTIVE: To evaluate whether the ultrashort-acting neuromuscular blocking agent gantacurium can be used to blunt evoked laryngospasm in anesthetized cats and to determine the duration of apnea without hemoglobin desaturation. ANIMALS: 8 healthy adult domestic shorthair cats. PROCEDURES: Each cat was anesthetized with dexmedetomidine and propofol, instrumented with a laryngeal mask, and allowed to breathe spontaneously (fraction of inspired oxygen, 1.0). The larynx was stimulated by spraying sterile water (0.3 mL) at the rima glottidis; a fiberscope placed in the laryngeal mask airway was used to detect evoked laryngospasm. Laryngeal stimulation was performed at baseline; after IV administration of gantacurium at doses of 0.1, 0.3, and 0.5 mg/kg; and after the effects of the last dose of gantacurium had terminated. Duration of apnea and hemoglobin oxygen saturation (measured by means of pulse oximetry) after each laryngeal stimulation were recorded. Neuromuscular block was monitored throughout the experiment by means of acceleromyography on a pelvic limb. RESULTS: Laryngospasm was elicited in all cats at baseline, after administration of 0.1 mg of gantacurium/kg, and after the effects of the last dose of gantacurium had terminated. The 0.3 and 0.5 mg/kg doses of gantacurium abolished laryngospasm in 3 and 8 cats, respectively, and induced complete neuromuscular block measured at the pelvic limb; the mean ± SE duration of apnea was 2 ± 1 minutes
and 3 ± 1.5 minutes, respectively. Hemoglobin oxygen saturation did not decrease significantly after administration of any dose of gantacurium. CONCLUSIONS AND CLINICAL RELEVANCE: Gantacurium may reduce tracheal intubation-associated morbidity in cats breathing oxygen.

**Adipose-derived stem cells in veterinary medicine: characterization and therapeutic applications.**
Mesenchymal stem cells, considered one of the most promising cell types for therapeutic applications due to their capacity to secrete regenerative bioactive molecules, are present in all tissues. Stem cells derived from the adipose tissue have been increasingly used for cell therapy in humans and animals, both as freshly isolated, stromal vascular fraction (SVF) cells, or as cultivated adipose-derived stem cells (ASCs). ASCs have been characterized in different animal species for proliferation, differentiation potential, immunophenotype, gene expression, and potential for tissue engineering. Whereas canine and equine ASCs are well studied, feline cells are still poorly known. Many companies around the world offer ASC therapy for dogs, cats, and horses, although in most countries these activities are not yet controlled by regulatory agencies. This is the first study to review the characterization and clinical use of SVF and ASCs in spontaneously occurring diseases in veterinary patients. Although a relatively large number of studies investigating ASC therapy in induced lesions are available in the literature, a surprisingly small number of reports describe ASC therapy for naturally affected dogs, cats, and horses. A total of seven studies were found with dogs, only two studies in cats, and four in horses. Taken as a whole, the results do not allow a conclusion on the effect of this therapy, due to the generally small number of patients included, diversity of cell populations used, and lack of adequate controls. Further controlled studies are clearly needed to establish the real potential of ASC in veterinary medicine.

**A review of the pharmacology of carbonic anhydrase inhibitors for the treatment of glaucoma in dogs and cats.**
Glaucoma is a heterogeneous group of disorders usually associated with elevated intraocular pressure (IOP), leading to optic nerve damage, retinal ganglion cell death and irreversible vision loss. Therefore, medications that lower IOP are the mainstay of glaucoma therapy. Carbonic anhydrase inhibitors (CAIs) are some of the principal drugs used in the management of canine and feline glaucoma. This paper summarises current knowledge of the mechanism of action of these agents and their effect on IOP in dogs and cats. It also discusses potential harmful side effects of CAIs and presents current opinions about their role and place in the medical management of glaucoma in small animals.

**Widespread correction of central nervous system disease after intracranial gene therapy in a feline model of Sandhoff disease.**
Sandhoff disease (SD) is caused by deficiency of N-acetyl-β-hexosaminidase (Hex) resulting in pathological accumulation of GM2 ganglioside in lysosomes of the central nervous system (CNS) and
progressive neurodegeneration. Currently, there is no treatment for SD, which often results in death by the age of five years. Adeno-associated virus (AAV) gene therapy achieved global CNS Hex restoration and widespread normalization of storage in the SD mouse model. Using a similar treatment approach, we sought to translate the outcome in mice to the feline SD model as an important step toward human clinical trials. Sixteen weeks after four intracranial injections of AAVrh8 vectors, Hex activity was restored to above normal levels throughout the entire CNS and in cerebrospinal fluid, despite a humoral immune response to the vector. In accordance with significant normalization of a secondary lysosomal biomarker, ganglioside storage was substantially improved, but not completely cleared. At the study endpoint, 5-month-old AAV-treated SD cats had preserved neurological function and gait compared with untreated animals (humane endpoint, 4.4±0.6 months) demonstrating clinical benefit from AAV treatment. Translation of widespread biochemical disease correction from the mouse to the feline SD model provides optimism for treatment of the larger human CNS with minimal modification of approach.

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.

In vitro inhibition of field isolates of feline calicivirus with short interfering RNAs (siRNAs).
Feline calicivirus (FCV) is a common infection of domestic cats. Most infections are mild and self-limiting; however more severe disease manifestations, such as FCV-associated virulent systemic disease, may be associated with significant morbidity and mortality. There is currently a lack of effective antiviral treatments for these disease manifestations. In this study, a panel of eight siRNAs were designed to target four conserved regions of the FCV genome. siRNAs were screened for in vitro antiviral efficacy against the reference strain FCV F9 by determination of extracellular virus titres and morphological assessment of protection from cytopathic effect. Three of the siRNA (FCV3.7, FCV4.1, and FCV4.2) demonstrated a marked antiviral effect with a greater than 99% reduction in extracellular viral titre. Titration of these effective siRNAs demonstrated a clear concentration-response relationship, with IC50 values of approximately 1nM, and combination treatment with multiple siRNAs.
demonstrated additive or synergistic effects. To assess the potential usefulness of the compounds in a clinical setting, siRNAs were screened against a panel of six recent Australian FCV isolates from cats with FCV-related disease. The siRNAs shown to be effective against the reference strain FCV F9 were active against the majority of the isolates tested, although some variability was noted. Taken together these data suggest potential therapeutic application of antiviral RNAi for treating FCV-associated disease in cats.

Identification of a nonsense mutation in feline ABCB1.
The aim of this study was to sequence all exons of the ABCB1 (MDR1) gene in cats that had experienced adverse reactions to P-glycoprotein substrate drugs (phenotyped cats). Eight phenotyped cats were included in the study consisting of eight cats that experienced central nervous system toxicosis after receiving ivermectin (n = 2), a combination product containing moxidectin and imidacloprid (n = 3), a combination product containing praziquantel and emodepside (n = 1) or selamectin (n = 2), and 1 cat that received the product containing praziquantel and emodepside but did not experience toxicity (n = 1). Fifteen exons contained polymorphisms and twelve exons showed no variation from the reference sequence. The most significant finding was a nonsense mutation (ABCB11930_1931del TC) in one of the ivermectin-treated cats. This cat was homozygous for the deletion mutation. All of the other phenotyped cats were homozygous for the wild-type allele. However, 14 missense mutations were identified in one or more phenotyped cats. ABCB11930_1931del TC was also identified in four nonphenotyped cats (one homozygous and three heterozygous for the mutant allele). Cats affected by ABCB11930_1931del TC would be expected to have a similar phenotype as dogs with the previously characterized ABCB1-1Δ mutation.

Epidermolysis bullosa in animals: a review.
Epidermolysis bullosa (EB) is a hereditary mechanobullous disease of animals and humans, characterized by an extreme fragility of the skin and mucous membranes. The main feature of EB in humans and animals is the formation of blisters and erosions in response to minor mechanical trauma. Epidermolysis bullosa is caused by mutations in the genes that code for structural proteins of the cytoskeleton of the basal keratinocytes or of the basement membrane zone. Based on the ultrastructural levels of tissue separation, EB is divided into the following three broad categories: epidermolysis bullosa simplex, junctional epidermolysis bullosa and dystrophic epidermolysis bullosa. Human types of EB are divided into several subtypes based on their ultrastructural changes and the mode of inheritance; subtypes are not fully established in animals. In humans, it is estimated that EB affects one in 17,000 live births; the frequency of EB in different animals species is not known. In all animal species, except in buffalo with epidermolysis bullosa simplex, multifocal ulcers are observed on the gums, hard and soft palates, mucosa of the lips, cheek mucosa and dorsum of the tongue. Dystrophic or absent nails, a frequent sign seen in human patients with EB, corresponds to the deformities and sloughing of the hooves in ungulates and to dystrophy or atrophy of the claws in dogs and cats. This review covers aspects of the molecular biology, diagnosis, classification, clinical signs and pathology of EB reported in animals.
Transcriptome analysis of feline infectious peritonitis virus infection.


Feline infectious peritonitis (FIP) is a lethal systemic disease caused by FIP virus (FIPV). There are no effective vaccines or treatment available, and the virus virulence determinants and pathogenesis are not fully understood. Here, we describe the sequencing of RNA extracted from Crandell Rees Feline Kidney (CRFK) cells infected with FIPV using the Illumina next-generation sequencing approach. Bioinformatics analysis, based on Felis catus 2X annotated shotgun reference genome, using CLC bio Genome Workbench is used to map both control and infected cells. Kal’s Z test statistical analysis is used to analyze the differentially expressed genes from the infected CRFK cells. In addition, RT-qPCR analysis is used for further transcriptional profiling of selected genes in infected CRFK cells and Peripheral Blood Mononuclear Cells (PBMCs) from healthy and FIP-diagnosed cats.

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.

Occlusion and malocclusion in the cat: What’s normal, what’s not and when’s the best time to intervene?


PRACTICAL RELEVANCE: Malocclusion affecting cats, and treatment thereof, has not been widely described in the veterinary literature, yet is a condition seen in a growing number of breeds, often causing pain and discomfort to the patient. Recognising the problem, and certainly whether it is a hereditary problem (e.g., a skeletal malocclusion), is important for the longer term health of pedigree breeds. CLINICAL CHALLENGES: If there is a malocclusion, the mouth may be painful and a thorough occlusal assessment of the conscious patient may be difficult. Occlusal assessment should always be accompanied by a thorough oral examination and, where necessary, further investigation under general anaesthesia, including dental radiography. Recognising what is normal, and what is not, can be challenging; so, too, can be determining the correct time to intervene. AUDIENCE: This article is intended to help fill the gap in dental education regarding the range of developmental and acquired malocclusions seen in cats. Treatment options are also briefly reviewed. EVIDENCE BASE: The
guidance contained in this article is based on a combination of the published literature, the author’s personal experience and that of colleagues.

**Pedicle ties provide a rapid and safe method for feline ovariohysterectomy.**


OBJECTIVES: The specific objectives of the present study were to evaluate the rate of hemorrhage-related complications across a large number of feline pedicle tie (PT) procedures, and evaluate for a difference in surgical time between traditional pedicle double ligation (PDL) and PT procedures.

METHODS: In the initial phase of the study, 2136 intact female cats underwent an ovariohysterectomy using the PT technique. Hemorrhagic complications not detected intraoperatively were to be confirmed via exploratory surgery or necropsy. The second phase of the study recorded the duration of surgery for four groups: kittens undergoing PTs (n = 50), kittens undergoing PDL (n = 49), adult cats undergoing PTs (n = 50) and adult cats undergoing PDL (n = 54). Kittens were defined as a cat 4 months old or younger. Statistical comparisons of age, body weight and surgical times between the PT and PDL groups were performed within, but not between, kitten and adult cat categories.

RESULTS: Six of 2136 (0.281%) cats experienced a hemorrhage-related complication associated with the ovarian pedicle. Five of the six ovarian pedicle hemorrhage-related complications were recognized and corrected intraoperatively, with the remaining hemorrhagic event being detected postoperatively. Surgical times were significantly shorter in PT kittens compared with PDL kittens (4.7 ± 0.1 mins vs 6.7 ± 0.1 mins) and PT adult cats compared with PDL adult cats (5.0 ± 0.2 mins vs 7.0 ± 0.2 mins).

CONCLUSIONS AND RELEVANCE: This study demonstrates that the PT technique is associated with a very low risk of hemorrhage-related complications and is significantly faster than double ligating the ovarian pedicle in kittens and adult cats. Use of the PT technique has the potential to be of significant economic benefit in institutions performing large numbers of feline ovariohysterectomies.

**Prognostic value of histologic grading for feline mammary carcinoma: a retrospective survival analysis.**


Feline mammary carcinoma is highly malignant and generally associated with a poor prognosis, although studies suggest the range of survival times in affected cats is broad. Histologic grading of these tumors is achieved using the Elston and Ellis system, originally developed for human breast cancer. In cats, however, classification using this method has variable prognostic value. Therefore, objectives of this study were (1) to evaluate the Elston and Ellis grading system for feline mammary carcinoma in a predominantly spayed population and (2) to determine whether modification of this system or development of a novel system improved the prognostic value of histologic grading. Survey data and histologic features for 108 carcinomas from 97 cats were analyzed with respect to overall survival. Elston and Ellis grading failed to correlate significantly with overall survival. Using multivariable analysis, lymphovascular invasion, nuclear form, and mitotic count each demonstrated independent prognostic significance (P =.008, <.001, and.004, respectively). Modifications of the Elston and Ellis system and a novel grading system were proposed based on these results; all showed significant correlation with overall survival (P <.001). Median survival times were 27, 29, or 31 months for grade I; 14, 12, or 14 months for grade II; and 13, 5, or 8 months for grade III carcinomas using the
mitotic-modified Elston and Ellis, the revised Elston and Ellis, or the novel grading system, respectively. Based on this retrospective study, adoption of the species-specific systems as proposed here may improve the prognostic value of histologic grading for feline mammary carcinoma.

Influence of music and its genres on respiratory rate and pupil diameter variations in cats under general anaesthesia: contribution to promoting patient safety.


OBJECTIVES: The aims of the study were to recognise if there is any auditory sensory stimuli processing in cats under general anaesthesia, and to evaluate changes in respiratory rate (RR) and pupillary diameter (PD) in anaesthetised patients exposed to different music genres, while relating this to the depth of anaesthesia. METHODS: A sample of 12 cats submitted for elective ovariohysterectomy were exposed to 2 min excerpts of three different music genres (classical [CM], pop [PM] and heavy metal [HM]) at three points during surgery (T1 = coeliotomy; T2 = ligature placement and transection of the ovarian pedicle; T3 = ligature placement and transection of the uterine body). A multiparametric medical monitor was used to measure the RR, and a digital calliper was used for PD measurement. Music was delivered through headphones, which fully covered the patient’s ears. P values <0.05 were considered to be statistically significant. RESULTS: Statistically significant differences between stimuli conditions for all surgical points were obtained for RR (T1, P = 0.03; T2, P = 0.00; and T3, P = 0.00) and for PD (T1, P = 0.03; T2, P = 0.04; and T3, P = 0.00). Most individuals exhibited lower values for RR and PD when exposed to CM, intermediate values to PM and higher values to HM. CONCLUSIONS AND RELEVANCE: The results suggest that cats under general anaesthesia are likely to perform auditory sensory stimuli processing. The exposure to music induces RR and PD variations modulated by the genre of music and is associated with autonomic nervous system activity. The use of music in the surgical theatre may contribute to allowing a reduced anaesthetic dose, minimising undesirable side effects and thus promoting patient safety.

Experimental Verification of the Effects on Normal Domestic Cats by Feeding Prescription Diet for Decreasing Stress.


The objective of this study was to evaluate the effects of diet on the feline stress response by measuring plasma and urinary cortisol. A study diet was developed with a unique combination of nutrients that supports the management of stressful situations. The specific formulation of the diet included alpha-casozepine, which is believed to have an anxiolytic effect, and tryptophan supplementation. Tryptophan is the precursor for the synthesis of the neurotransmitter serotonin. Twenty-one indoor cats were fed with the study diet (n = 10) or a control diet (n = 11) for 8 weeks, after which physiological responses were evaluated. The study diet significantly increased the ratio of plasma tryptophan to large neutral amino acids and decreased urinary cortisol concentrations after being consumed daily for 8 weeks, but there was no effect on plasma cortisol levels following a stressful event (veterinary examination and blood draw). Further studies, such as behavioral analyses, are needed to clarify the effects of the study diet.

Feline cystinuria caused by a missense mutation in the SLC3A1 gene.

**BACKGROUND:** Cystinuria is an inherited metabolic disease that is relatively common in dogs, but rare in cats and is characterized by defective amino acid reabsorption, leading to cystine urolithiasis. **OBJECTIVES:** The aim of this study was to report on a mutation in a cystinuric cat. **ANIMALS:** A male domestic shorthair (DSH) cat with cystine calculi, 11 control cats from Wyoming, and 54 DSH and purebred control cats from elsewhere in the United States. **METHODS:** Exons of the SLC3A1 gene were sequenced from genomic DNA of the cystinuric cat and a healthy cat. Genetic screening for the discovered polymorphisms was conducted on all cats. **RESULTS:** A DSH cat showed stranguria beginning at 2 months of age, and cystine calculi were removed at 4 months of age. The cat was euthanized at 6 months of age because of neurological signs possibly related to arginine deficiency. Twenty-five SLC3A1 polymorphisms were observed in the sequenced cats when compared to the feline reference sequence. The cystinuric cat was homozygous for 5 exonic and 8 noncoding SLC3A1 polymorphisms, and 1 of them was a unique missense mutation (c.1342C>T). This mutation results in a deleterious amino acid substitution (p.Arg448Trp) of a highly conserved arginine residue in the rBAT protein encoded by the SLC3A1 gene. This mutation was found previously in cystinuric human patients, but was not seen in any other tested cats. **CONCLUSIONS AND CLINICAL IMPORTANCE:** This study is the first report of an SLC3A1 mutation causing cystinuria in a cat, and could be used to characterize other cystinuric cats at the molecular level.

Comparison of anamnestic responses to rabies vaccination in dogs and cats with current and out-of-date vaccination status.


**OBJECTIVE:** To compare anamnestic antibody responses of dogs and cats with current versus out-of-date vaccination status. **DESIGN:** Cross-sectional study. **ANIMALS:** 74 dogs and 33 cats. **PROCEDURES:** Serum samples were obtained from dogs and cats that had been exposed to rabies and brought to a veterinarian for proactive serologic monitoring or that had been brought to a veterinarian for booster rabies vaccination. Blood samples were collected on the day of initial evaluation (day 0) and then again 5 to 15 days later. On day 0, a rabies vaccine was administered according to label recommendations. Paired serum samples were analyzed for antirabies antibodies by means of a rapid fluorescent focus inhibition test. **RESULTS:** All animals had an antirabies antibody titer ≥ 0.5 IU/mL 5 to 15 days after booster vaccination. Dogs with an out-of-date vaccination status had a higher median increase in titer, higher median fold increase in titer, and higher median titer following booster vaccination, compared with dogs with current vaccination status. Most (26/33) cats, regardless of rabies vaccination status, had a titer ≥ 12 IU/mL 5 to 15 days after booster vaccination. **CONCLUSIONS AND CLINICAL RELEVANCE:** Results indicated that dogs with out-of-date vaccination status were not inferior in their antibody response following booster rabies vaccination, compared with dogs with current vaccination status. Findings supported immediate booster vaccination followed by observation for 45 days of dogs and cats with an out-of-date vaccination status that are exposed to rabies, as is the current practice for dogs and cats with current vaccination status.

**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 asymptptomatically infect the mouth of cats.

**Oral Papillomas Associated With Felis catus Papillomavirus Type 1 in 2 Domestic Cats.**


Multiple small sessile raised lesions were detected on the ventral surface of the tongue in two 13-year-old domestic cats. The lesions were incidental in both cats. Lesions from both cats appeared histologically as well-demarcated foci of markedly thickened folded epithelium that formed keratin-filled shallow cuplike structures. Large keratinocytes that contained a swollen nucleus surrounded by a clear cytoplasmic halo (koilocytes) were common, suggesting a diagnosis of a papillomavirus-induced papillomas, and papillomavirus antigen was demonstrated by immunohistochemistry. The papillomas exhibited diffuse intense cytoplasmic and nuclear immunoreactivity against cyclin-dependent kinase inhibitor 2A protein (also known as p16 or INK4a protein). Felis catus papillomavirus type 1 DNA sequences were amplified from both papillomas. The papillomas resolved in 1 cat within 3 months of diagnosis, while the papillomas were still visible 4 months after diagnosis in the other cat. This is the first evidence that these papillomas are caused by *F. catus* papillomavirus type 1.

**Nosocomial spread of Mycobacterium bovis in domestic cats.**


Five domestic cats were euthanased owing to confirmed or suspected *Mycobacterium bovis* infection. The initial source of infection remains unclear. Cat A was presented to a veterinary clinic in County Kildare, Ireland, with a discharging submandibular lesion. The infection appears to have been transmitted to four other cats through direct (cats B and C living in the same household as cat A) and non-direct (nosocomial spread during routine operations; cats D and E) contact over a 13.5-week period. Of the five cases, two (B and D) had post-mortem examinations in which gross changes consistent with tuberculosis were seen, moderate numbers of acid-fast bacteria (AFB) were seen on microscopy and *M bovis* (spoligotype SB0978) was confirmed on culture. Of the remaining three cats, one had a swab taken from its draining ovariohysterectomy wound, which revealed large numbers of AFB with morphology consistent with *M bovis* (cat E). Two cases were euthanased without diagnostic tests; however, their history and clinical presentations were highly suggestive of tuberculosis (cats A and C). To our knowledge, this is the first documented case of nosocomial spread of *M bovis* in cats.
Susceptibility of Microsporum canis arthrospores to a mixture of chemically defined essential oils: a perspective for environmental decontamination.


The zoophilic dermatophyte Microsporum canis has cats as natural reservoir, but it is able to infect a wide range of hosts, including humans, where different clinical features of the so-called ringworm dermatophytosis have been described. Human infections are increasingly been reported in Mediterranean countries. A reliable control program against *M. canis* infection in cats should include an antifungal treatment of both the infected animals and their living environment. In this article, a herbal mixture composed of chemically defined essential oils (EOs) of Litsea cubeba (1%), Illicium verum, Foeniculum vulgare, and Pelargonium graveolens (0.5% each) was formulated and its antifungal activity assessed against *M. canis* arthrospores which represent the infective environmental stage of *M. canis*. Single compounds present in higher amounts in the mixture were also separately tested in vitro. Litsea cubeba and *P. graveolens* EOs were most effective (minimum inhibitory concentration (MIC) 0.5%), followed by EOs of *I. verum* (MIC 2%) and *F. vulgare* (MIC 2.5%). Minimum fungicidal concentrations (MFC) values were 0.75% (*L. cubeba*), 1.5% (*P. graveolens*), 2.5% (*I. verum*) and 3% (*F. vulgare*). MIC and MFC values of the mixture were 0.25% and 0.5%, respectively. The daily spray of the mixture (200 µL) directly onto infected hairs inhibited fungal growth from the fourth day onwards. The compounds present in higher amounts exhibited variable antimycotic activity, with MIC values ranging from >10% (limonene) to 0.1% (geranial and neral). Thus, the mixture showed a good antifungal activity against arthrospores present in infected hairs. These results are promising for a further application of the mixture as an alternative tool or as an adjuvant in the environmental control of feline microsporosis.

Polycystic kidney disease in four British shorthair cats with successful treatment of bacterial cyst infection.


Polycystic kidney disease is the most common inherited disorder in cats. Renal cysts progressively increase in size and number, resulting in a gradual decrease in kidney function. An autosomal dominant mutation in exon 29 of the polycystin-1 gene has been identified, mostly in Persian and Persian-related breeds. This case study describes polycystic kidney disease in four British shorthair cats, of which two had the same genetic mutation reported in Persian and Persian-related cats. This likely reflects introduction of this mutation into the British shorthair breeding line because of previous outcrossing with Persian cats. An infected renal cyst was diagnosed and successfully treated in one of the cats. This is a commonly reported complication in human polycystic kidney disease, and to the authors’ knowledge has not previously been reported in cats with polycystic kidney disease.

Negative pressure wound therapy augmented full-thickness free skin grafting in the cat: outcome in 10 grafts transferred to six cats.


OBJECTIVES: The aim of this clinical evaluation was to describe the technique and outcomes of negative pressure wound therapy (NPWT) augmented skin grafting in cats. METHODS: Cats with soft...
tissue and skin defects (n = 6) underwent open wound management. Wounds were initially covered using a NPWT system that was changed to polyurethane foam dressing once infection was controlled and granulation started. Final closure was achieved after establishment of a healthy, fully granulated wound bed by grafting of free full-thickness skin from the lateral abdominal wall. The freshly grafted skin was then treated with an NPWT dressing at a pressure of -125 mmHg for 3 days with dressing changes performed daily. Percentage graft take, complications, wound bioburden and cosmetic outcome were recorded. RESULTS: The mean duration of open wound management was 21.4 days (range 3.0-45.0 days), with a mean duration of NPWT of 8.0 days (range 3.0-14.0 days). Five cats received a single graft, while one cat had five grafts transferred to the right hindlimb. In 7/10 grafts, graft take was 100%, in two grafts take was 95% and in one graft take was 80% (mean take rate 97%). Therapy was well tolerated in all patients. The grafted site displayed normal hair regrowth in four cats, sparse hair regrowth in one and no hair growth at all in one patient. Skin sensation was normal in all grafted patients. CONCLUSIONS AND RELEVANCE: Skin graft augmentation using NPWT in cats is a feasible option that allows graft fixation, even in anatomically demanding areas. Graft take rate reported here is slightly higher than documented in previous reports.

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.

Longevity and mortality of cats attending primary care veterinary practices in England.


Enhanced knowledge on longevity and mortality in cats should support improved breeding, husbandry, clinical care and disease prevention strategies. The VetCompass research database of primary care veterinary practice data offers an extensive resource of clinical health information on companion animals in the UK. This study aimed to characterise longevity and mortality in cats, and to identify important demographic risk factors for compromised longevity. Crossbred cats were hypothesised to live longer than purebred cats. Descriptive statistics were used to characterise the deceased cats. Multivariable linear regression methods investigated risk factor association with longevity in cats that died at or after 5 years of age. From 118,016 cats attending 90 practices in England, 4009 cats with confirmed deaths were randomly selected for detailed study. Demographic characterisation showed that 3660 (91.7%) were crossbred, 2009 (50.7%) were female and 2599 (64.8%) were neutered. The most
frequently attributed causes of mortality in cats of all ages were trauma (12.2%), renal disorder (12.1%), non-specific illness (11.2%), neoplasia (10.8%) and mass lesion disorders (10.2%). Overall, the median longevity was 14.0 years (interquartile range [IQR] 9.0-17.0; range 0.0-26.7). Crossbred cats had a higher median longevity than purebred cats (median [IQR] 14.0 years [9.1-17.0] vs 12.5 years [6.1-16.4]; P <0.001), but individual purebred cat breeds varied substantially in longevity. In cats dying at or after 5 years (n = 3360), being crossbred, having a lower bodyweight, and being neutered and non-insured were associated with increased longevity. This study described longevity in cats and identified important causes of mortality and breed-related associations with compromised longevity.

**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.

**Translational value of animal models of obesity-Focus on dogs and cats.**


A prolonged imbalance between a relative increase in energy intake over a decrease in energy expenditure results in the development of obesity; extended periods of a positive energy balance eventually lead to the accumulation of abnormally high amounts of fat in adipose tissue but also in other organs. Obesity is considered a clinical state of impaired general health in which the excessive increase in adipose tissue mass may be associated with metabolic disorders such as type 2 diabetes mellitus, hyperlipidemia, hypertension and cardiovascular diseases. This review discusses briefly the use of animal models for the study of obesity and its comorbidities. Generally, most studies are performed with rodents, such as diet induced obesity and genetic models. Here, we focus specifically on two different species, namely dogs and cats. Obese dogs and cats show many features of human obesity. Interestingly, however, dogs and cats differ from each other in certain aspects because even though obese dogs may become insulin resistant, this does not result in the development of diabetes mellitus. In fact, diabetes in dogs is typically not associated with obesity because dogs present a type 1 diabetes-like syndrome. On the other hand, obese cats often develop diabetes mellitus which shares many features with human type 2 diabetes; feline and human diabetes are similar in respect to their
pathophysiology, underlying risk factors and treatment strategies. Our review discusses genetic and endocrine factors in obesity, discusses obesity induced changes in lipid metabolism and includes some recent findings on the role of gut microbiota in obesity. Compared to research in rodent models, the array of available techniques and tools is unfortunately still rather limited in dogs and cats. Hence, even though physiological and pathophysiological phenomena are well described in dogs and cats, the underlying mechanisms are often not known and studies investigating causality specifically are scarce.

The use of a nerve stimulation test to confirm sacrococcygeal epidural needle placement in cats.


OBJECTIVE: To determine if a nerve stimulation test (NST) could act as a monitoring technique to confirm sacrococcygeal epidural needle placement in cats. STUDY DESIGN: Prospective experimental trial in a clinical setting. ANIMALS: Twenty-four adult cats, scheduled for a therapeutic procedure where epidural anesthesia was indicated. METHODS: Under general anesthesia, an insulated needle was inserted through the S3-Cd1 intervertebral space guided by the application of a fixed electrical current (0.7 mA) until a motor response was obtained. The NST was considered positive when the epidural nerve stimulation produced a motor response of the muscles of the tail, whereas it was considered negative when no motor response was evoked. In the NST positive cases, 0.3 mL kg(-1) of 0.5% bupivacaine was administrated before needle withdrawal. Ten minutes after injection, epidural blockade was confirmed by the loss of perineal (anal), and pelvic limbs reflexes (patellar and withdrawal). RESULTS: The use of a fixed electrical stimulation current of 0.7 mA resulted in correct prediction of sacrococcygeal epidural injection, corroborated by post bupivacaine loss of perineal and pelvic limb reflexes, in 95.8% of the cases. CONCLUSION AND CLINICAL RELEVANCE: This study demonstrates the feasibility of using, in a clinical setting, an electrical stimulation test as an objective and in real-time method to confirm sacrococcygeal epidural needle placement in cats.

Changes in Serum and Urine SAA Concentrations and Qualitative and Quantitative Proteinuria in Abyssinian Cats with Familial Amyloidosis: A Five-year Longitudinal Study (2009-2014).


BACKGROUND: Diagnosis of familial amyloidosis (FA) in Abyssinian cats usually is made on postmortem examination. HYPOTHESIS/OBJECTIVES: Sequential analysis of serum SAA (sSAA), urinary SAA (uSAA), urinary protein:creatinine (UPC) ratio, or sodium-dodecylsulfate agarose gel electrophoresis (SDS-AGE) may facilitate early identification of cats with FA. ANIMALS: Twenty-three Abyssinian cats belonging to cattery A or B (low and high prevalence of FA, respectively). METHODS: Prospective longitudinal study using 109 blood and 100 urine samples collected over 4-year period every 4 months, if possible, or more frequently in case of illness. Cats that died during study were necropsied. Health status of live cats was checked 5 years after enrollment. Serum amyloid A (sSAA) and urinary SAA (uSAA) were measured using ELISA kit. The UPC ratio and SDS-AGE also was performed. RESULTS: Familial amyloidosis was not identified in cattery A, whereas 7/14 cats from cattery B had FA. Serum amyloid A concentrations were not significantly different between cats in catteries A and B or between cats with or without FA, despite frequent peaks in cats from cattery B. Conversely, uSAA was significantly higher in cattery B, especially in the terminal phases of FA. Proteinuria occasionally was found in cats from both catteries, especially in those with FA. Urine
protein electrophoresis identified mixed proteinuria only in cats with FA. CONCLUSIONS AND CLINICAL IMPORTANCE: Serum amyloid A and UPC ratio are not helpful for early identification of Abyssinian cats with FA. Conversely, increases in uSAA with or without mixed proteinuria may be found before onset of clinical signs in cats with FA.

The effect of butorphanol on the incidence of dexmedetomidine-induced emesis in cats.


OBJECTIVE: To evaluate the antiemetic effect of butorphanol (BUT) when co-administered with dexmedetomidine (DEX) in cats. STUDY DESIGN: Double-blind, randomized controlled cross-over experimental study. ANIMALS: Fourteen purpose-bred healthy Domestic Short Hair cats, seven females and seven males, aged median (range) 14-84 (78) months and weighing 1.7-5.5 (4.0) kg. METHODS: Each cat received five different treatment protocols intramuscularly (IM): (A) 25 µg kg(-1) DEX; (B) 20 µg kg(-1) DEX and 0.2 mg kg(-1) BUT; (C) 20 µg kg(-1) DEX and 0.1 mg kg(-1) BUT; (D) 25 µg kg(-1) DEX and 0.2 mg kg(-1) BUT; and (E) 20 µg kg(-1) DEX. Episodes of emesis, incidence and severity of nausea, and time to lateral recumbency were recorded for a period of 8 minutes after treatment administration, and the sedation was scored at the end of this period. The Friedman test and the Cochran’s Q-test were used to analyse the data. Significance was evaluated at the 5% level. RESULTS: The proportion of cats that vomited was significantly lower with the treatment protocols that included BUT (B, C and D) compared with the protocols that included only DEX (A and E). The proportion of cats that had nausea was significantly higher with the protocols that included only DEX (A and E) compared with protocols B and D. Time to lateral recumbency (p = 0.09) and sedation score (p = 0.07) was not statistically different between the treatment protocols. CONCLUSIONS AND CLINICAL RELEVANCE: Butorphanol can be used to prevent emesis and reduce the incidence and the severity of nausea caused by DEX in cats. It seems that the combination of BUT and DEX is very useful not only when emesis could result in serious complications, but also to provide comfort and well-being in cats sedated for minor procedures.

Evaluation of the effect of orally administered acid suppressants on intragastric pH in cats.


BACKGROUND: Acid suppressant drugs are a mainstay of treatment for cats with gastrointestinal erosion and ulceration. However, clinical studies have not been performed to compare the efficacy of commonly PO administered acid suppressants in cats. HYPOTHESIS/OBJECTIVES: To compare the effect of PO administered famotidine, fractionated omeprazole tablet (fOT), and omeprazole reformulated paste (ORP) on intragastric pH in cats. We hypothesized that both omeprazole formulations would be superior to famotidine and placebo. ANIMALS: Six healthy adult DSH colony cats. METHODS: Utilizing a randomized, 4-way crossover design, cats received 0.88-1.26 mg/kg PO q12h fOT, ORP, famotidine, and placebo (lactose capsules). Intragastric pH monitoring was used to continuously record intragastric pH for 96 hours beginning on day 4 of treatment. Plasma omeprazole concentrations at steady state (day 7) were determined by high performance liquid chromatography (HPLC) with ultraviolet detection. Mean percentage time that intragastric pH was ≥ 3 and ≥ 4 were compared among groups using ANOVA with a posthoc Tukey-Kramer test (α = 0.05). RESULTS: The mean percentage time ± SD that intragastric pH was ≥ 3 was 68.4 ± 35.0% for fOT, 73.9 ± 23.2% for
ORP, 42.8 ± 18.6% for famotidine, and 16.0 ± 14.2% for placebo. Mean ± SD plasma omeprazole concentrations were similar in cats receiving fOT compared to those receiving ORP and in a range associated with acid suppression reported in other studies. CONCLUSIONS AND CLINICAL IMPORTANCE: These results suggest that both omeprazole formulations provide superior acid suppression in cats compared to famotidine or placebo. Fractionated enteric-coated OT is an effective acid suppressant despite disruption of the enteric coating.

Postanaesthetic tear production and ocular irritation in cats.

OBJECTIVE: General anaesthesia significantly reduces tear production and normal values are not immediately re-established on ending anaesthesia. Therefore, adequate protection of the cornea has to be assured during the perianaesthetic period. There are various methods available, including taping of the eyelids and the application of eye ointments, gels and drops. In human medicine studies, different formulations were found to induce signs of ocular irritation. The aim of the present study was to determine tear production in cats after general anaesthesia, and to identify possible causes of irritation. MATERIAL AND METHODS: Tear production was determined in 41 cats after general anaesthesia and eyes were examined for signs of irritation. Two different anaesthetic protocols were used. To protect the cornea, an ointment and gel were applied to the right and left eyes, respectively. RESULTS: Postoperatively, tear production was significantly reduced for 6 hours and 18 hours in the right and left eyes, respectively. Two hours after anaesthesia, blepharospasm of the right eye was observed in 92.7% (n = 38) of the cats. In contrast, the left eye was always held open. CONCLUSIONS: This study demonstrated that tear production in cats is significantly decreased both during and after anaesthesia. The degree of reduction was independent of the anaesthetic protocol. Both the eye ointment and gel proved effective in protecting the corneal surface. However, eye gel use is recommended because the eye ointment consistently caused an irritation comparable to the foreign-body sensation reported in humans.

Levels of feline infectious peritonitis virus in blood, effusions, and various tissues and the role of lymphopenia in disease outcome following experimental infection.

Twenty specific pathogen free cats were experimentally infected with a virulent cat-passaged type I field strain of FIPV. Eighteen cats succumbed within 2-4 weeks to effusive abdominal FIP, one survived for 6 weeks, and one seroconverted without outward signs of disease. A profound drop in the absolute count of blood lymphocytes occurred around 2 weeks post-infection (p.i.) in cats with rapid disease, while the decrease was delayed in the one cat that survived for 6 weeks. The absolute lymphocyte count of the surviving cat remained within normal range. Serum antibodies as measured by indirect immunofluorescence appeared after 2 weeks p.i. and correlated with the onset of disease signs. Viral genomic RNA was either not detectable by reverse transcription quantitative real-time PCR (RT-qPCR) or detectable only at very low levels in terminal tissues not involved directly in the infection, including hepatic and renal parenchyma, cardiac muscle, lung or popliteal lymph node. High tissue virus loads were measured in severely affected tissues such as the omentum, mesenteric lymph nodes and spleen. High levels of viral genomic RNA were also detected in whole ascitic fluid, with the
cellular fraction containing 10-1000 times more viral RNA than the supernatant. Replicating virus was strongly associated with macrophages by immunohistochemistry. Virus was usually detected at relatively low levels in feces and there was no evidence of enterocyte infection. Viral genomic RNA was not detected at the level of test sensitivity in whole blood, plasma, or the white cell fraction in terminal samples from the 19 cats that succumbed or in the single survivor. These studies reconfirmed the effect of lymphopenia on disease outcome. FIPV genomic RNA was also found to be highly macrophage associated within diseased tissues and effusions as determined by RT-qPCR and immunohistochemistry but was not present in blood.

**Leishmaniosis of companion animals in Europe: an update.**


Leishmaniosis caused by Leishmania infantum is a vector-borne zoonotic disease endemic in southern Europe, but which is spreading northwards. Millions of dogs, cats and other non-conventional companion animals susceptible to L. infantum, living in European households, may develop a severe disease and contribute to the spread of leishmaniosis because of travelling or re-homing. Dogs are the main reservoir but other new reservoirs have recently been incriminated. Sand flies remain the sole proven vector and non-vectorial transmission has been reported at individual level and in areas where the vector is absent. Clinical disease affects only a proportion of infected dogs and a complex genetic background of immune response is responsible for this susceptibility. There is a wide range of serological and parasitological diagnostic tools available whose cost-effective use depends on a reasoned approach. Clinical response to treatment of sick dogs is variable. Clinical cure is often obtained but clinical recurrence can occur and post-therapy follow up should be maintained life-long. In Europe, vaccination can be combined with individual protection with pyrethroids as part of an integrated approach to prevention. L. infantum is the only species isolated from cats in Europe and xenodiagnosis substantiated that infected cats are infectious for sand flies. Feline infection may be frequent in endemic areas, but prevalence is generally lower than in dogs. When cats are tested by both serological and molecular techniques discordant results are often observed. Feline cases have been reported from endemic areas in Italy, France, Spain and Portugal, but four cases were also diagnosed in Switzerland in cats that had travelled to or been imported from Spain. Half of the cases were diagnosed in cats with impaired immune responses. Clinical manifestations compatible with feline leishmaniosis include lymph node enlargement, skin and mucocutaneous lesions, ocular lesions, chronic gingivostomatitis, hypergammaglobulinemia, and normocytic normochromic anemia. Cats have been empirically treated with some drugs used in dogs. Due to polymorphic clinical picture and the insidious progressive course, leishmaniosis can persist for a long time before dogs or cats are brought to a veterinarian and so diagnosis can be delayed. Exotic or new Leishmania spp. have been reported in humans, animals and vectors in Europe. This changing situation requires attention in Europe for designing epidemiological studies and control measures.

**Impact of fixation method on postoperative complication rates following surgical stabilization of diaphyseal tibial fractures in cats.**


OBJECTIVES: To compare the complication rate between open reduction and internal fixation (ORIF) and external skeletal fixation (ESF) for feline diaphyseal tibial fractures. METHODS: In a retrospective
study spanning a 10 year period, 57 feline tibial fractures stabilized via ESF or ORIF were included for analysis and complication rates were compared between the two methods. RESULTS: In the overall study population, 23 (40.4%) cases suffered complications (9 major, 20 minor, 6 with both major and minor). All of the major complications occurred in the ESF group. Complications were more common in cats with ESF (50.0%) while only one (7.7%) of the ORIF cases suffered complications (OR 12.0 [CI: 2.09; 228.10], p = 0.02). Use of postoperative antibiotic medications was identified as a confounder. After adjusting for confounding, stabilization using ESF remained associated with a higher risk of complications (OR = 13.71 [CI: 2.18; 274.25], p = 0.02). Cats with ESF had a longer duration of follow-up (15.6 weeks; 95% CI: 13.0; 18.3) compared to ORIF (9.5 weeks; 95% CI: 6.4; 12.7) (p = 0.003), and a higher number of revisits (mean 3.0; 95% CI: 2.4; 3.6) than the ORIF group (mean 1.6; 95% CI: 0.9; 2.3) (p = 0.002). CLINICAL SIGNIFICANCE: This study demonstrates a significant difference in complication rates between the methods of stabilization, with ESF resulting in a significantly higher complication rate compared to ORIF. Based on these results, it may be prudent to select ORIF for stabilization of feline tibial fractures wherever practical.


PRACTICAL RELEVANCE: Periodontal disease is commonly encountered in feline practice. Gingivitis, followed by inflammation of the rest of the periodontal tissues, can lead to chronic oral infection, bacteraemia, pain and ultimately tooth loss. Given adequate plaque control and thorough, consistent dental home care, gingivitis is a reversible and controllable condition. Periodontitis, however, is an essentially irreversible and progressive condition. Treatment aims to control tissue inflammation, returning the gingiva to clinical health and preventing destruction of the periodontium in other parts of the mouth. CLINICAL CHALLENGES: Diagnosis must be established using a combination of oral examination under anaesthesia and dental radiography. Periodontitis leads to tooth attachment loss, and given the short length of most cat teeth, probing depths of 1 mm or more should alert the clinician to the presence of periodontitis. The decision of whether to extract or preserve affected teeth needs careful consideration. In practice, as periodontitis is often associated with type 1 tooth resorption, extraction is often required, but the slender and delicate nature of feline tooth roots, compounded by the destructive nature of tooth resorption, can frustrate extraction attempts. As highlighted in this article, iatrogenic damage to teeth is also a real risk if periodontal therapy procedures (including scaling and polishing) are not performed carefully. The challenges of providing home care in the cat are additionally discussed. EVIDENCE BASE: The authors have drawn upon, wherever possible, an evidence base relating strictly to the feline patient. Where there is a lack of published research, evidence from canine and human studies is assessed.

Prevalence and degree of thyroid pathology in hyperthyroid cats increases with disease duration: a cross-sectional analysis of 2096 cats referred for radioiodine therapy.


OBJECTIVES: Hyperthyroidism is common in cats, but there are no reports that evaluate its severity or underlying thyroid tumor disease based on disease duration (ie, time from original diagnosis). The objective of this study was to compare serum thyroxine (T4) concentrations and thyroid scintigraphic characteristics of cats referred for radioiodine treatment based on disease duration. METHODS: This
was a cross-sectional study of 2096 cats with hyperthyroidism. Cats were divided into five groups based on time from diagnosis: ≥1 year (n = 1773); >1-2 years (n = 169); >2-3 years (n = 88); >3-4 years (n = 35); and >4-6.1 years (n = 31). Methimazole, administered to 996 (47.5%) cats, was stopped at least 1 week prior to examination to allow for serum T4 testing. Each thyroid scintiscan was evaluated for pattern (unilateral, bilateral, multifocal), location (cervical, thoracic inlet, chest) and size (small, median, large, huge) of the thyroid tumor, as well as features suggesting malignancy.

RESULTS: Median serum T4 concentration increased with increasing disease duration from 100 nmol/l (<1 year) to 315 nmol/l (>4-6.1 years) (P <0.001). Prevalence of unilateral thyroid disease decreased, whereas multifocal disease (three or more tumor nodules) increased (P <0.001) with increasing disease duration. Median tumor volume in the five groups increased from 1.6 cm(3) (<1 year) to 6.4 cm(3) (>4-6.1 years). Prevalence of large (4-8 cm(3)) and huge (>8 cm(3)) thyroid tumors increased from 5.1% (<1 year) to 88.6% (>4-6.1 years), while the prevalence of intrathoracic tumor tissue increased from 3.4% (<1 year) to 32.3% (>4-6.1 years). Prevalence of suspected thyroid carcinoma (characterized by severe hyperthyroidism; huge, intrathoracic, multifocal tumors; refractory to methimazole treatment) increased with increasing disease duration from 0.4% (<1 year) to 19.3% (>4-6.1 years). CONCLUSIONS AND RELEVANCE: Our results indicate that the prevalence of severe hyperthyroidism, large thyroid tumors, multifocal disease, intrathoracic thyroid masses and suspected malignant disease all increase with disease duration in cats referred for radioiodine therapy.

Thyroid scintigraphy findings in 2096 cats with hyperthyroidism.

Thyroid scintigraphy is currently the reference standard for diagnosing and staging cats with hyperthyroidism, but few studies describing the scintigraphic characteristics in a large number of cats have been reported. The objective of this study was to better characterize thyroid scintigraphy findings by evaluating 2096 consecutive cats with hyperthyroidism that were referred over a 3.5-year period. Of these cats, 2068 (98.7%) had a high thyroid-to-salivary ratio (>1.5), whereas 2014 (96.1%) were found to have a high thyroid-to-background ratio (>6.1). When the patterns of the cats’ thyroid disease were recorded, 665 (31.7%) had unilateral disease, 1060 (50.6%) had bilateral-asymmetric disease (two thyroid lobes unequal in size), 257 (12.3%) had bilateral-symmetric disease (both lobes similar in size), and 81 (3.9%) had multifocal disease (≥3 areas of increased radionuclide uptake). The number of areas of (99m) TcO(-4) uptake in the 2096 cats ranged from 1 to 6 (median, 2), located in the cervical area in 2057 (98.1%), thoracic inlet in 282 (13.5%), and in the thoracic cavity in 115 (5.5%). Ectopic thyroid tissue (e.g. lingual or mediastinal) was diagnosed in 81 (3.9%) cats, whereas thyroid carcinoma was suspected in 35 (1.7%) of the cats. The results of this study support conclusions that most hyperthyroid cats have unilateral or bilateral thyroid nodules, but that multifocal disease will develop in a few cats that have ectopic thyroid disease or thyroid carcinoma. Both ectopic thyroid disease and thyroid carcinoma are relatively uncommon in hyperthyroid cats, with a respective prevalence of ~4% and ~2% in this study.

The impact of surgical timing and intervention on outcome in traumatized dogs and cats.
OBJECTIVE: To review the relevant human and veterinary literature regarding the timing of surgical intervention for trauma patients and the impact on outcome. DATA SOURCES: Original research, clinical studies, and review articles with no date restrictions from both human and veterinary literature. HUMAN DATA SYNTHESIS: Despite extensive research into the ideal timing of surgical intervention for human trauma victims, debate is ongoing and views are still evolving. Prior to the 1970s, the standard of care consisted of delayed surgical treatment, as these patients were considered too ill to undergo surgery. Beginning in the 1970s, and continuing for nearly 2 decades, early definitive surgical treatment was recommended. The most recent evolution of human trauma management incorporates the concept of damage control surgery, which acknowledges the importance of early skeletal stabilization or laparotomy for reducing morbidity while attempting to avoid complications such as acute respiratory distress syndrome or multiple organ dysfunction syndrome. VETERINARY DATA SYNTHESIS: Despite a relatively large amount of literature available regarding veterinary trauma, no evidence exists to provide the clinician guidance as to the ideal timing of surgery for trauma patients. With the exception of diaphragmatic hernia, no studies were identified that attempted to evaluate this variable. CONCLUSIONS: Veterinary-specific studies are needed to evaluate the impact of surgical timing on outcome following trauma. The information that can be obtained from studies in this area can improve veterinary trauma care and may be used as models for human trauma care through translational applications.

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.

Clinical evaluation of the v-gel supraglottic airway device in comparison with a classical laryngeal mask and endotracheal intubation in cats during spontaneous and controlled mechanical ventilation.
OBJECTIVE: To compare airway management during induction of anaesthesia, in spontaneous ventilation and controlled mechanical ventilation (CMV), using a cat-specific supraglottic airway device (the v-gel), a classical laryngeal mask (LM) or an endotracheal tube (ETT). STUDY DESIGN: Prospective, randomized clinical trial. ANIMALS: Forty-five healthy cats. METHODS: After premedication, cats were randomly allocated to one of three groups to secure the airway: 1) v-gel; 2) LM; or 3) ETT (cuff pressure: 20 cm H2 O). Cats were anaesthetized for elective procedures. The dose of propofol necessary to insert the v-gel, LM or ETT, the number of attempts required to achieve insertion and leakage during spontaneous ventilation and CMV at different peak inspiratory pressures (8, 10, 12, 14 and 16 cm H2 O) were recorded. Leakage of >20% of tidal volume was considered as a criterion for exclusion. Significance was set at a p-value of <0.05. RESULTS: Cats in the v-gel group required a median (range) of 3 mg kg(-1) (2-5 mg kg(-1)) of propofol for successful placement, which was significantly less than the 5 mg kg(-1) (3-7 mg kg(-1)) required for endotracheal intubation (p = 0.005). No significant difference in the total dose of propofol was observed between the v-gel and LM [3 mg kg(-1) (2-7 mg kg(-1))] groups or the ETT and LM groups. Significantly more cats in the ETT group were excluded for leakage of >20% during CMV at all pressure settings. CONCLUSIONS AND CLINICAL RELEVANCE: The v-gel is a practical alternative to the LM and ETT for securing the airway after induction of anaesthesia and for CMV up to 16 cm H2 O in healthy cats. The v-gel can be inserted at a more superficial level of anaesthesia than the ETT and showed significantly less leakage during CMV than the ETT.

Pancreatic surgical biopsy in 24 dogs and 19 cats: postoperative complications and clinical relevance of histological findings.


OBJECTIVE: To assess the immediate postoperative complications associated with pancreatic biopsy in dogs and cats and review the clinical relevance of biopsy findings. METHODS: Retrospective review of clinical records from two referral institutions for cases undergoing pancreatic biopsy between 2000 and 2013. RESULTS: Twenty-four dogs and 19 cats that had surgical pancreatic biopsy had sufficient detail in their clinical records and fulfilled the inclusion criteria. Postoperative complications were seen in 10 cases of which 5 were suggestive of post-surgical pancreatitis. Two patients were euthanased within 10 days of surgery because of the underlying disease; neither suffered postoperative complications. Pancreatic pathology was found in 19 cases, 7 cases showed no change other than benign pancreatic nodular hyperplasia, and no abnormalities were seen in 18 cases. CLINICAL SIGNIFICANCE: Complications may be encountered following surgical pancreatic biopsy, although the risk should be minimal with good surgical technique. Pancreatic biopsy may provide a useful contribution to case management but it is not clear whether a negative pancreatic biopsy should be used to rule out pancreatic disease. Dogs were more likely to have no significant pathology found on pancreatic biopsy than cats, where chronic pancreatitis was the most common finding.

Assessment of intravenous adipose-derived allogeneic mesenchymal stem cells for the treatment of feline chronic kidney disease: a randomized, placebo-controlled clinical trial in eight cats.

OBJECTIVES: Feline chronic kidney disease (CKD) is characterized by chronic tubulointerstitial nephritis, and inflammation contributes to the progression of renal fibrosis. Mesenchymal stem cells (MSCs) have demonstrated anti-inflammatory and antifibrotic effects in rodent CKD models. However, few randomized trials evaluating the effectiveness of MSC therapy for diseases in companion animals have been reported. The purpose of this study was to evaluate the effectiveness of allogeneic MSCs for the treatment of feline CKD using a randomized, placebo-controlled trial. METHODS: MSCs were isolated from the cryopreserved adipose tissues of specific pathogen-free research cats and culture expanded. CKD cats were enrolled in a randomized, placebo-controlled, blinded one-way crossover clinical study. Four CKD cats were randomized to receive $2 \times 10^6$ MSCs/kg intravenously at 2, 4 and 6 weeks. Four CKD cats were randomized to receive placebo, with two cats crossing over to the MSC treatment group and one cat failing to complete the trial. Complete blood counts, chemistry and urinalysis were performed at weeks 0, 2, 4, 6 and 8. Glomerular filtration (GFR) via nuclear scintigraphy and urine protein:creatinine ratio (UPC) were determined at weeks 0 and 8. RESULTS: Six cats received three doses of allogeneic MSC culture expanded from cryopreserved adipose without adverse effects. No significant change in serum creatinine, blood urea nitrogen, potassium, phosphorus, GFR by nuclear scintigraphy, UPC or packed cell volume was seen in cats treated with MSCs. Individual changes in GFR were 12%, 8%, 8%, 2%, -13% and -67% in treated cats compared with 16%, 36% and 0% in placebo-treated cats. CONCLUSIONS AND RELEVANCE: While administration of MSC culture expanded from cryopreserved adipose was not associated with adverse effects, significant improvement in renal function was not observed immediately after administration. Long-term follow-up is necessary to determine whether MSC administration affects disease progression in cats with CKD.

Complementary and Integrative Therapies for Lower Urinary Tract Diseases.


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

Mycobacterium bovis infection in humans and cats in same household, Texas, USA, 2012.


Mycobacterium bovis infection of cats is exceedingly rare in regions where bovine tuberculosis is not endemic. We describe the diagnosis and clinical management of pulmonary M. bovis infection in 2 indoor-housed cats and their association with at least 1 M. bovis-infected human in Texas, USA, in September 2012.
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.

Prevalence of Cytauxzoon felis infection in healthy cats from enzootic areas in Arkansas, Missouri, and Oklahoma.


BACKGROUND: Infection with Cytauxzoon felis in domestic cats can cause fever, lethargy, depression, inappetence, icterus, and often death. With a high mortality rate, cytauxzoonosis was historically considered a fatal disease. Within the last 15 years, cats with or without treatment have been recognized as chronically infected survivors of C. felis infection. Our objective was to determine the prevalence of C. felis in healthy domestic cats from Arkansas, Missouri, and Oklahoma. METHODS: Infection with C. felis was determined using DNA extracted from anticoagulated whole blood and PCR amplification using C. felis-specific primers. Chi-square, Fisher’s exact tests, and odds ratios were used to compare proportions of cats infected with C. felis. RESULTS: Blood samples were collected from 902 healthy domestic cats between October 2008 and April 2012. DNA from Cytauxzoon felis was detected in 56 of 902 (6.2%; 95% confidence interval, 4.7-7.9) samples. The highest prevalence of C. felis infection (15.5%; 10.3-21.7) was observed in cats from Arkansas, followed by cats from Missouri (12.9%; 6.1-24.0), and cats from Oklahoma (3.4%; 2.2-5.1). Cats sampled in Arkansas and Missouri were 5.1 and 4.2, respectively, times more likely to be chronically infected with C. felis than cats from Oklahoma. CONCLUSIONS: Infection with C. felis is common in domestic cats through Arkansas, Missouri, and Oklahoma. The high prevalence of C. felis reported herein suggests that infected domestic cats are likely reservoirs of infection for naive felines. The high prevalence of C. felis substantiates the importance for the use of approved acaricides on cats to prevent cytauxzoonosis.
Effect of high-dose ciclosporin on the immune response to primary and booster vaccination in immunocompetent cats.


Ciclosporin (Atopica oral solution for cats 100 mg/ml; Novartis Animal Health) was recently approved for use in cats with feline hypersensitivity dermatitis. The immunosuppressant effect of ciclosporin on the ability of cats to mount an immune response following vaccination was determined. Thirty-two healthy, immunocompetent adult cats (16 cats/group) were treated with either ciclosporin for 56 days at a dose of 24 mg/kg once daily or sham dosed. Prior to treatment, cats had an adequate antibody response to primary vaccination against feline calicivirus (FCV), feline herpesvirus-1 (FHV-1), feline panleukopenia virus (FPV), feline leukemia virus (FeLV) and rabies. Booster vaccination or novel vaccination with feline immunodeficiency virus (FIV) was administered 28 days after initiation of treatment with ciclosporin. There were no differences between the ciclosporin-treated and control cats for FCV and FPV antibody titers following booster vaccination. There were delays/reductions in antibody response to FHV-1, FeLV and rabies in treated cats; however, adequate protection was achieved in response to all booster vaccinations. Following primary vaccination with FIV, control cats showed a response, but treated cats showed no antibody production. Adverse events commonly associated with ciclosporin treatment, including diarrhea/loose stool, vomiting, salivation and regurgitation, were reported. In adult cats treated with 24 mg/kg/day of ciclosporin (more than three times the therapeutic dose), vaccine titer levels were adequate for protection following booster vaccination. In contrast, treated cats failed to mount a humoral response to a novel (FIV) vaccination, suggesting that memory B-cell immune responses remain intact during repeated high-dose ciclosporin administration in cats, but that primary immune responses are impaired.

Capturing the complexity of first opinion small animal consultations using direct observation.


Various different methods are currently being used to capture data from small animal consultations. The aim of this study was to develop a tool to record detailed data from consultations by direct observation. A second aim was to investigate the complexity of the consultation by examining the number of problems discussed per patient. A data collection tool was developed and used during direct observation of small animal consultations in eight practices. Data were recorded on consultation type, patient signalment and number of problems discussed. During 16 weeks of data collection, 1901 patients were presented. Up to eight problems were discussed for some patients; more problems were discussed during preventive medicine consultations than during first consultations (P<0.001) or revisits (P<0.001). Fewer problems were discussed for rabbits than cats (P<0.001) or dogs (P<0.001). Age was positively correlated with discussion of specific health problems and negatively correlated with discussion of preventive medicine. Consultations are complex with multiple problems frequently discussed, suggesting comorbidity may be common. Future research utilising practice data should consider how much of this complexity needs to be captured, and use appropriate methods accordingly. The findings here have implications for directing research and education as well as application in veterinary practice.

The effects of diazepam or midazolam on the dose of propofol required to induce anaesthesia in cats.

OBJECTIVES: Assess effects of benzodiazepine administration on the propofol dose required to induce anaesthesia in healthy cats, investigate differences between midazolam and diazepam, and determine an optimal benzodiazepine dose for co-induction. STUDY DESIGN: Prospective, randomised, blinded, placebo-controlled clinical trial. ANIMALS: Ninety client-owned cats (ASA I and II) with a median (interquartile range) body mass of 4.0 (3.4-4.9) kg. METHODS: All cats received 0.01 mg kg(-1) acepromazine and 0.2 mg kg(-1) methadone intravenously (IV). Fifteen minutes later, sedation was scored on a scale of 1-5, with 5 indicating greatest sedation. Propofol, 2 mg kg(-1), administered IV, was followed by either midazolam or diazepam at 0.2, 0.3, 0.4 or 0.5 mg kg(-1) or saline 0.1 mL kg(-1). Further propofol was administered until endotracheal intubation was possible. Patient signalment, sedation score, propofol dosage and adverse reactions were recorded. RESULTS: Midazolam and diazepam (all doses) significantly reduced the propofol dose required compared with saline (p < 0.001). There was no difference between midazolam and diazepam in propofol dose reduction (p = 0.488). All individual doses of midazolam reduced propofol requirement compared with saline (0.2 mg kg(-1), p = 0.028; 0.3 mg kg(-1), p = 0.006; 0.4 mg kg(-1), p < 0.001; 0.5 mg kg(-1), p = 0.009). Diazepam 0.2 mg kg(-1) did not reduce the propofol dose compared with saline (p = 0.087), but the remaining doses did (0.3 mg kg(-1), p = 0.001; 0.4 mg kg(-1), p = 0.032; 0.5 mg kg(-1), p = 0.041). Cats with sedation scores of 3 required less propofol than cats with scores of 2 (p = 0.008). There was no difference between groups in adverse events. CONCLUSIONS AND CLINICAL RELEVANCE: Midazolam (0.2-0.5 mg kg(-1)) and diazepam (0.3-0.5 mg kg(-1)) administered IV after 2 mg kg(-1) propofol significantly reduced the propofol dose required for tracheal intubation.

Histology and clinical outcome of benign and malignant vascular lesions primary to feline cervical lymph nodes.


A novel form of primary feline hemangiosarcoma and additional cases of plexiform vascularization in the cervical lymph nodes are reported. Sixteen cases of feline lymphadenopathy attributed to abnormal vascular proliferation were identified and evaluated. Most of these lesions were diagnosed histologically as hemangiosarcoma. However, lesions of plexiform vascularization, with and without areas of putative malignant transformation, were also identified. Mean age of the cats was 11 years (range, 3-16 years) with most being domestic shorthair and medium hair (13). Two domestic long hair and 1 Maine Coon were identified. Excisional nodal biopsy was performed in 15 cases and incisional biopsy in 1 case. Six cats were euthanized due to their disease. Survival times ranged from ≤ 1 month to ≥ 30 months. We provide a new clinical differential for cervical lymphadenopathy in cats that is not widely recognized. Proper identification of primary nodal vascular lesions in cats will enable further characterization of clinical features and biologic behavior to determine specific therapy.

Phylogenetic analysis of feline immunodeficiency virus strains from naturally infected cats in Belgium and The Netherlands.


Feline immunodeficiency virus (FIV) is a major pathogen in feline populations worldwide, with seroprevalences up to 26%. Virus strains circulating in domestic cats are subdivided into different phylogenetic clades (A-E), based on the genetic diversity of the V3-V4 region of the env gene. In this
report, a phylogenetic analysis of the V3-V4 env region, and a variable region in the gag gene was made for 36 FIV strains isolated in Belgium and The Netherlands. All newly generated gag sequences clustered together with previously known clade A FIV viruses, confirming the dominance of clade A viruses in Northern Europe. The same was true for the obtained env sequences, with only one sample of an unknown env subtype. Overall, the genetic diversity of FIV strains sequenced in this report was low. This indicates a relatively recent introduction of FIV in Belgium and The Netherlands. However, the sample with an unknown env subtype indicates that new introductions of FIV from unknown origin do occur and this will likely increase genetic variability in time.

**Multidrug resistance in Escherichia coli strains isolated from infections in dogs and cats in Poland (2007-2013).**


The antimicrobial susceptibility of Escherichia coli isolates associated with various types of infections in dogs and cats was determined. The studied isolates were most frequently susceptible to fluoroquinolones and the extended-spectrum cephalosporins (ESCs), antimicrobials commonly used in treatment of infections in companion animals. However, an increase in the percentage of strains resistant to β-lactam antibiotics including ESCs was noted between January 2007 and December 2013. The frequency of multidrug-resistant (MDR) E. coli isolation (66.8% of isolates) is alarming. Moreover, the statistically significant increase of the percentage of MDR isolates was observed during the study period. No difference in the prevalence of multidrug resistance was found between bacteria causing intestinal and extraintestinal infections and between canine and feline isolates. Nonhemolytic E. coli isolates were MDR more often than hemolytic ones. Our study showed the companion animals in Poland as an important reservoir of MDR bacteria. These results indicate that continuous monitoring of canine and feline E. coli antimicrobial susceptibility is required. Furthermore, introduction and application of recommendations for appropriate use of antimicrobials in small animal practice should be essential to minimize the emergence of multidrug resistance among E. coli in companion animals.

**The detection of toxigenic Corynebacterium ulcerans from cats with nasal inflammation in Japan.**


SUMMARY Corynebacterium ulcerans (toxigenic C. ulcerans) produces the diphtheria toxin, which causes pharyngeal and cutaneous diphtheria-like disease in people, and this bacterium is commonly detected in dogs and cats that are reared at home. It is considered dangerous when a carrier animal becomes the source of infection in people. To investigate the carrier situation of toxigenic C. ulcerans of cats bred in Japan, bacteria were isolated from 37 cats with a primary complaint of rhinitis in 16 veterinary hospitals in Osaka. Toxigenic C. ulcerans was detected in two of the cats. By drug sensitivity testing, the detected bacterium was sensitive to all investigated drugs, except clindamycin. It appears necessary to create awareness regarding toxigenic C. ulcerans infection in pet owners because this bacterium is believed to be the causative organism for rhinitis in cats.
Feline upper respiratory tract lymphoma: site, cyto-histology, phenotype, FeLV expression, and prognosis.


Lymphoma is the most common feline upper respiratory tract (URT) tumor. Primary nasal and nasopharyngeal lymphomas have been evaluated as distinct pathological entities; however, data on their differing clinical behavior are missing. A total of 164 endoscopic-guided URT pinch biopsies were formalin fixed and routinely processed. Imprint cytological specimens were stained with May Grünwald-Giemsa. Immunohistochemistry for anti-CD20, CD3, FeLVp27, and FeLVgp70 was performed. Prognostic significance of clinicopathological variables was investigated by univariate and multivariate analysis. Lymphoma was diagnosed in 39 cats (24%). Most cats with lymphoma were domestic shorthair (32 [82%]), were male (F/M = 0.56), and had a mean age of 10.3 years (range, 1-16 years). Lymphomas were primary nasal in 26 cats (67%), nasopharyngeal in 6 (15%), and in both locations (combined lymphomas) in 7 cats (18%). Neoplastic growth pattern was diffuse in 35 cases (90%) and nodular in 4 (10%). Epitheliotropism was observed in 10 cases (26%). Tumor cells were large in 15 cases, were small and medium in 11 cases each, and 2 had mixed cell size. Submucosal lymphoplasmacytic inflammation was observed in 23 cases (59%). Cytology was diagnostic for lymphoma in 12 of 25 cases (48%). A B-cell origin prevailed (34 [87%]). Feline leukemia virus (FeLV) p27 or gp70 antigen was detected in 21 lymphomas (54%). URT lymphomas were aggressive, with survival varying from 0 to 301 days (mean, 53 days). Epitheliotropism in 8 B-cell lymphomas (80%) and in 2 T-cell lymphomas (20%) correlated with prolonged survival. Age younger or older than 10 years had a negative prognostic value. Lymphoplasmacytic inflammation and FeLV infection may represent favoring factors for URT lymphoma development.

Anaplasma phagocytophilum infection of domestic cats: 16 cases from the northeastern USA.


OBJECTIVES: Anaplasma phagocytophilum is an Ixodes species-transmitted rickettsial organism that is occasionally associated with clinical abnormalities in humans, ruminants, horses, dogs and cats. While serological evidence of A phagocytophilum exposure is common in cats in Ixodes species endemic areas, reports of clinical feline anaplasmosis are few. The objective of this study was to describe the clinical and laboratory abnormalities and treatment responses in 16 cats with A phagocytophilum DNA amplified from blood. METHODS: Commercial laboratory electronic records were searched to find cats that had A phagocytophilum DNA amplified from their blood. Once cases were identified, the primary care veterinarian was interviewed and the medical records were reviewed. RESULTS: The cats ranged in age from 4 months to 13 years (mean 4.1 years, median 2 years). All cats lived in Ixodes scapularis endemic areas and had potential for exposure. All cats were lethargic, 15 (94%) had elevated body temperature (>39.4°C) and 14 were anorexic on initial physical examination. Other less common clinical findings included hepatosplenomegaly, ataxia, conjunctivitis and elevation of the nictitating membranes. Blood from 11 cats was evaluated by complete blood cell count; abnormalities included lymphopenia in seven (64%) cats, thrombocytopenia in seven (64%), morulae in neutrophils of three (27%), neutropenia in three (27%) and leukopenia in two (18%). Treatment responses were reported for 14 cats, and the clinical abnormalities in these cats resolved when doxycycline was administered. CONCLUSIONS AND RELEVANCE: This is the first published report describing A phagocytophilum morulae in neutrophils of naturally infected North American cats.
with infection confirmed by PCR. A phagocytophilum infection should be considered in cats evaluated for lethargy, anorexia and fever living in Ixodes species endemic areas.

**European consensus statement on leptospirosis in dogs and cats.**

Leptospirosis is a zoonotic disease with a worldwide distribution affecting most mammalian species. Clinical leptospirosis is common in dogs but appears to be rare in cats. Both dogs and cats, however, can shed leptospires in the urine. This is problematic as it can lead to exposure of humans. The control of leptospirosis, therefore, is important not only from an animal but also from a public health perspective. The aim of this consensus statement is to raise awareness of leptospirosis and to outline the current knowledge on the epidemiology, clinical features, diagnostic tools, prevention and treatment measures relevant to canine and feline leptospirosis in Europe.

**Sampling sites for detection of feline herpesvirus-1, feline calicivirus and Chlamydia felis in cats with feline upper respiratory tract disease.**

OBJECTIVES: Feline herpesvirus-1 (FHV-1), feline calicivirus (FCV) and Chlamydia felis are involved in feline upper respiratory tract disease (FURTD). Clinical signs caused by these agents can overlap, and the involvement of certain pathogens is often unpredictable. The objectives of this study were to compare detection rates of FHV-1, FCV and C felis at different sampling sites, and to investigate the correlation between positive test results and clinical signs in cats with FURTD.

METHODS: Swabs were taken from the nose, pharynx, tongue and conjunctiva of 104 cats with signs of FURTD. Real-time PCR was performed on all samples for the detection of FHV-1, FCV and C felis.

RESULTS: Infectious agents were identified in 93 (89.4%) cats. Of these, 55.8% were positive for FHV-1, 50.0% for FCV and 35.6% for C felis. FCV was found more frequently in the oropharynx (92.3% of FCV-positive cats) and on the tongue (90.4%) than the conjunctiva (38.5%) (P <0.001). There was no significant difference between the four sampling sites for the detection of FHV-1 and C felis. If nasal samples had also been taken, 94.9% of FHV-1-positive cats, 96.2% of FCV-positive cats and 81.1% of C felis-positive cats would have been detected. CONCLUSIONS AND RELEVANCE: The oropharynx can be recommended as the preferred single sampling site for the detection of FCV, FHV-1 and C felis if only one sample can be taken; however, taking samples at different sites significantly increases the detection rate for all pathogens studied. Interestingly, sampling from a site with FURTD-associated lesions did not increase the likelihood of detecting the infectious agents.

**Reference values, intertest correlations, and test-retest repeatability of selected tear film tests in healthy cats.**

OBJECTIVE: To determine reference values, intertest correlations, and test-retest repeatability of Schirmer tear test 1 (STT-1), phenol red thread test (PRTT), tear film breakup time (TFBUT), tear osmolarity, and meibometry in healthy cats. DESIGN: Evaluation study. ANIMALS: 135 healthy
domestic cats aged 0.5 to 12.8 years. PROCEDURES: Each test was performed once in 120 cats and repeated in 40. Pearson correlation was used to assess correlation among tests. Intraclass correlation coefficients (ICCs) and 95% limits of agreement (LOA) were used to evaluate test-retest repeatability. RESULTS: Median (95% central range) values were 18 mm/min (9 to 34 mm/min) for STT-1, 29 mm/15 s (15 to 37 mm/15 s) for PRTT, 12.4 seconds (9.1 to 17.7 seconds) for TFBUT, 322 mOsm/L (297 to 364 mOsm/L) for osmolarity, and 32 meibometry units (MU; 11 to 114 MU) for peak meibometry value. The STT-1 and PRTT values were positively correlated. Age was weakly associated with TFBUT and osmolarity. Meibometry measurements were higher for strips that contacted the tear film (285 MU) than for those that touched the eyelid margin only (32 MU). All ICCs were < 0.75, and 95% LOA were wide. CONCLUSIONS AND CLINICAL RELEVANCE: Tear deficiency should be suspected in cats with STT-1 < 9 mm/min, PRTT < 15 mm/15 s, or TFBUT < 9 to 10 seconds. Generally poor correlation among tests suggested that thorough tear film analysis requires performance of multiple tests in concert. Relatively poor test-retest repeatability should be considered when repeated tests are used to monitor tear film dysfunction and response to treatment.

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.

Multiple invasions of an infectious retrovirus in cat genomes.

Endogenous retroviruses (ERVs) are remnants of ancient retroviral infections of host germ-line cells. While most ERVs are defective, some are active and express viral proteins. The RD-114 virus is a replication-competent feline ERV, and several feline cell lines produce infectious RD-114 viral particles. All domestic cats are considered to have an ERV locus encoding a replication-competent RD-114 virus in their genomes; however, the locus has not been identified. In this study, we investigated RD-114 virus-related proviral loci in genomes of domestic cats, and found that none were capable of producing infectious viruses. We also found that all domestic cats have an RD-114 virus-related
sequence on chromosome C2, termed RDRS C2a, but populations of the other RDRSs are different depending on the regions where cats live or breed. Our results indicate that RDRS C2a, the oldest RD-114-related provirus, entered the host genome before an ancestor of domestic cats started diverging and the other new RDRSs might have integrated into migrating cats in Europe. We also show that infectious RD-114 virus can be resurrected by the recombination between two non-infectious RDRSs. From these data, we conclude that cats do not harbor infectious RD-114 viral loci in their genomes and RD-114-related viruses invaded cat genomes multiple times.

**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.

**Controversies regarding choice of vasopressor therapy for management of septic shock in animals.**
OBJECTIVE: To review and appraise common vasopressor drugs used to treat septic shock-induced hypotension in volume replete animals. DATA SOURCES: Human and animal publications were searched using PubMed without time limits and the following keywords were used: “vasopressor,” “septic shock,” “norepinephrine,” “dopamine,” “epinephrine,” and “vasopressin.” HUMAN DATA SYNTHESIS: The choice of vasopressor drug is unlikely to have a marked impact on outcome, but the incidence of adverse events (eg, tachycardia) varies greatly between the various treatment options. In agreement with the 2012 Cochrane Database consensus, norepinephrine is the first-choice vasopressor to maintain a mean arterial pressure $\geq 65$ mm Hg. If an additional agent is required, epinephrine should be administered. Low-dose vasopressin can be added to norepinephrine to either increase the arterial blood pressure to the target goal value or decrease the norepinephrine dose, but should not be used as the initial vasopressor. Dopamine is not recommended except in highly selected circumstances. VETERINARY DATA SYNTHESIS: There is insufficient evidence to make definitive conclusions regarding the treatment of naturally occurring septic shock, but clinical studies are underway to provide further data. CONCLUSIONS: The treatment of hypotension in people or animals with septic shock is challenging and vasopressor therapy is associated with a variety of adverse effects. Further research is warranted in dogs and cats to establish evidence-based guidelines.

**Interactions of mechanically induced coughing and sneezing in cat.**
Mutual interactions of cough and sneeze were studied in 12 spontaneously breathing pentobarbitone anesthetized cats. Reflexes were induced by mechanical stimulation of the tracheobronchial and nasal airways, respectively. The amplitude of the styloglossus muscle EMG moving average during the sneeze expulsion was 16-fold higher than that during cough (p<0.01). Larger inspiratory efforts occurred during coughing (p<0.01) vs. those in sneeze. The number of reflexes during simultaneous mechanical stimulation of the nasal and tracheal airways was not altered significantly compared to controls (p>0.05) and there was no modulation in temporal characteristics of the behaviors. When both reflexes occurred during simultaneous stimuli the responses were classified as either sneeze or cough (no hybrid responses occurred). During simultaneous stimulation of both airway sites, peak diaphragm EMG and inspiratory esophageal pressures during sneezes were significantly increased. The expiratory maxima of esophageal pressure and amplitudes of abdominal EMGs were increased in coughs and sneezes during simultaneous mechanical stimulation trials compared to control reflexes.

Pancreatititis and triaditis in cats: causes and treatment.
Pancreatititis in cats is frequently accompanied by concurrent disease in other organ systems. Co-morbidities include hepatic lipidosis, inflammatory liver disease, bile duct obstruction, diabetes mellitus, inflammatory bowel disease, vitamin deficiency (B12/cobalamin, folate or K), intestinal lymphoma, nephritis, pulmonary thromboembolism and pleural and peritoneal effusions. “Triaditis” is the term used to describe concurrent inflammation of the pancreas, liver and small intestines. Triaditis has been reported in 50 to 56% of cats diagnosed with pancreatitis and 32 to 50% of those with cholangitis/inflammatory liver disease. A definitive diagnosis of triaditis is based on the histopathological evaluation of each organ. However, the specific conditions of each organ that constitute a diagnosis of triaditis remains to be defined. While the aetiopathogenesis of pancreatitis and its relationship to inflammation in other organ systems is unclear, preliminary studies point to a heterogeneous group of conditions with differential involvement of host inflammatory and immune responses and enteric bacteria. Comprehensive, prospective studies that simultaneously evaluate the presence of predefined clinical, clinicopathological and histopathological abnormalities, coupled with high-resolution evaluation of pancreaticobiliary morphology, immunological profiling and screening for bacterial colonisation are required to advance diagnosis and therapy.

Structural analysis of a feline norovirus protruding domain.
Norovirus infects different animals, including humans, mice, dogs, and cats. Here, we show an X-ray crystal structure of a feline GIV.2 norovirus capsid-protruding (P) domain to 2.35Å resolution. The feline GIV.2 P domain was reminiscent of human norovirus P domains, except for a novel P2 subdomain α-helix and an extended P1 subdomain interface loop. These new structural features likely obstructed histo-blood group antigens, which are attachment factors for human norovirus, from binding at the equivalent sites on the feline GIV.2 P domain. Additionally, an ELISA showed that the feline GIV.2 was antigenically distinct from a human GII.10 norovirus.
Comparison of axillary, tympanic membrane and rectal temperature measurement in cats.


OBJECTIVES: Rectal temperature (RT) is routinely used to assess body temperature in cats but has limitations and can be poorly tolerated. Axillary temperature (AT) and tympanic membrane temperature (TMT) are reported alternatives. This study aimed to determine the differences between RT and AT, and between RT and TMT in cats. Additional aims were to examine the effect of environmental and patient factors on these differences and to assess patient tolerance to each technique.

METHODS: AT, TMT and RT were measured in immediate succession. Measurement order was randomised, as was the choice of left or right axilla and tympanic membrane. A digital thermometer and a veterinary infrared ear thermometer were used. The subjective tolerance of each procedure was recorded. RESULTS: One hundred and fifty cats were included. Significantly more conscious cats were tolerant of AT (90.6%) than TMT (81.2%) and RT (53.0%). The rectal-axillary temperature difference ranged from 1.2°C to 1.4°C (median 0.1°C) and was within ±0.5°C in 78.0% of cats. On multivariable analysis the difference was larger in overweight cats, neutered cats, cats in which the right axilla was used and as the RT increased. The rectal-tympanic membrane temperature difference ranged from -1.6°C to 3°C (median -0.3°C) and was within ±0.5°C in 51.3% of cats, significantly fewer than for AT (P <0.001). The rectal-tympanic membrane temperature difference increased as the RT increased.

CONCLUSIONS AND RELEVANCE: TMT and AT should not be used interchangeably with RT in cats. When RT measurement is not possible, AT is recommended over TMT as it is better tolerated and significantly fewer cats had clinically unacceptable differences (>0.5°C). AT may more closely reflect RT in normal or underweight cats than it does in overweight cats.

Detection of Norovirus and Sapovirus from diarrheic dogs and cats in Japan.


Norovirus (NoV) and sapovirus (SaV) are important causes of human diarrhea. In this study, between 2007 and 2014 fecal samples were collected from 97 dogs and 83 cats with diarrhea and examined to determine the prevalence of NoV and SaV infections in Japan. To detect caliciviruses, approximately 300 bases targeting the polymerase gene were amplified using RT-PCR and subjected to phylogenetic and homology analyses. Specific PCR products were obtained from four canine and nine feline samples: two canine and one feline isolate were classified as NoV, two canine isolates as SaV and the remaining eight feline isolates as vesivirus (VeV). The three NoV isolates were classified into the same clade as that of known canine and feline NoVs; their homologies (75.9-92.3%) were higher than those with human genogroup IV (GIV) NoVs (59.1-65.9%). The homology of the feline NoV isolate with previously reported feline NoV isolates was particularly high (91.7-92.3%). Regarding SaV, the two canine isolates were classified into the same clade as known canine SaVs and their homologies (72.5-86.5%) were higher than those with other mammal SaVs (20.7-58.0%). The eight feline VeV isolates were assumed to be feline calicivirus. The present study is the first report of the presence of NoV- and SaV-infected dogs and cats in Japan. The findings suggest there are species-specific circulations of NoV and SaV among dogs and cats, in Japan.

Haematological and biochemical reference intervals in adult Maine Coon cat blood donors.

OBJECTIVES: The objectives of this study were to derive Maine Coon haematological and biochemical reference intervals (RIs) from adult healthy blood donors, to validate (or reject) the use of published RIs for the general feline population in this breed, and to evaluate the effects of age, sex and weight on the haematological and biochemical results. METHODS: Haematological and biochemical data were retrieved retrospectively from a database of 81 healthy adult Maine Coon cat blood donors and were analysed to generate normal RIs. RIs were determined and compared with established non-breed-specific feline RIs according to the Clinical and Laboratory Standards Institute guidelines and the American Society of Veterinary Clinical Pathology guidelines using Reference Value-Advisor (version 2.1) software. RESULTS: The age of the cats ranged from 1-8 years (mean 4.4 years), 42 were female and 39 were male, and weights ranged from 4.9-8.5 kg (mean 6.7 kg). New Maine Coon RIs were proposed for red blood cell count, mean corpuscular volume, mean corpuscular haemoglobin concentration, reticulocyte count and percentage. Haematocrit was higher in male cats (mean HCT 42.9% vs 41% in females; P = 0.001) and in heavier cats (P = 0.003; slope 1.0, regression equation HCT = 35.1 + 1.0 \times \text{weight}). New biochemical RIs were proposed for urea, aspartate aminotransferase, \( \gamma \)-glutamyl transpeptidase (GGT), alkaline phosphatase, total protein and albumin in Maine Coons. Females had higher GGT (median GGT value in females 4.0 vs 3.0 in males; P = 0.011) and albumin values (mean albumin value 3.3 in females vs 3.1 in males; P = 0.013). CONCLUSIONS AND RELEVANCE: Currently published RIs for some haematological and biochemical parameters are not appropriate for use in adult Maine Coon cats. A breed-specific variation could be a plausible explanation for the new haematological and serum biochemical analytes proposed in this study. Breed-specific RIs for Maine Coon cats will help prevent misinterpretation of laboratory results in diagnosis and in the selection of ideal blood donors.


PRACTICAL RELEVANCE: Diabetes mellitus (DM) is a common endocrinopathy in cats that appears to be increasing in prevalence. The prognosis for affected cats can be good when the disease is well managed, but clinical management presents challenges, both for the veterinary team and for the owner. These ISFM Guidelines have been developed by an independent, international expert panel of clinicians and academics to provide practical advice on the management of routine (uncomplicated) diabetic cats. CLINICAL CHALLENGES: Although the diagnosis of diabetes is usually straightforward, optimal management can be challenging. Clinical goals should be to limit or eliminate clinical signs of the disease using a treatment regimen suitable for the owner, and to avoid insulin-induced hypoglycaemia or other complications. Optimising bodyweight, feeding an appropriate diet and using a longer acting insulin preparation (eg, protamine zinc insulin, insulin glargine or insulin detemir) are all factors that are likely to result in improved glycaemic control in the majority of cats. There is also some evidence that improved glycaemic control and reversal of glucose toxicity may promote the chances of diabetic remission. Owner considerations and owner involvement are an important aspect of management. Provided adequate support is given, and owners are able to take an active role in monitoring blood glucose concentrations in the home environment, glycaemic control may be improved. Monitoring of other parameters is also vitally important in assessing the response to insulin. Insulin adjustments should always be made cautiously and not too frequently - unless hypoglycaemia is encountered. EVIDENCE BASE: The Panel has produced these Guidelines after careful review of the existing literature and of the quality of the published studies. They represent a
consensus view on practical management of cats with DM based on available clinical data and experience. However, in many areas, substantial data are lacking and there is a need for better studies in the future to help inform and refine recommendations for the clinical management of this common disease.

**Robenacoxib versus meloxicam for the control of peri-operative pain and inflammation associated with orthopaedic surgery in cats: a randomised clinical trial.**


**BACKGROUND:** Non-steroidal anti-inflammatory drugs (NSAIDs) are widely used in veterinary medicine. Robenacoxib is a NSAID with high selectivity for the cyclo-oxygenase-2 enzyme. In this study, the efficacy and safety of robenacoxib were evaluated in a prospective, randomised, active- and placebo-controlled masked clinical trial in 147 cats undergoing orthopaedic surgery. Cats were randomised into two treatment groups: Group 1, robenacoxib (2 mg/kg) administered via subcutaneous (s.c.) injection before surgery, followed by robenacoxib tablets (1-2.4 mg/kg) administered post-operatively for approximately 9 days (n = 101) and Group 2, meloxicam (0.3 mg/kg) administered s.c. before surgery, followed by placebo tablets administered post-operatively for approximately 9 days (n = 46). Cats were assessed using numerical rating scales (NRSs) by clinicians before surgery and at 3, 8, 22 and 28 hours after surgery and at the final visit (VF on approximately Day 10), and daily by their owners from Day 1 to the VF. **RESULTS:** The primary end point was the global investigator score which was the sum of clinician NRSs for posture, behaviour and pain on palpation/manipulation. The efficacy of the single robenacoxib injection, assessed during 3 to 22 hours, was statistically non-inferior to meloxicam, with a relative efficacy of 1.029 (95% confidence interval, 0.847-1.231). No significant differences were detected during the follow-up treatment with robenacoxib tablets for approximately 9 days compared with placebo via clinician assessments at 28 hours and the VF, or in owner assessments on Days 1-VF. There were no significant differences in frequencies of reported adverse events, clinical observations and haematology or clinical chemistry variables between the groups. **CONCLUSIONS:** Single s.c. injection of robenacoxib before surgery had non-inferior efficacy compared with meloxicam in controlling post-operative pain and inflammation in cats undergoing orthopaedic surgery. Follow-up treatment with oral robenacoxib tablets for approximately 9 days was well tolerated, but there were no differences in the efficacy scores after Day 1 compared with the group receiving meloxicam s.c. followed by placebo control.

**The safety of high-dose buprenorphine administered subcutaneously in cats.**


The safety of a proprietary formulation of buprenorphine hydrochloride administered subcutaneously (SC) to young cats was investigated in a blinded, randomized study. Four cohorts of eight cats aged approximately 4 months were administered saline, 0.24, 0.72 or 1.20 mg/kg/day buprenorphine SC for nine consecutive days, representing 0×, 1×, 3× and 5× of the intended dose. Cats were monitored daily for evidence of clinical reactions, food and water intake and adverse events (AEs). Physical examinations, clinical pathology, vital signs and electrocardiograms (ECGs) were evaluated at protocol-specified time points. Complete necropsy and histopathologic examinations were performed following humane euthanasia. Four buprenorphine-treated cats experienced AEs during the study, two unrelated and two related to study drug administration. The two cats with AEs considered related to
drug administration had clinical signs of hyperactivity, difficulty in handling, disorientation, agitation and dilated pupils in one 0.24 mg/kg/day cat and one 0.72 mg/kg/day cat. All of these clinical signs were observed simultaneously. There were no drug-related effects on survival, injection response, injection site inspections, body weight, food or water consumption, bleeding time, urinalysis, respiration rate, heart rate, ECGs, blood pressures, body temperatures, macroscopic examinations or organ weights. Once daily buprenorphine s.c. injections at doses of 0.24, 0.72 and 1.20 mg/kg/day for 9 consecutive days were well tolerated in young domestic cats.

A preliminary investigation of the thermal antinociceptive effects of codeine in cats.
OBJECTIVES: The aim of this study was to evaluate the potential thermal antinociceptive effects of oral administration of a single dose of codeine in cats compared with positive (buprenorphine) and negative (saline 0.9%) controls. METHODS: Six adult healthy cats weighing 5.14 ± 0.6 kg were used. Skin temperature and thermal thresholds (TTs) were evaluated using a wireless device (Topcat Metrology) at baseline, 0.5, 1, 3, 6 and 10 h after treatment. In period 1, TTs were evaluated after subcutaneous administration of saline 0.9%. In period 2, cats were administered either oral codeine (10 mg total, 2.0 ± 0.2 mg/kg) or buccal buprenorphine (0.04 mg/kg) in a cross-over, blinded study design. Half of the volume of buprenorphine was administered into each cheek pouch. Δ TT (difference between TTs after and before treatment) was used for data comparison. Mean ± SD data were analyzed using one-way ANOVA followed by Dunnett’s or Tukey’s test when appropriate (P <0.05).
RESULTS: Adverse effects did not occur in any group. Skin temperature was not different between groups nor over time. Temporal changes in TTs were not observed after saline or codeine. Buprenorphine increased Δ TT at 3 h (2.7 ± 3.3°C) when compared with baseline or saline (P <0.05). For buprenorphine, TTs were not >47.6°C at any time point in four cats. The mean highest temperature recorded in the two other cats in that group was 54.5 and 52.8°C at 3 h. CONCLUSIONS AND CLINICAL RELEVANCE: At the dose administered, codeine did not produce thermal antinociception. Mild increases in TT after buccal buprenorphine might be related to the first-pass effect after drug swallowing, drug spillage during administration and/or individual variability. These factors should be taken in consideration when administering buprenorphine by this route of administration in the clinical setting.

Clinical presentation and outcome of cats with circumcaval ureters associated with a ureteral obstruction.
BACKGROUND: Circumcaval ureters (CU) are a rare embryological malformation resulting in ventral displacement of the caudal vena cava, which crosses the ureter, potentially causing a ureteral stricture. OBJECTIVES: To evaluate cats with obstructed CU(s) and report the presenting signs, diagnostics, treatment(s), and outcomes. Cats with obstructed CU(s) were compared to ureterally obstructed cats without CU(s). ANIMALS: 193 cats; 22 circumcaval obstructed (Group 1); 106 non-circumcaval obstructed (Group 2); 65 non-obstructed necropsy cases (Group 3). METHODS: Retrospective study, review of medical records for cats treated for benign ureteral obstructions from AMC and University of Pennsylvania between 2009 and 2013. INCLUSION CRITERIA: surgical treatment of benign ureteral
obstruction, complete medical record including radiographic, ultrasonographic, biochemistry, and surgical findings. RESULTS: Seventeen percent (22/128) of obstructed cats had a CU (80% right-sided) compared to 14% (9/65) non-obstructed necropsy cats (89% right-sided). Clinical presentation, radiographic findings, and creatinine were not statistically different between Groups 1 and 2. Strictures were a statistically more common (40%) cause of ureteral obstruction in Group 1 compared to Group 2 (17%) (P =.01). The MST for Groups 1 and 2 after ureteral decompression was 923 and 762 days, respectively (P =.62), with the MST for death secondary to kidney disease in both groups being >1,442 days. Re-obstruction was the most common complication in Group 1 (24%) occurring more commonly in ureters of cats treated with a ureteral stent(s) (44%) compared to the subcutaneous ureteral bypass (SUB) device (8%) (P =.01). CONCLUSIONS AND CLINICAL IMPORTANCE: Ureteral obstructions in cats with a CU(s) have a similar outcome to those cats with a ureteral obstruction and normal ureteral anatomy. Long-term prognosis is good for benign ureteral obstructions treated with a double pigtail stent or a SUB device. The SUB device re-obstructed less commonly than the ureteral stent, especially when a ureteral stricture was present.

A clinical review of the pathophysiology, diagnosis, and treatment of pyothorax in dogs and cats.
OBJECTIVE: To review the current literature in reference to the pathophysiology, diagnosis, and treatment of pyothorax in dogs and cats. ETIOLOGY: Pyothorax, also known as thoracic empyema, is characterized by the accumulation of septic purulent fluid within the pleural space. While the actual route of pleural infection often remains unknown, the oral cavity and upper respiratory tract appear to be the most common source of microorganisms causing pyothorax in dogs and cats. In human medicine, pyothorax is a common clinical entity associated with bacterial pneumonia and progressive parapneumonic effusion. DIAGNOSIS: Thoracic imaging can be used to support a diagnosis of pleural effusion, but cytologic examination or bacterial culture of pleural fluid are necessary for a definitive diagnosis of pyothorax. THERAPY: The approach to treatment for pyothorax varies greatly in both human and veterinary medicine and remains controversial. Treatment of pyothorax has classically been divided into medical or surgical therapy and may include administration of antimicrobials, intermittent or continuous thoracic drainage, thoracic lavage, intrapleural fibrinolytic therapy, video-assisted thoracic surgery, and traditional thoracostomy. Despite all of the available options, the optimal treatment to ensure successful short- and long-term outcome, including the avoidance of recurrence, remains unknown. PROGNOSIS: The prognosis for canine and feline pyothorax is variable but can be good with appropriate treatment. A review of the current veterinary literature revealed an overall reported survival rate of 83% in dogs and 62% in cats. As the clinical presentation of pyothorax in small animals is often delayed and nonspecific, rapid diagnosis and treatment are required to ensure successful outcome.

Increased normalized pulmonary transit times and pulmonary blood volumes in cardiomyopathic cats with or without congestive heart failure.
OBJECTIVES: To estimate heart rate-normalized pulmonary transit times (nPTTs) in cardiomyopathic cats with or without congestive heart failure (CHF). To assess potential associations of echocardiographic variables and nPTT and to evaluate nPTT as a test for the presence of CHF.
ANIMALS: Forty-eight privately owned cats. METHODS: nPTT was measured using echocardiography and the ultrasound contrast media SonoVue® in 3 groups of cats: healthy cats (group 1), cats with cardiomyopathy (CM) but without CHF (group 2), and cats with CM and CHF (group 3). Interrelations between pulmonary blood volume (PBV), nPTT, stroke volume (SV), and echocardiographic variables were investigated by means of linear univariate and multivariate analysis. RESULTS: Median nPTT values in group 1, group 2, and group 3 were 3.63 (interquartile range [IQR], 3.20-4.22), 6.09 (IQR, 5.0-7.02), and 8.49 (IQR, 7.58-11.04), respectively. Values were significantly different between all 3 groups. Median PBVs in group 1, group 2, and group 3 were 27.94 mL (IQR, 21.02-33.17 mL), 42.83 mL (IQR, 38.46-50.36 mL) and 49.48 mL (IQR, 38.84-64.39 mL). SV, PBV, and shortening fraction <30% were significant predictors of nPTT. nPTT and left atrial to aortic root (LA:AO) ratio, not SV, were the main predictors of PBV. CONCLUSION: nPTT may be useful as a test for the presence of CHF in cats with CM and as a measure of cardiac performance. nPTT and LA:AO ratios predict CHF with equal accuracy. Increased PBV is significantly associated with higher nPTT and LA:AO ratios.

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 Heilongjian, Jilin, and Liaonin 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.

The first case of 38,XX (SRY-positive) disorder of sex development in a cat.


BACKGROUND: SRY-positive XX testicular disorder of sex development (DSD) caused by X;Y translocations was not yet reported in domestic animals. In humans it is rarely diagnosed and a majority of clinical features resemble those which are typical for Klinefelter syndrome (KS). Here we describe the first case of SRY-positive XX DSD in a tortoiseshell cat with a rudimentary penis and a lack of scrotum. RESULTS: Molecular analysis showed the presence of two Y-linked genes (SRY and ZFY) and a normal sequence of the SRY gene. Application of classical cytogenetic techniques revealed two X chromosomes (38,XX), but further FISH studies with the use of the whole X chromosome painting probe and BAC probes specific to the Yp chromosome facilitated identification of Xp;Yp translocation.
The SRY gene was localised at a distal position of Xp. The karyotype of the studied case was described as: 38,XX.ish der(X)(X;Y)(p22;p12)(SRY+). Moreover, the X inactivation status assessed by a sequential R-banding and FISH with the SRY-specific probe showed a random inactivation of the derivative X(SRY) chromosome. CONCLUSIONS: Our study showed that among DSD tortoiseshell cats, apart from XXY trisomy and XX/XY chimerism, also SRY-positive XX cases may occur. It is hypothesized that the extremely rare occurrence of this abnormality in domestic animals, when compared with humans, may be associated with a different organisation of the Yp arm in these species.

**Toxoplasma gondii seroprevalence in pet cats in Norway and risk factors for seropositivity.**


OBJECTIVES: To estimate Toxoplasma gondii seroprevalence in pet cats in Norway and to evaluate risk factors for seropositivity. Additionally, serum biochemistry and haematological variables for T gondii seropositive and seronegative cats were compared. METHODS: A convenience sample of surplus sera submitted to the Central Laboratory, Norwegian University of Life Sciences, was collected. The samples were from healthy cats and cats with a variety of diseases. Analyses for IgG antibodies to T gondii were performed with a commercial direct agglutination test, with 1:40 as the threshold value. For risk factor analysis a logistic regression model of the relationship between predictors and the outcome was applied. RESULTS: One hundred and ninety-six of 478 cats were seropositive for T gondii, and the estimated seroprevalence in the study sample was 41.0% (95% confidence interval 36.6-45.4). Compared with domestic cats, pedigree cats had reduced risk for Toxoplasma seropositivity (odds ratio [OR] 0.42). Males had increased risk (OR 1.63) compared with females. The effect of age was highly significant, and an increase in the cats’ age across the interquartile range (IQR; 52-160 months/4-13 years of age) doubled the risk of Toxoplasma seropositivity (OR 2.11). The risk for Toxoplasma seropositivity among cats living in Oslo was significantly reduced (OR 0.51) when compared with the rest of Norway. CONCLUSIONS AND RELEVANCE: Pet cats in Norway appear to be commonly exposed to T gondii. Signalment and geographical region influenced the odds of Toxoplasma seropositivity, whereas health status did not.

**Antiviral treatment of feline immunodeficiency virus-infected cats with (R)-9-(2-phosphonylmethoxypropyl)-2,6-diaminopurine.**


Feline immunodeficiency virus (FIV), the causative agent of an acquired immunodeficiency syndrome in cats (feline AIDS), is a ubiquitous health threat to the domestic and feral cat population, also triggering disease in wild animals. No registered antiviral compounds are currently available to treat FIV-infected cats. Several human antiviral drugs have been used experimentally in cats, but not without the development of serious adverse effects. Here we report on the treatment of six naturally FIV-infected cats, suffering from moderate to severe disease, with the antiretroviral compound (R)-9-(2-phosphonylmethoxypropyl)-2,6-diaminopurine ([R]-PMPDAP), a close analogue of tenofovir, a widely prescribed anti-HIV drug in human medicine. An improvement in the average Karnofsky score (pretreatment 33.2 ± 9.4%, post-treatment 65±12.3%), some laboratory parameters (ie, serum amyloid A and gammaglobulins) and a decrease of FIV viral load in plasma were noted in most cats. The role of
concurrent medication in ameliorating the Karnofsky score, as well as the possible development of haematological side effects, are discussed. Side effects, when noted, appeared mild and reversible upon cessation of treatment. Although strong conclusions cannot be drawn owing to the small number of patients and lack of a placebo-treated control group, the activity of (R)-PMPDAP, as observed here, warrants further investigation.

Feasibility of radial and circumferential strain analysis using 2D speckle tracking echocardiography in cats.

The purpose of the present study is to investigate the feasibility of strain analysis using speckle tracking echocardiography (STE) in cats and to evaluate STE variables in cats with hypertrophic cardiomyopathy (HCM). Sixteen clinically healthy cats and 17 cats with HCM were used. Radial and circumferential strain and strain rate variables in healthy cats were measured using STE to assess the feasibility. Comparisons of global strain and strain variables between healthy cats and cats with HCM were performed. Segmental assessments of left ventricle (LV) wall for strain and strain rate variables in cats with HCM were also performed. As a result, technically adequate images were obtained in 97.6% of the segments for STE analysis. Sedation using buprenorphine and acepromazine did not affect any global strain nor strain rate variable. In LV segments of cats with HCM, reduced segmental radial strain and strain rate variables had significantly related with segmental LV hypertrophy. It is concluded that STE analysis using short axis images of LV appeared to be clinically feasible in cats, having the possibility to be useful for detecting myocardial dysfunctions in cats with diseased heart.

Serological diagnosis of feline coronavirus infection by immunochromatographic test.

The immunochromatographic assay (ICA) is a simple antibody-antigen detection method, the results of which can be rapidly obtained at a low cost. We designed an ICA to detect anti-feline coronavirus (FCoV) antibodies. A colloidal gold-labeled recombinant FCoV nucleocapsid protein (rNP) is used as a conjugate. The Protein A and affinity-purified cat anti-FCoV IgG are blotted on the test line and the control line, respectively, of the nitrocellulose membrane. The specific detection of anti-FCoV antibodies was possible in all heparin-anticoagulated plasma, serum, whole blood, and ascitic fluid samples from anti-FCoV antibody positive cats, and nonspecific reaction was not noted in samples from anti-FCoV antibody negative cats.

Central venous blood gas and acid-base status in conscious dogs and cats.
Tamura J., Itami T., Ishizuka T., Fukui S., Miyoshi K., Sano T. & Yamashita K. (2015) *J Vet Med Sci* To determine the reference level of central venous oxygen saturation (ScvO2) and clinical efficacy of central venous blood gas analysis, partial pressures of oxygen and carbon dioxide, pH, oxygen saturation, base excess (B.E.) and HCO3 concentration were compared between simultaneously obtained central venous and arterial blood samples from conscious healthy 6 dogs and 5 cats. Comparisons between arteriovenous samples were performed by a paired t-test and Bland-Altman analysis. Between arteriovenous samples, B.E. showed good agreement, but there were significant
differences in other parameters in the dogs, and no good agreement was detected in cats. The ScvO2 in dogs and cats were 82.3 ± 3.5 and 62.4 ± 13.5%, respectively. Central venous blood gas analysis is indispensable, especially in cats.

**Sedative effects of intramuscular alfaxalone administered to cats.**


The sedative effects of intramuscular (IM) alfaxalone in 2-hydroxypropyl-beta-cycloDEXTRIN (alfaxalone-HPCD) were evaluated in cats. The cats were treated with alfaxalone-HPCD in five occasions with a minimum 14-day interval between treatments: an IM injection of 1.0 mg/kg (IM1), 2.5 mg/kg (IM2.5), 5 mg/kg (IM5) or 10 mg/kg (IM10), or an intravenous injection of 5 mg/kg (IV5). The sedative effects were evaluated subjectively using a composite measurement scoring system (a maximum score of 16). Cardio-respiratory variables were measured non-invasively. The median sedation scores peaked at 10 min (score 9), 15 min (score 14), 10 min (score 16), 10 to 20 min (score 16) and 2 to 5 min (score 16) after the IM1, IM2.5, IM5, IM10 and IV5 treatment, respectively. The IM5 treatment produced longer lasting sedation, compared to the IV5 treatment. Durations of maintenance of lateral recumbency after the IM10 treatment (115 ± 22 min) were longer than those after the IM2.5 (40 ± 15 min), IM5 (76 ± 21 min) and IV5 treatments (50 ± 5 min). Cardio-respiratory variables remained within clinically acceptable ranges, except for each one cat that showed hypotension (<60 mmHg) after the IM10 and IV5 treatments. Tremors, ataxia and opisthotonus-like posture were observed during the early recovery period after the IM2.5, IM5, IM10 and IV5 treatments. In conclusion, IM alfaxalone-HPCD produced dose-dependent and clinically relevant sedative effect at 2.5 to 10 mg/kg in healthy cats. Hypotension may occur at higher IM doses of alfaxalone-HPCD.

**Molecular epidemiological study of feline coronavirus strains in Japan using RT-PCR targeting nsp14 gene.**


**BACKGROUND:** Feline infectious peritonitis is a fatal disease of cats caused by infection with feline coronavirus (FCoV). For detecting or genotyping FCoV, some RT-PCR plus nested PCR techniques have been reported previously. However, referring to the whole genome sequences (WGSs) registered at NCBI, there are no detection methods that can tolerate the genetic diversity among FCoV population. In addition, the quasispecies nature of FCoV, which consists of heterogeneous variants, has been also demonstrated; thus, a universal method for heteropopulations of FCoV variants in clinical specimens is desirable. **RESULTS:** To develop an RT-PCR method for detection and genotyping of FCoV, we performed comparative genome analysis using WGSs of 32 FCoV, 7 CCoV and 5 TGEV strains obtained from NCBI. As the PCR target, we focused on the nsp14 coding region, which is highly conserved and phylogenetically informative, and developed a PCR method targeting nsp14 partial sequences. Among 103 ascites, 45 pleural effusion and 214 blood specimens from clinically ill cats, we could detect FCoV in 55 (53.4%), 14 (31.1%) and 19 (8.9%) specimens using the present method. Direct sequencing of PCR products and phylogenetic analysis allowed discrimination between type I- and II-FCoV serotypes. Our nsp14 amino acid sequence typing (nsp14 aa ST) showed that the FCoV clone with sequence type (ST) 42, which was the most predominant genotype of WGS strains,
was prevalent in domestic cats in Japan. CONCLUSIONS: Our nsp14 PCR scheme will contribute to virus detection, epidemiology and ecology of FCoV strains.

**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.

**The use of quantitative PCR to detect Felis catus papillomavirus type 2 DNA from a high proportion of queens and their kittens.**

Squamous cell carcinomas are common feline skin cancers that have been associated with infection with Felis catus papillomavirus type 2 (FcaPV-2). Currently, little is known about the epidemiology of FcaPV-2 infection. The aim of this study was to develop a real-time PCR assay to quantify FcaPV-2 DNA in plucked hairs and skin swabs from 11 healthy breeding queens and their kittens. Samples were taken prior to kittening and then 2, 7 and 28 days after kittening to determine the age at which the kittens were first exposed to the virus. FcaPV-2 DNA was amplified from all of the queens and from 91% of the kittens at 2 days of age. There was a wide range in the quantity of FcaPV-2 DNA detected, from 1 to 92,520 copies per swab, and from 0.01 to 234 copies per copy of reference gene DNA in the hair plucks. The quantity of FcaPV-2 DNA detected in samples collected from the kittens was strongly correlated to that of their respective queens and the mean viral DNA load was similar for cats within a household but varied significantly between households. This is the first time that quantitative PCR has been used to detect FcaPV-2 DNA and the results suggest that the virus is ubiquitous but there is a wide variation of viral DNA loads. Kittens appear to be exposed to FcaPV-2 early in life, presumably from direct contact with their queen. These results are important when determining if FcaPV-2 infection of cats is preventable.

**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.

**Relationship between degenerative joint disease, pain, and Bartonella spp. seroreactivity in domesticated cats.**


**BACKGROUND:** Recently, a potential association was identified between Bartonella exposure and arthritides in mammalian species other than cats. **HYPOTHESIS/OBJECTIVES:** We hypothesized that Bartonella exposure is associated with more severe degenerative joint disease (DJD) and a greater burden of DJD-associated pain in client-owned cats. **ANIMALS:** Ninety-four client-owned cats (6 months to 20 years old), ranging from clinically unaffected to severely lame because of DJD. **METHODS:** Using physical examination and radiography, pain and radiographic scores were assigned to each part of the bony skeleton. Sera were tested for Bartonella henselae, B. koehlerae, and B. vinsonii subspp. berkhoffii (genotypes I, II, and III) antibodies using immunofluorescence antibody assays. Variables were categorized and logistic regression used to explore associations. **RESULTS:** Seropositivity to Bartonella was identified in 33 (35.1%) cats. After multivariate analysis controlling for age, total DJD score (OR, 0.51; 95% CI, 0.26-0.97; P = .042), appendicular pain score (OR, 0.33; 95% CI, 0.17-0.65; P = .0011), and total pain score (OR, 0.35; 95% CI, 0.17-0.72; P = .0045) were
significantly inversely associated with Bartonella seroreactivity status, indicating that cats with higher DJD and pain scores were less likely to be Bartonella seropositive. CONCLUSIONS AND CLINICAL IMPORTANCE: Based upon this preliminary study, Bartonella spp. seropositivity was associated with decreased severity of DJD and decreased DJD-associated pain in cats. Additional studies are needed to verify these findings, and if verified, to explore potential mechanisms.

Clinical outcome, PDGFRβ and KIT expression in feline histiocytic disorders: a multicentre study.


Information about histiocytic disease in cats is limited. The aim of this study was to document clinical findings and outcome in feline histiocytic disorders, and characterize the expression of PDGFRβ and KIT in order to identify potential treatment targets. Morphologically diagnosed feline histiocytic tumours were reviewed and characterized by immunohistochemistry (IHC). Five cases of feline progressive histiocytosis (FPH), eight histiocytic sarcomas (HS) and two haemophagocytic histiocytic sarcomas (HaeHS) were confirmed. PDGFRβ was variably positive in most histiocytic cases, while KIT was negative in all. Clinical presentation, treatment and outcome were also evaluated. Partial responses were recorded in measurable disease with tyrosine kinase inhibitors and lomustine, and radiotherapy achieved long-term control in some cases. Survival times were shortest in HaeHS and disseminated disease. PDGFRβ, but not KIT, may represent a therapeutic target in feline histiocytic disorders but more studies are needed to investigate other potential treatment targets.

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


Abstract 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 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 gravity results than reference methods and other refractometers. CLINICAL RELEVANCE: Because of this imprecision, veterinarians should not use precise cut off values such as 1.030 or 1.035 for
evaluation of renal concentrating ability in dogs and cats. Veterinarians should consider the variability of refractometric specific gravity results in their clinical assessment. Two feline refractometers appeared to report falsely low specific gravity results.

Simultaneous infection by four feline lungworm species and implications for the diagnosis.

Besides Aelurostrongylus abstrusus, other parasites belonging to the superfamily Metastrongyloidea, namely Oslerus rostratus, Troglostrongylus brevior and to the family Trichuridae, i.e. Eucoleus aerophilus (syn. Capillaria aerophila), have also been reported as agents of respiratory infection in domestic cats. A case of simultaneous infection by four feline lungworm species in Sardinia is herein described. An adult female cat (Felis silvestris catus), road-killed in the southeast part of Sardinia (municipality of Villacidro, province of Cagliari), Italy, was referred to the Laboratory of Parasitology of the Veterinary Teaching Hospital in Sassari. At necropsy, the lungs were examined and dissected under a stereomicroscope for the presence of parasites, and first-stage larvae (L1) of broncho-pulmonary nematodes were searched for in a faecal sample using the Baermann method. Parasites collected in the lungs were morphologically identified as A. abstrusus, E. aerophilus, and O. rostratus. In addition to the above species, L1s of Troglostrongylus spp. were detected at coproscopy but no adult specimen was found in the lungs. The morphological identification was confirmed by the molecular amplification and sequencing of cox1 mitochondrial gene, 18S and ITS2 ribosomal DNA. This finding stands as the first simultaneous infection by four feline lungworm species in the same animal, and as the first report of O. rostratus and E. aerophilus in Sardinia.

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 ovariecotomy or orchietomy. 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.

Effect of thyroid volume on radioiodine therapy outcome in hyperthyroid cats.
Radioiodine therapy is commonly used in hyperthyroid cats and has a high success rate, ranging from 85-95%. As in humans, thyroid volume has been reported to influence radioiodine therapy outcome in hyperthyroid cats. The purpose of this study was to relate total thyroid volume, calculated by a newly constructed formula for feline patients, to the outcome of radioiodine therapy. To search for a correlation between total thyroid volume and therapy outcome, 167 hyperthyroid cats were included. Patients were categorised according to the administered radioiodine dose and therapy outcome. Our analysis did not show a significant relationship between an increasing total thyroid volume and the odds for a final low total thyroxine concentration (TT4; P = 0.3930) or a final hyperthyroid outcome (P = 0.0901). A significant relationship was found for an increase in the odds for a final low TT4 outcome with an increase in the number of foci detected on the pertechnetate thyroid scan (P = 0.0238). This was not true for a final hyperthyroid outcome (P = 0.7435). The number of detected foci was also significantly associated with the total thyroid volume (P = 0.0006). Findings indicated that the presence of multiple affected foci influences therapy outcome towards a low TT4 outcome. Bilateral hyperthyroidism and its potential effect on a final low TT4 outcome should therefore be addressed when informing owners of the possible outcomes of radioiodine therapy for their cat.

Clinical comparison of the TonoVet(®) rebound tonometer and the Tono-Pen Vet(®) applanation tonometer in dogs and cats with ocular disease: glaucoma or corneal pathology.


OBJECTIVE: To compare the TonoVet(®) rebound tonometer with the Tono-Pen Vet(®) applanation tonometer in a larger number of glaucomatous eyes and to evaluate the effect of different corneal pathologies on both tonometers. PROCEDURE: In 26 eyes with clinical signs of glaucoma, intraocular pressure (IOP) was measured using the TonoVet(®) followed by the Tono-Pen Vet(®). In 29 eyes with focal corneal pathology (e.g., corneal scarring, edema, pigmentation), both tonometers were used successively to measure IOP in one unaffected area of the cornea, as well as on the lesion itself. Impact on measurement results was assessed comparing the deviation in IOP readings of each tonometer between the two localizations. Statistical data analysis included paired t-tests and regression analysis using sas software (version 9.2; SAS Institute, Cary, NC). RESULTS: In glaucomatous eyes, the TonoVet(®) consistently yielded higher values of IOP than the Tono-Pen Vet(®) as can be quantified by the regression equation IOP (TonoVet(®)) [mmHg] = 1.12 * IOP (Tono-Pen Vet(®)) [mmHg] + 11.5 with R(2) = 0.91 and P < 0.0001. Depending on the type and degree of corneal pathology, the deviation in IOP resulting from measurements on altered cornea ranged from -6 to 16 mmHg for the TonoVet(®) and -7 to 20 mmHg for the Tono-Pen Vet(®), respectively. On average, the effect of corneal disease on IOP measurements was lower for the TonoVet(®) by 1.14 mmHg. CONCLUSIONS: Rebound tonometry appears to be a valuable alternative to established applanation tonometry in patients with ocular disease such as glaucoma and corneal disorders. In patients suffering from glaucoma, the same type of tonometer should be used for follow-up examinations, as measurement results of the TonoVet(®) and the Tono-Pen Vet(®) differ substantially with increasing IOP. Corneal pathology has considerable influence on both tonometers with the degree of over- or underestimation of IOP depending on the alteration of biomechanical properties of the cornea inflicted by various corneal pathologies.
Medical infrared thermal imaging of cats with hyperthyroidism.


OBJECTIVE: To determine the usefulness of medical infrared thermal imaging (MITI) as a screening tool for hyperthyroidism in cats, evaluate the need for hair clipping over the ventral aspect of the neck to achieve optimal images, and determine whether there is a change in thermal patterns at 1 and 3 months after radioactive sodium iodide I 131 treatment. ANIMALS: 17 cats with and 12 control cats without hyperthyroidism. PROCEDURES: All cats underwent MITI first with the hair present and then after the hair was clipped. Each cat with hyperthyroidism was subsequently appropriately treated SC with radioiodide; reevaluations, including MITI before and after hair clipping and measurement of serum thyroxine concentration, were performed 1 and 3 months after treatment. RESULTS: The MITI had 80.5% and 87.5% accuracy in differentiating hyperthyroid cats from clinically normal cats before and after the hair over the ventral aspect of the neck was clipped. Among cats with an initial serum thyroxine concentration > 4.0 µg/dL, the success rate for MITI-detected response to radioiodide treatment at the 1-month reevaluation was 92.86% in unshaved cats and 85.71% in shaved cats. The success rate for MITI-detected response to radioiodide treatment at the 3-month reevaluation was 100% in unshaved and shaved cats. CONCLUSIONS AND CLINICAL RELEVANCE: Results indicated that MITI was successful in differentiating between hyperthyroid cats and clinically normal cats and identifying patients with thyroxine concentration within reference interval after radioactive sodium iodide I 131 treatment.

A review of the pharmacology and clinical application of alfaxalone in cats.


Alfaxalone-2-hydroxpropyl-β-cyclodextrin (alfaxalone-HPCD) was first marketed for veterinary use in Australia in 2001 and has since progressively became available throughout the world, including the USA, where in 2012 Food and Drug Administration (FDA) registration was granted. Despite the growing body of published works and increasing global availability of alfaxalone-HPCD, the accumulating evidence for its use in cats has not been thoroughly reviewed. The purpose of this review is: (1) to detail the pharmacokinetic properties of alfaxalone-HPCD in cats; (2) to assess the pharmacodynamic properties of alfaxalone-HPCD, including its cardiovascular, respiratory, central nervous system, neuromuscular, hepatic, renal, haematological, blood-biochemical, analgesic and endocrine effects; and (3) to consider the clinical application of alfaxalone-HPCD for sedation, induction and maintenance of anaesthesia in cats. Based on the published literature, alfaxalone-HPCD provides a good alternative to the existing intravenous anaesthetic options for healthy cats.

Pancreatitis in dogs and cats: definitions and pathophysiology.


Pancreatitis, or inflammation of the pancreas, is commonly seen in dogs and cats and presents a spectrum of disease severities from acute to chronic and mild to severe. It is usually sterile, but the causes and pathophysiology remain poorly understood. The acute end of the disease spectrum is associated with a high mortality but the potential for complete recovery of organ structure and function
if the animal survives. At the other end of the spectrum, chronic pancreatitis in either species can cause refractory pain and reduce quality of life. It may also result in progressive exocrine and endocrine functional impairment. There is confusion in the veterinary literature about definitions of acute and chronic pancreatitis and there are very few studies on the pathophysiology of naturally occurring pancreatitis in dogs and cats. This article reviews histological and clinical definitions and current understanding of the pathophysiology and causes in small animals by comparison with the much more extensive literature in humans, and suggests many areas that need further study in dogs and cats.

**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.

**AVMA policy on trap-neuter-vaccinate-return programs for free-roaming cats.**


**The oral and conjunctival microbiotas in cats with and without feline immunodeficiency virus infection.**


The oral and conjunctival microbiotas likely play important roles in protection from opportunistic infections, while also being the source of potential pathogens. Yet, there has been limited investigation in cats, and the impact of comorbidities such as feline immunodeficiency virus (FIV) infection has not been reported. Oral and conjunctival swabs were collected from cats with FIV infection and FIV-
uninfected controls, and subjected to 16S rRNA gene (V4) PCR and next generation sequencing. 9,249 OTUs were identified from conjunctival swabs, yet the most common 20 (0.22%) OTUs accounted for 76% of sequences. The two most abundant OTUs both belonged to Staphylococcus, and accounted for 37% of sequences. Cats with FIV infection had significantly lower relative abundances of Verrucomicrobia, Fibrobacteres, Spirochaetes, Bacteroidetes and Tenericutes, and a higher relative abundance of Deinococcus-Thermus. There were significant differences in both community membership ($P = 0.006$) and community structure ($P = 0.02$) between FIV-infected and FIV-uninfected cats. FIV-infected cats had significantly higher relative abundances of Fusobacteria and Actinobacteria in the oral cavity, and significantly higher relative abundances of several bacterial classes including Fusobacteria (0.022 vs 0.007, $P = 0.006$), Actinobacteria (0.017 vs 0.003, $P = 0.003$), Sphingobacteria (0.00015 vs 0.00003, $P = 0.0013$) and Flavobacteria (0.0073 vs 0.0034, $P = 0.030$). The feline conjunctival and oral microbiotas are complex polymicrobial communities but dominated by a limited number of genera. There is an apparent impact of FIV infection on various components of the microbiota, and assessment of the clinical relevance of these alterations in required.

**Infection with haemoplasma species in 22 cats with anaemia.**


OBJECTIVES: Information regarding the clinical course of natural infection with feline haemotropic mycoplasmas (haemoplasmas) is limited. The objective of the study was to describe the clinical findings and course of disease in naturally infected cats with haemoplasmosis and anaemia. METHODS: A retrospective analysis was performed on patient data from cats presenting with anaemia and haemoplasma infection regarding signalment, clinical signs, laboratory data and course of infection. The diagnosis was confirmed by conventional haemoplasma PCR analysis. RESULTS: Haemoplasma infection was found in 22 anaemic (haematocrit 5-25% [median 17%]; reference interval 30-44%) cats (‘Candidatus Mycoplasma haemominutum’, $n = 12$; Mycoplasma haemofelis, $n = 3$; ‘Candidatus Mycoplasma turicensis’, $n = 2$; species not determined, $n = 4$; co-infection with all three species, $n = 1$) between 2005 and 2014. Thirteen of the cats had concurrent diseases. All cats underwent antibiotic treatment; 15 cats received blood products. Six cats were euthanased within 11 weeks owing to concurrent disease, persistent severe anaemia or financial constraints. Ten cats underwent follow-up for a period of 14-199 weeks (median 26 weeks). Haemoplasma PCR was negative in 5/7 cases after 3-23 weeks. PCR remained positive in two cases after 18 and 199 weeks, respectively. Reactivation of the haemoplasma infection occurred in two cats, once and three times, respectively, up to 177 weeks after initial presentation. Reactivation was suspected in two further cases. Owing to concurrent disease, four of the 10 follow-up cats were euthanased 14-180 weeks after initial presentation. CONCLUSION AND RELEVANCE: Infection with haemoplasma species is often chronic, can reactivate months later and is rarely a reason for euthanasia.

**Susceptibility of rapidly growing mycobacteria isolated from Australian cats to ivermectin, moxidectin, ceftiofur and florfenicol.**


OBJECTIVES: Rapidly growing mycobacteria (RGM) infections in cats typically manifest as a panniculitis, requiring long-term antimicrobial therapy for resolution. The search for novel antimicrobial therapies to reduce treatment duration and improve the rate of clinical resolution is
imperative. Accordingly, RGM isolates underwent susceptibility testing to some avermectins and other antibacterial drugs currently available. METHODS: Five Mycobacterium fortuitum and six Mycobacterium smegmatis isolates obtained from Australian cats underwent susceptibility testing by microbroth dilution to ivermectin, moxidectin, ceftiofur and florfenicol. RESULTS: All isolates were resistant to the highest concentrations of ivermectin, moxidectin and ceftiofur tested, (1024 µg/ml, 256 µg/ml and 32 µg/ml, respectively). All isolates of M. fortuitum were resistant to the highest concentration of florfenicol tested (128 µg/ml). The minimum inhibitory concentration range of florfenicol that inhibited growth of M. smegmatis isolates was 32-64 µg/ml. CONCLUSIONS AND RELEVANCE: All drugs appear to have no efficacy in vitro for the treatment of RGM infections.

**Diagnosis of pancreatitis in dogs and cats.**


Pancreatitis is the most common disorder of the exocrine pancreas in both dogs and cats. Ante-mortem diagnosis of canine and feline pancreatitis can be challenging. The clinical picture of dogs and cats with pancreatitis varies greatly (from very mild to severe or even fatal) and is characterised by non-specific findings. Complete blood count, serum biochemistry profile and urinalysis should always be performed in dogs and cats suspected of having pancreatitis, although findings are not-specific for pancreatitis. Serum amylase and lipase activities and trypsin-like immunoreactivity (TLI) concentrations have no or only limited clinical value for the diagnosis of pancreatitis in either dogs or cats. Conversely, serum pancreatic lipase immunoreactivity (PLI) concentration is currently considered to be the clinicopathological test of choice for the diagnosis of canine and feline pancreatitis. Abdominal radiography is a useful diagnostic tool for the exclusion of other diseases that may cause similar clinical signs to those of pancreatitis. Abdominal ultrasonography can be very useful for the diagnosis of pancreatitis, but this depends largely on the clinician’s experience. Histopathological examination of the pancreas is considered the gold standard for the diagnosis and classification of pancreatitis, but it is not without limitations. In clinical practice, a combination of careful evaluation of the animal’s history, serum PLI concentration and abdominal ultrasonography, together with pancreatic cytology or histopathology when indicated or possible, is considered to be the most practical and reliable means for an accurate diagnosis or exclusion of pancreatitis compared with other diagnostic modalities.

**Dermoscopic evaluation of skin in healthy cats.**


BACKGROUND: Dermoscopy is a diagnostic tool that can reveal morphological structures not visible upon clinical examination. HYPOTHESIS/OBJECTIVES: To assess the usefulness and applicability of dermoscopy for the examination of healthy cat skin. ANIMALS: Twenty-one domestic short-haired cats from a feline rescue association. METHODS: Four regions (head, dorsal neck, sacral and abdominal regions) were examined with both a contact hand-held nonpolarized light dermoscope at 10-fold magnification and a videodermoscope at 70-fold magnification. Findings were assessed using histological analysis of skin samples cut both longitudinally and transversely, set as the gold standard. RESULTS: With a hand-held dermoscope at 10-fold magnification, thick, straight primary hairs surrounded by multiple secondary hairs were observed. With a videodermoscope at 70-fold
magnification, hair shaft thickness was measured and the follicular openings and arrangement of vessels were clearly observed. Correspondence was observed between dermoscopic and histological results. CONCLUSIONS AND CLINICAL IMPORTANCE: Dermoscopy represents a valid noninvasive and reproducible technique that could be helpful in clinical examination.

**Prognostic evaluation of feline mammary carcinomas: a review of the literature.**

A large number of studies have investigated feline mammary tumors in an attempt to identify prognostic markers and generate comparative analyses with human breast cancer. Nevertheless, a retrospective base of assessments and the lack of standardization in methodology and study design have caused weakness in study results, making comparison difficult. We examined feline mammary tumor publications and evaluated postulated prognostic parameters according to the recently published “Recommended Guidelines for the Conduct and Evaluation of Prognostic Studies in Veterinary Oncology.” Using these criteria, we determined with statistically significant reliability that prognostic parameters for feline mammary tumors are tumor grading and lymph node/lymphovascular invasion. Furthermore, tumor subtype, size, and staging are worthy of further standardized investigation. We present statistical significance for each studied parameter as well as its relevance to disease progression and survival. Our evaluation suggests that marker expression (ie, Ki67, HER2, ER) may provide relevant information applicable for therapeutic predictions; however, consensus efforts and protocol standardization are needed. We identify and discuss major points of concern—such as sample preservation and selection, standardization of immunohistochemical protocols, and evaluation of results—to provide support for subsequent reliable analyses.

**Occurrence and molecular identification of Giardia duodenalis from stray cats in Guangzhou, southern China.**

The objective of this study was to genetically characterize isolates of Giardia duodenalis and to determine if zoonotic potential of G. duodenalis could be found in stray cats from urban and suburban environments in Guangzhou, China. Among 102 fresh fecal samples of stray cats, 30 samples were collected in Baiyun district (urban) and 72 in Conghua district (suburban). G. duodenalis specimens were examined using light microscopy, then the positive specimens were subjected to PCR amplification and subsequent sequencing at 4 loci such as glutamate dehydrogenase (gdh), triose phosphate isomerase (tpi), β-giardin (bg), and small subunit ribosomal RNA (18S rRNA) genes. The phylogenetic trees were constructed using obtained sequences by MEGA5.2 software. Results show that 9.8% (10/102) feline fecal samples were found to be positive by microscopy, 10% (3/30) in Baiyun district and 9.7% (7/72) in Conghua district. Among the 10 positive samples, 9 were single infection (8 isolates, assemblage A; 1 isolate, assemblage F) and 1 sample was mixed infection with assemblages A and C. Based on tpi, gdh, and bg genes, all sequences of assemblage A showed complete homology with AI except for 1 isolate (CHC83). These findings not only confirmed the occurrence of G. duodenalis in stray cats, but also showed that zoonotic assemblage A was found for the first time in stray cats living in urban and suburban environments in China.
Serological evidence of avian influenza virus and canine influenza virus infections among stray cats in live poultry markets, China.


From January 2010 to January 2012, we collected sera samples from 700 stray cats living in close proximity to poultry farms or poultry markets in 4 provinces in China. A number of cats had evidence of avian and canine influenza virus infection: avian H9N2 [24 by HI ≥1:20 and 16 by microneutralization (MN) assay ≥1:80]; avian H5N1 (9 by HI ≥1:20 and 3 by MN assay ≥1:80) and canine H3N2 (32 by HI ≥1:20 and 18 by MN ≥1:80). Bivariate analyses revealed that cats sampled near live poultry markets and cats with influenza-like illness were at increased risk of having elevated antibody titers by HI against avian H9N2, avian H5N1, or canine H3N2 viruses. Hence, cats may play a very important role in the ecology of novel influenza viruses and periodic epidemiological surveillance for novel influenza infections among stray cats could serve as an early warning system for human threats.

Tracheobronchial brush cytology and bronchoalveolar lavage in dogs and cats with chronic cough: 45 cases (2012-2014).


BACKGROUND: Animals with chronic cough can have normal bronchoalveolar lavage fluid cytology when small airway disease is absent. Cytology of a tracheobronchial brushing can detect inflammation in larger airways; however, evaluation of this technique has been limited in veterinary medicine.

OBJECTIVE: To compare airway brush cytology to bronchoalveolar lavage fluid analysis in dogs and cats with chronic cough. ANIMALS: Forty dogs and five cats undergoing bronchoscopic investigation of chronic cough. METHODS: Prospective study. Bronchoscopy and bronchoalveolar lavage were performed followed by tracheobronchial brushing of central airways. Results of cytologic assessment of BAL fluid and brush cytology were compared for the presence or absence of inflammation and concordance of inflammatory cell type. RESULTS: Brush cytology detected central airway inflammation in 34 of 40 (85%) dogs with inflammatory BAL fluid. However, the type of inflammation reported differed in 23 of 34 dogs. In five cats with inflammation in BAL fluid, brush cytology detected inflammation in four; the type of inflammation was discordant in all cats.

CONCLUSIONS AND CLINICAL RELEVANCE: Brush cytology has good agreement with BAL regarding the presence of inflammation, although the type of inflammation detected with the different sampling techniques commonly varies. Brush cytology can provide supplementary information to BAL, and additional studies will provide further information on the role of tracheobronchial brush cytology in the diagnosis and management of respiratory conditions.

Longitudinal evaluation of serum pancreatic enzymes and ultrasonographic findings in diabetic cats without clinically relevant pancreatitis at diagnosis.


BACKGROUND: Cats with diabetes mellitus can have subclinical pancreatitis but prospective studies to confirm this are lacking. Metabolic control of diabetic cats with pancreatitis is difficult.
HYPOTHESIS: Subclinical pancreatitis occurs in diabetic cats at the time diabetes is diagnosed or might develop during the follow-up period, hampering diabetic remission. ANIMALS: Thirty cats with newly diagnosed diabetes without clinical signs of pancreatitis on admission. METHODS: Prospective study. On admission and 2 and 6 months later, serum Spec fPL and DGGR-lipase were measured and the pancreas underwent ultrasonographic examination. Pancreatitis was suspected if serum markers were increased or ≥2 ultrasonographic abnormalities were detected. Cats were treated with insulin glargine and diabetic remission was defined as euglycemia ≥4 weeks after discontinuation of insulin. Nonparametric statistical tests were used for analysis. RESULTS: Subclinical pancreatitis at the time of diagnosis was suspected in 33, 50, and 31% of cats based on Spec fPL, DGGR-lipase and ultrasonography, respectively; and in 60% when diagnostic criteria were combined. During the follow-up period, suspected pancreatitis developed in additional 17-30% cats. Only 1 cat had transient clinical signs compatible with pancreatitis. Seventeen of the 30 cats (57%) achieved remission. Frequency of abnormal Spec fPL and DGGR-lipase and abnormal ultrasonographic findings did not differ in cats achieving remission and those who did not. Cats achieving remission had significantly lower Spec fPL at 2 months (P < .001). CONCLUSIONS AND CLINICAL IMPORTANCE: Based on laboratory and ultrasonographic measurements, many cats with diabetes might have pancreatitis, although without clinical signs. Cats with high Spec fPL might have a reduced chance of diabetic remission; however, this topic needs further studies in large cohorts of diabetic cats.

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.