Small Animal Article Summaries – FELINE MEDICINE & SURGERY

November-December, 2014

Generously provided by

The International Society of Feline Medicine

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The International Society of Feline Medicine (ISFM) and the American Association of Feline Practitioners (AAFP) publish the Journal of Feline Medicine and Surgery.
Electrophysiologic confirmation of heterogeneous motor polyneuropathy in young cats.


BACKGROUND: Reports of motor polyneuropathies in young cats are scarce. Further, in-depth electrophysiologic evaluation to confirm a motor polyneuropathy in young cats of various breeds other than 2 Bengal cats is lacking.

HYPOTHESIS/OBJECTIVES: To confirm a motor polyneuropathy in young cats of various breeds. ANIMALS: Five young cats with heterogeneous chronic or relapsing episodes of weakness. METHODS: Retrospective case series. Cats were presented for evaluation of generalized neuromuscular disease and underwent electrophysiologic examination including electromyography, nerve conduction, and repetitive nerve stimulation. Minimum database and muscle and nerve biopsy analyses were carried out. Descriptive statistics were performed. RESULTS: Disease onset was at 3 months to 1 year of age and in 5 breeds. The most common clinical sign (5 of 5 cats) was weakness. Additional neurologic deficits consisted of palmigrade and plantigrade posture (4/4), low carriage of the head and tail (4/4), and variable segmental reflex deficits (5/5). Motor nerve conduction studies were abnormal for the ulnar (4/4), peroneal (5/5), and tibial (2/2) nerves (increased latencies, reduced amplitudes, slow velocities). A marked decrement was observed on repetitive nerve stimulation of the peroneal nerve in 3 cats for which autoimmune myasthenia gravis was ruled out. All sensory nerve conduction studies were normal. Histologic evaluation of muscle and nerve biopsies supported heterogeneous alterations consistent with motor polyneuropathy with distal nerve fiber loss. CONCLUSIONS AND CLINICAL IMPORTANCE: Heterogenous motor polyneuropathies should be considered in young cats of any breed and sex that are presented with relapsing or progressive generalized neuromuscular disease.

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.

Prevalence and phylogenetic analysis of haemoplasmas from cats infected with multiple species.


Mycoplasma haemofelis (Mhf), ‘Candidatus Mycoplasma haemominutum’ (CMhm) and ‘Candidatus Mycoplasma turicensis’ (CMt) are agents of feline haemoplasmosis and can induce anaemia in cats. This study aimed to determine the prevalence and phylogeny of haemoplasma species in cats from Brazil’s capital and surrounding areas, and whether correlation with haematological abnormalities existed. Feline haemoplasmas were found in 13.8% of 432 cats. CMhm was the most prevalent species (in 13.8% of cats), followed by Mhf (11.1%) and CMt (4.4%). Over 80% of haemoplasma-infected cats harboured two or more feline haemoplasma species: 7.1% of cats were co-infected with Mhf/CMhm, 0.4% with CMhm/CMt and 3.9% with Mhf/CMhm/CMt. Male gender was significantly associated with haemoplasma infections. No association was found between qPCR haemoplasma status and haematological variables, however CMhm relative copy numbers were correlated with red blood cell (RBC) numbers and packed cell volume (PCV). Haemoplasma 16S rRNA gene sequences (> 1 Kb) were derived from co-infected cats using novel haemoplasma species-specific primers. This allowed 16S rRNA gene sequences to be obtained despite the high level of co-infection, which precluded the use of universal 16S rRNA gene primers. Within each species, the Mhf, CMhm and CMt sequences showed > 99.8%, > 98.5% and > 98.8% identity, respectively. The Mhf, CMhm and CMt sequences showed > 99.2%, > 98.4% and > 97.8% identity, respectively, with GenBank sequences. Phylogenetic analysis showed all Mhf sequences to reside in a single clade, whereas the CMhm
and CMt sequences each grouped into three distinct subclades. These phylogeny findings suggest the existence of different CMhm and CMt strains.

Concentrations of anti-Mullerian hormone in the domestic cat. Relation with spay or neuter status and serum estradiol.
Axner E. & Strom Holst B. (2014) Theriogenology
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-Mullerian hormone (AMH) in females, whereas Sertoli cells produce AMH in males. Anti-Mullerian 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.

Limited efficacy of topical recombinant feline interferon-omega for treatment of cats with acute upper respiratory viral disease.
Despite a lack of controlled studies confirming its efficacy, recombinant feline interferon-omega (rFeIFN-omega) is used in the treatment of feline upper respiratory tract disease (FURTD), which is usually caused by feline calicivirus (FCV) or feline herpesvirus-1 (FHV-1). The aims of the present study were to investigate whether administration of rFeIFN-omega improves clinical signs in cats with acute FURTD and whether this treatment reduces shedding of FCV. Thirty-seven cats affected with acute FURTD were recruited into a prospective, randomised, placebo-controlled, double-blinded clinical trial. The presence of FCV and/or FHV-1 was determined by performing quantitative polymerase chain reaction (qPCR) on oropharyngeal and conjunctival swabs. Cats were randomly assigned to treatment groups, receiving either placebo or rFeIFN-omega (2.5 MU/kg) subcutaneously, followed by 0.5 MU topically at 8-h intervals via the conjunctiva, intranasally, and orally for 21 days. All cats received additional treatment with antibiotics, expectorants, and inhalation of nebulised physiological saline with camomile. Clinical signs and FCV shedding were evaluated over 42 days. All cats demonstrated improvement in clinical signs during the course of the study, with no significant difference in any of the assessed variables when comparing the two groups. FCV copy numbers decreased more rapidly in cats receiving rFeIFN-omega compared to placebo, but might accelerate a reduction in FCV load in infected cats.

Molecular detection, phylogenetic analysis, and identification of transcription motifs in feline leukemia virus from naturally infected cats in malaysia.
A nested PCR assay was used to determine the viral RNA and proviral DNA status of naturally infected cats. Selected samples that were FeLV-positive by PCR were subjected to sequencing, phylogenetic analysis, and motifs search. Of the 39 samples that were positive for FeLV p27 antigen, 87.2% (34/39) were confirmed positive with nested PCR. FeLV proviral DNA was detected in 38 (97.3%) of p27-antigen negative samples. Malaysian FeLV isolates are found to be highly similar with a homology of 91% to 100%. Phylogenetic analysis revealed that Malaysian FeLV isolates divided into two clusters, with a majority (86.2%) sharing similarity with FeLV-K01803 and fewer isolates (13.8%) with FeLV-GM1 strain. Different enhancer motifs including NF-GMa, Krox-20/WT1I-del2, BAF1, AP-2, TBP, TFIIF-beta, TRF, and TFIID are found to
occur either in single, duplicate, triplicate, or sets of 5 in different positions within the U3-LTR-gag region. The present result confirms the occurrence of FeLV viral RNA and provirus DNA in naturally infected cats. Malaysian FeLV isolates are highly similar, and a majority of them are closely related to a UK isolate. This study provides the first molecular based information on FeLV in Malaysia. Additionally, different enhancer motifs likely associated with FeLV related pathogenesis have been identified.

An investigation of the breadth of neutralising antibody response in cats naturally infected with feline immunodeficiency virus (FIV).
Neutralising antibodies (NAbs) are believed to comprise an essential component of the protective immune response induced by vaccines against FIV and HIV infections. However, relatively little is known about the role of NAbs in controlling FIV infection and subsequent disease progression. Here we present studies examining the neutralisation of HIV-luciferase pseudotypes bearing homologous and heterologous FIV Envs (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. Neutralisation profiles varied significantly between FIV infected cats and strong autologous neutralisation, 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 are likely to be involved. Similarly, no correlation was observed between the development of autologous NAbs and the duration of infection. Furthermore, cross-neutralising antibodies were evident in only a small proportion (13%) of cats.

Rapid evolution of the env gene leader sequence in cats naturally infected with feline immunodeficiency virus (FIV).
Analysing the evolution of FIV on the intra-host level is important, in order to address whether the diversity and composition of viral quasispecies affects disease progression. We examined the intra-host diversity and the evolutionary rates of the entire env and structural fragments of the env sequences obtained from sequential blood samples in 43 naturally infected domestic cats that displayed different clinical outcomes. We observed in the majority of cats that FIV env showed very low levels of intra-host diversity. We estimated that env evolved at the rate of 1.16 x 10^-6 substitutions per site per year and demonstrated that recombinant sequences evolved faster than non-recombinant sequences. It was evident that the V3-V5 fragment of FIV env displayed higher evolutionary rates in healthy cats than in those with terminal illness. Our study provided the first evidence that the leader sequence of env, rather than the V3-V5 sequence, had the highest intra-host diversity and the highest evolutionary rate of all env fragments, consistent with this region being under a strong selective pressure for genetic variation. Overall, FIV env displayed relatively low intra-host diversity and evolved slowly in naturally infected cats. The maximal evolutionary rate was observed in the leader sequence of env. Although genetic stability is not necessarily a prerequisite for clinical stability, the higher genetic stability of FIV compared to HIV might explain why many naturally infected cats do not progress to AIDS rapidly.

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 pseudintemedius (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 beta-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 over time 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.

**Spontaneous gastrointestinal perforation in cats: a retrospective study of 13 cases.**


OBJECTIVES: To describe the clinical characteristics and the frequency of malignant vs non-malignant causes for spontaneous gastrointestinal perforation in cats. METHODS: The medical records of cats diagnosed as having gastrointestinal perforation between August 2010 and July 2013 were reviewed. Diagnosis was confirmed by exploratory surgery. Patients with incomplete records, perforation due to external trauma, leakage of previous enterotomy or anastomotic sites, or foreign bodies were excluded. Each record was examined for different information pertaining to signalment, medical history, clinical and clinicopathological data, imaging findings, abdominal fluid examination, surgical findings, histopathological examination, treatment received after surgery and outcome. RESULTS: Thirteen cats were included. Five of these cats had concurrent illnesses, including viral upper respiratory tract disease, pancreateitis and chronic kidney disease. Two cats had previously received non-steroidal anti-inflammatory drugs and four had received corticosteroids. Clinical signs and clinicopathological abnormalities were not specific. Six of 13 patients were diagnosed during surgery with gastric perforations, four patients with duodenal perforations and three patients with jejunal perforations. Histopathological examination of the ulcerated wall was performed in 11/13 cats. Alimentary lymphoma was diagnosed in six cats. Non-neoplastic lesions (lymphocytic- plasmacytic inflammatory bowel disease, necrotic suppurative enteritis) were observed in the other five cats. The major limitation of the study was the small sample size. CONCLUSIONS AND RELEVANCE: Lymphoma may be a frequent cause of spontaneous perforation in cats. Therefore, histological examination of ulceration is essential in all cases. The direct and single implication of anti-inflammatory administration in a gastrointestinal perforation is not clearly established in this study.

**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.

**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 naive 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 (approximately 5x) 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).

Dysregulation of tyrosine kinases and use of imatinib in small animal practice.

Bonkobara M. (2014) Vet J

Imatinib inhibits the activity of several tyrosine kinases, including BCR-ABL, KIT and platelet-derived growth factor receptor (PDGFR). Dysregulation of KIT is found in mast cell tumours (MCTs) and KIT is mutated in approximately 30% and 70% of canine and feline MCTs, respectively. KIT mutations have also been reported in canine and feline gastrointestinal stromal tumours (GISTs), canine acute myeloid leukaemia and canine melanoma. In addition, BCR-ABL and PDGFR mutations have been found in canine leukaemia and haemangiosarcoma, respectively. Imatinib has anti-tumour activity with tolerable toxicity towards a certain subset of MCTs in dogs and cats. Favourable clinical responses are likely to be associated with the presence of KIT mutation. Anti-tumour activity of imatinib has also been demonstrated in canine GISTs with a KIT mutation and in feline hypereosinophilic syndrome; however, to date only one of each of these cases has been reported. In conclusion, analysis of KIT mutations appears to provide valuable data for individual treatment with imatinib in dogs and cats.

Plasma cardiac troponin I concentration and cardiac death in cats with hypertrophic cardiomyopathy.


BACKGROUND: The use of cardiac biomarkers to assist in the diagnosis of occult and symptomatic hypertrophic cardiomyopathy (HCM) in cats has been established. There is limited data describing their prognostic utility in cats with HCM. HYPOTHESIS: Circulating concentrations of N-terminal B-type natriuretic peptide (NTproBNP) and cardiac troponin I (cTnI) predict cardiac death in cats with HCM. ANIMALS: Forty-one cats diagnosed with HCM at a veterinary teaching hospital, between February 2010 and May 2011. METHODS: Prospective investigational study. Plasma samples were collected from cats diagnosed with HCM and concentrations of NTproBNP and cTnI were analyzed at a commercial laboratory. Echocardiographic measurements from the day of blood sampling were recorded. Long-term outcome data were obtained. Associations with time to cardiac death were analyzed using Cox proportional hazards models. RESULTS: When controlling for the presence/absence of heart failure and echocardiographic measures of left atrial size and function, cTnI > 0.7 ng/mL was independently associated with time to cardiac death. In univariable analysis, NTproBNP > 250 pmol/L was associated with cardiac death (P = .023), but this did not remain significant (P = .951) when controlling for the effect of clinical signs or left atrial size/function. CONCLUSIONS AND CLINICAL IMPORTANCE: Plasma concentration of cTnI (cutoff >0.7 ng/mL) is a predictor of cardiac death in cats with HCM that is independent of the presence of heart failure or left atrial dilatation.

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.

**Applying One Health to behaviour.**
The British Veterinary Behaviour Association and the Association of Pet Behaviour Counsellors held a meeting last month to highlight the One Health principle with regard to the behaviour of people and animals, particularly pets. Caroline Bower reports.

**Relationship between serum symmetric dimethylarginine concentration and glomerular filtration rate in cats.**
BACKGROUND: Direct measurement of glomerular filtration rate (GFR) is the preferred method to assess renal function in cats, but it is not widely used in the diagnosis of chronic kidney disease (CKD). In cats with CKD, symmetric dimethylarginine (SDMA) has been shown to increase and to correlate with plasma creatinine concentrations.
HYPOTHESIS: In cats, reduced GFR corresponds with increased serum SDMA concentration. ANIMALS: The study group consisted of ten client-owned cats whose GFR had been measured previously. Cats ranged in age from 11.1 to 16.9 years; both azotemic and nonazotemic animals were included. METHODS: Glomerular filtration rate was determined for each cat by plasma iohexol clearance using the three sample slope-intercept method, and serum SDMA concentration was measured by liquid chromatography-mass spectrometry.
RESULTS: A linear relationship was observed between GFR and the reciprocal of serum SDMA concentration (R(2) = 0.82, P < .001). A similar relationship was found between GFR and the reciprocal of plasma creatinine concentration (R(2) = 0.81, P < .001).
CONCLUSIONS AND CLINICAL IMPORTANCE: Increased serum SDMA concentrations were observed in cats with reduced renal function as determined by direct measurement of GFR. This finding indicates that SDMA could have clinical applications in the diagnosis of CKD in cats.

**Development of a behaviour-based measurement tool with defined intervention level for assessing acute pain in cats.**
OBJECTIVES: To develop a composite measure pain scale tool to assess acute pain in cats and derive an intervention score.
METHODS: To develop the prototype composite measure pain scale-feline, words describing painful cats were collected, grouped into behavioural categories and ranked. To assess prototype validity two observers independently assigned composite measure pain scale-feline and numerical rating scale scores to 25 hospitalised cats before and after analgesic treatment. Following interim analysis the prototype was revised (revised composite measure pain scale-feline). To determine intervention score, two observers independently assigned revised composite measure pain scale-feline and numerical rating scale scores to 116 cats. A further observer, a veterinarian, stated whether analgesia was necessary.
RESULTS: Mean +/- sd decrease in revised composite measure pain scale-feline and numerical rating scale scores following analgesia were 2.4 +/- 2.87 and 1.9 +/- 2.34, respectively (95% confidence interval for mean change in revised composite measure pain scale-feline between 1.21 and 3.6). Changes in revised composite measure pain scale-feline and numerical rating scale were significantly correlated (r = 0.8) (P < 0.001). Intervention level score of >/=4/16 was derived for revised composite measure pain scale-feline (26.7% misclassification) and >/=3/10 for numerical rating scale (14.5% misclassification).
CLINICAL SIGNIFICANCE: A valid instrument with a recommended analgesic intervention level has been developed to assess acute clinical pain in cats that should be readily applicable in practice.

**Estimate of the size and demographic structure of the owned dog and cat population living in Veneto region (northeastern 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 (northeastern 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.

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


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 ovariecotomy (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.

Evaluation of indirect immunofluorescence antibody test and enzyme-linked immunosorbent assay for the diagnosis of infection by Leishmania infantum in clinically normal and sick cats.


Cats that live in areas where canine and human leishmaniosis due to Leishmania infantum is endemic may become infected and may develop anti-Leishmania antibodies. In this study 50 clinically normal and 50 cats with cutaneous and/or systemic signs that lived in an endemic area and had been previously examined for infection by L. infantum using PCR in four different tissues were serologically tested for the presence of anti-Leishmania IgG (IFAT and ELISA) and IgM (IFAT). The aim was to compare the results of IFAT, ELISA and PCR to investigate the possible associations between seropositivity to Leishmania spp and signalment, living conditions, season of sampling, health status of the cats, and seropositivity to other infectious agents. Low concentrations of anti-Leishmania IgG were detected by IFAT in 10% of the cats and by ELISA in 1%, whereas anti-Leishmania IgM were detected by IFAT in 1%. There was disagreement between the results of IFAT and ELISA for anti-Leishmania IgG (P = 0.039) and between all serological tests and PCR (P <0.001). The diagnostic sensitivity of all serological tests, using PCR as the gold standard, was very low, but ELISA and IFAT for anti-Leishmania IgM had 100% specificity. The diagnostic specificity of all serological tests could not be improved by changing the cut-off values. Seropositivity for Leishmania spp was not associated with signalment, living conditions, season of sampling and health status of the cats or with seropositivity to feline leukemia virus, feline immunodeficiency virus, feline coronavirus, Toxoplasma gondii and Bartonella henselae. In conclusion, because of their low sensitivity and very high specificity two of the evaluated serological tests (ELISA for anti-Leishmania IgG and IFAT for anti-Leishmania IgM) may be useless as population screening tests but valuable for diagnosing feline infection by L. infantum.

The benefit of pets and animal-assisted therapy to the health of older individuals.


Many studies utilizing dogs, cats, birds, fish, and robotic simulations of animals have tried to ascertain the health benefits of
pet ownership or animal-assisted therapy in the elderly. Several small unblinded investigations outlined improvements in behavior in demented persons given treatment in the presence of animals. Studies piloting the use of animals in the treatment of depression and schizophrenia have yielded mixed results. Animals may provide intangible benefits to the mental health of older persons, such as relief social isolation and boredom, but these have not been formally studied. Several investigations of the effect of pets on physical health suggest animals can lower blood pressure, and dog walkers partake in more physical activity. Dog walking, in epidemiological studies and few preliminary trials, is associated with lower complication risk among patients with cardiovascular disease. Pets may also have harms: they may be expensive to care for, and their owners are more likely to fall. Theoretically, zoonotic infections and bites can occur, but how often this occurs in the context of pet ownership or animal-assisted therapy is unknown. Despite the poor methodological quality of pet research after decades of study, pet ownership and animal-assisted therapy are likely to continue due to positive subjective feelings many people have toward animals.

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 x 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 (Sigma5) in hyperthyroid and euthyroid cats was 82 and 174ngg(-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 118ngg(-1)lw (5-5260ngg(-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 33ngkg(-1)bwd(-1) (0.2-150ngkg(-1)bwd(-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.

Ultrasonographical examination of feline adrenal glands: intra- and inter-observer variability.
Interpretation of ultrasonographical measurements requires an understanding of the source and the magnitude of variation. A substantial part of the variation can be attributed to the observer, the equipment or the animal. The aim of this study was to evaluate which adrenal gland measurement is the least variable within and between observers. Three experienced ultrasonographers examined six cats at three different times on the same day, more than 1 h apart, according to a strict scanning protocol. Seven ultrasonographical measurements were performed on each adrenal gland (maximal length on sagittal images, maximal height at the cranial and caudal poles on sagittal and transverse images, and maximal width of the cranial and caudal poles on transverse images). Height measurements in both planes showed the lowest variability within and between observers compared with length and width measurements. Descriptive ultrasonographical features, such as echogenicity of the gland, presence of hyperechoic spots or layering assessment, demonstrated satisfactory-to-good intra- and inter-observer agreement, whereas the shape assessment showed very poor inter-observer agreement. The results of this study describe a reliable scanning protocol that can be the basis for future adrenal ultrasonographical examinations for cats suspected of adrenal disease (eg, hyperaldosteronism, hyperadrenocorticism, sex hormone-producing tumours).
Associations between meal size, gastric emptying and post-prandial plasma glucose, insulin and lactate concentrations in meal-fed cats.


Obesity in show cats.


Skeletal and hepatic changes induced by chronic vitamin A supplementation in cats.


Poisoning of dogs and cats by drugs intended for human use.
Cortinovis C., Pizzo F. & Caloni F. (2014) *Vet J*

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 (beta2-adrenergic receptor agonists).

Safety of ultrasound-guided fine-needle aspiration of the feline pancreas: a case-control study.

The safety of fine-needle aspiration (FNA) of the feline pancreas has not been reported. The incidence of complications following ultrasound-guided pancreatic FNA in 73 cats (pancreatic aspirate [PA] cats) with clinical and ultrasonographic evidence of pancreatic disease was compared with complications in two groups of matched control cats also diagnosed with pancreatic disease that either had abdominal organs other than the pancreas aspirated (control FNA, n = 63) or no aspirates performed (control no FNA, n = 61). The complication rate within 48 h of the ultrasound and/or aspirate procedure did not differ among the PA cats (11%), control FNA (14%) or control no FNA (8%) cats. There was no difference in rate of survival to discharge (82%, 84% and 83%, respectively) or length of hospital stay among groups. The cytologic recovery rate for the pancreatic samples was 67%. Correlation with histopathology, available in seven cases, was 86%. Pancreatic FNA in cats is a safe procedure requiring further investigation to establish diagnostic value.

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.

Pharmacokinetic profiles of the analgesic drug flupirtine in cats.

Flupirtine (FLU) is a non-opioid analgesic drug with no antipyretic or antiphlogistic effects, used in the treatment of a wide range of pain states in human beings. There is a substantial body of evidence on the efficacy of FLU in humans but this is inadequate to recommend its off-label use in veterinary clinical practice. The aim of this study was to evaluate the pharmacokinetic profiles of FLU after IV and PO administration in healthy cats. Six mixed breed adult cats were randomly assigned to two treatment groups using an open, single-dose, two-treatment, two-phase, paired, cross-over design (2 x 2 Latin-square). Group 1 (n = 3) received a single dose of 5 mg/kg of FLU injected IV into the jugular vein. Group 2 (n = 3) received the same dose via PO route. The wash out period was 1 week. Blood samples (1 mL) were collected at assigned times and plasma was then analysed by a validated HPLC method. No adverse effects at the point of injection and no behavioural changes or alterations in health parameters were observed in the animals during or after the study (up to 7 days after the full study). After IV administration, FLU was detectable in plasma up to 36 h. After PO administration, FLU plasma concentrations were lower than those following IV administration, but they were detectable over the same time range. The terminal part of both mean pharmacokinetic curves showed a similar trend of elimination. The oral bioavailability was approximately 40%. This is the first study of FLU in an animal species of veterinary interest and it could
Syndrome of inappropriate antidiuretic hormone secretion in a cat with a putative Rathke’s cleft cyst.
An 11-year-old spayed female domestic shorthair cat was evaluated for anorexia, lethargy and weight loss of 6 days’ duration. Bilateral mydriasis, absent menace response, slow-to-absent pupillary light reflexes, bilateral retinal detachment, intermittent horizontal nystagmus, intermittent ventral strabismus and systemic hypertension were present. Biochemical analysis revealed severe hyponatremia, severe hypochloremia and mild hypokalemia. Multifocal central nervous system disease was suspected based on optic, trigeminal sensory (ophthalmic branch), vestibulocochlear and possible oculomotor nerve dysfunction. Thoracic radiographs showed mild cardiomegaly without evidence of congestive heart failure. Ultrasound revealed mild pleural and peritoneal effusion. A cause of the severe hyponatremia was not identified, and it persisted despite fluid therapy. Syndrome of inappropriate antidiuretic hormone secretion (SIADH) was suspected as the cause of hyponatremia. Humane euthanasia was elected owing to continued clinical decline. Serum hyposmolality, urine hyperosmolality, natriuresis and lack of confirmed renal, thyroid and pulmonary disease aided in the presumed diagnosis of SIADH. Post-mortem histopathology of the brain revealed degeneration of the hypothalamus and optic tracts, along with a prominent fluid-filled craniopharyngeal duct (putative Rathke’s cleft cyst) separating the pars distalis and the pars intermedia. The hypothalamic degeneration, possibly secondary to a Rathke’s cleft cyst, was hypothesized to be the cause of presumptive SIADH in the patient. Although rare in occurrence, Rathke’s cleft cyst should be included as a differential diagnosis in dogs and cats with signs of pituitary dysfunction.

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 phylogenies, 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.

Serum ionised calcium as a prognosis risk factor in the clinical course of pancreatitis in cats.

OBJECTIVES: The aims of the study were to assess the possible effects of sex, age and breed on the evolution of pancreatitis, and to understand if low values of serum ionised calcium ([Ca2+]) can be considered as a prognosis risk factor for the clinical course of the disease. METHODS: A sample of 24 cats (n = 24) with pancreatitis was used and grouped according to the disease progression into two groups: (i) non-fatal (NF) for those that recovered and (ii) fatal (F) for those that died. Quantification of [Ca2+] by the ADVIA 2400 Chemistry System (Siemens) and feline pancreatic lipase (fPL) by the enzyme-linked immunosorbent assay fPL-SNAP (IDEXX) was carried out for each patient at two different times: T1 (day of diagnosis) and T2 (day of recovery or death). For statistical analysis, P values <0.05 were considered significant. RESULTS: At T1, 58.3% of patients presented with hypocalcaemia, 33.3% with normocalcaemia and 8.3% with hypercalcaemia. The [Ca2+] mean values were higher in the F group than in NF. At T2, 75.0% of patients showed normocalcaemia and 25.0% hypocalcaemia. The mean values of [Ca2+] for F at T2 was 0.88 +/- 0.23 mmol/l, whereas the NF was 1.10 +/- 0.11 mmol/l. There is no sex or age predisposition for disease development, contrary to the breed (domestic shorthair cats are more prone to developing it). CONCLUSIONS AND RELEVANCE: The results suggest that hypocalcaemia is common in patients with pancreatitis and that [Ca2+] may be used as a prognosis risk factor for the clinical course of the disease, corresponding to a poor prognosis where values are 1 mmol/l.

Effects of intravenous and subcutaneous heartworm homogenate from doxycycline-treated and untreated donor dogs on bronchial reactivity and lung in cats.

A controlled, blind research study was conducted to define the innate response of lungs in specific pathogen free (SPF) cats to intravenous (n=10) or subcutaneous (n=4) administration of homogenate of adult Dirofilaria immitis from donor dogs compared with lung response in control cats (n=6). There was no difference in cats that received heartworm homogenate IV for 18 days from donor dogs treated with doxycycline for 1 month compared with cats given heartworm homogenate from untreated donor dogs. Cats did not develop clinical signs, and no radiographic changes were noted. Cats given SC heartworm homogenate at lower concentration than IV groups did not develop histologic changes. Cats that received IV heartworm homogenate for 18 days developed mild interstitial and peribronchial myofibrocyte proliferation and smooth muscle proliferation of the pulmonary arteries. Bronchial ring contractility in vitro was blunted in the IV homogenate cats to the agonists acetylcholine and 5-hydroxytryptamine. Cats in the SC group had increased sensitivity to histamine at high concentrations but normal contractility and relaxation responses to other agonists. No increase in mast cells was noted in lung tissues of cats given homogenate. In the absence of bronchial wall remodeling, cats given IV homogenate had blunted responses to bronchial constriction, but normal relaxation to nitroprusside and substance P and increased sensitivity to...
histamine. In the absence adult heartworms, the homogenate of adult heartworms in the circulation of SPF cats induced a direct effect on lung parenchyma and altered bronchial ring reactivity.

**Spectral analysis of femoral artery blood flow waveforms of conscious domestic cats.**

The qualitative and quantitative aspects of femoral artery blood flow waveform spectra were evaluated in 15 male and 15 female Persian and mixed breed domestic cats (*Felis catus*), which were healthy and not sedated, using duplex Doppler ultrasonography (DDU). Spectral Doppler demonstrated a biphasic characteristic in 16 (53.34%) of the animals evaluated, and a triphasic characteristic in the 14 (46.66%) remaining animals. The systolic blood pressure and heart rate values were within the normal range for the species. The quantitative parameters evaluated, based on the spectral Doppler, were as follows: systolic velocity peak (SVP), recent diastolic velocity peak (RDVP), end diastolic velocity peak (EDVP), mean velocity (MV), integral velocity time (ITV), artery diameter (AD), femoral flow volume (FFV), pulsatility index (PI), resistive index (RI), systolic peak acceleration time (AT) and deceleration time (DT). The respective mean values were: 36.41 +/- 7.33 cm/s, 4.69 +/- 0.90 cm/s, 10.74 +/- 2.74 cm/s, 23.06 +/- 4.86 cm/s, 3.91 +/- 1.05 cm, 0.17 +/- 0.04 cm, 0.11 +/- 0.08 cm(3), 3.85 +/- 0.19, 1.40 +/- 0.20, 39.84 +/- 7.38 ms, and 114.0 +/- 22.15 ms. No significant differences were found between males and females. The analyses carried out on the femoral artery flow spectrum obtained by DDU showed that it is easy to use and highly tolerated in non-sedated, healthy cats. It appears that DDU may be a useful diagnostic technique, but further studies are needed to evaluate how it compares with invasive telemetric methodology or high-definition oscillometric waveform analytic techniques.

**Life cycle of Cystoisospora felis (Coccidia: Apicomplexa) in cats and mice.**

Cystoisospora felis is a ubiquitous apicomplexan protozon of cats. The endogenous development of *C. felis* was studied in cats after feeding them infected mice. For this, five newborn cats were killed at 24, 48, 72, 96, and 120 h after having been fed mesenteric lymph nodes and spleens of mice that were inoculated with *C. felis* sporulated sporocysts. Asexual and sexual development occurred in enterocytes throughout the villi of the small intestine. The number of asexual generations was not determined with certainty, but there were different sized merozoites. At 24 h, merogony was seen only in the duodenum and the jejenum. Beginning at 48 h, the entire small intestine was parasitized. At 24 h, meronts contained 1-4 zoites, and at 48 h up to 12 zoites. Beginning with 72 h, the ileum was more heavily parasitized than the jejunum. At 96 and 120 h, meronts contained many zoites in various stages of development; some divided by endodyogeny. The multiplication was asynchronous, thus both immature multinucleated meronts and mature merozoites were seen in the same parasitophorous vacuole. Gametogony occurred between 96 and 120 h, and oocysts were present at 120 h. For the study of the development of *C. felis* in murine tissues, mice were killed from day 1 to 720 d after having been fed 10(5) sporocysts, and their development were examined for the parasites microscopically, and by bioassay in cats. The following conclusions were drawn. (1) *Cystoisospora felis* most frequently invaded the mesenteric lymph nodes of mice and remained there for at least 23 mo. (2) It also invaded the spleen, liver, brain, lung, and skeletal muscle of mice, but division was not seen based on microscopic examination. (3) This species could not be passed from mouse to mouse.

**Comparison of anaesthesia ‘Day 1 skills’ expectations between veterinary anaesthetists and general practitioners.**
Duncan J.C., Ross M., Rhind S., Clutton E. & Shaw D.J. (2014) *Vet Rec*

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.

Rabies surveillance in the United States during 2013.

During 2013, 53 reporting jurisdictions reported 5,865 rabid animals and 3 human rabies cases to the CDC, representing a 4.8% decrease from the 6,162 rabid animals and 1 human case reported in 2012. Ninety-two percent of reported rabid animals were wildlife. Relative contributions by the major animal groups were as follows: 1,898 raccoons (32.4%), 1,598 bats (27.2%), 1,447 skunks (24.7%), 344 foxes (5.9%), 247 cats (4.2%), 86 cattle (1.5%), and 89 dogs (1.5%). One human case was reported from Maryland. The infection was determined to have been transmitted via organ transplantation. Infection in the organ donor, a North Carolina resident, was retrospectively diagnosed. Both the organ donor and the organ recipient were infected with the raccoon rabies virus variant. The third human case, reported by Texas, involved a Guatemalan resident who was detained while crossing the US border. The infection was determined to be caused by a canine rabies virus variant that circulates in Central America.

Impression cytology: a novel sampling technique for conjunctival cytology of the feline eye.

OBJECTIVE: Impression cytology is a noninvasive investigation of the ocular surface. It uses the adhesive features of different filter papers to collect a monolayer of epithelial cells from the cornea and/or conjunctiva. Samples obtained by impression cytology exhibit all characteristics of an ideal cytology specimen. The aim of this study was to test the feasibility of impression cytology and determine the most appropriate filter paper to achieve maximum diagnostic value of the feline eye. ANIMALS STUDIED: Ten healthy cats. PROCEDURES: The study was conducted in two phases. In the first phase, eight different filter papers (FPs) with various pore sizes were tested: 3.0-, 1.2-, 0.8-, 0.45-, 0.22-, 0.05- and 0.025-mum cellulose acetate papers and a 0.4-mum Biopore membrane (BM). Samples were obtained from the superior bulbar and from the inferior palpebral conjunctiva. In the second phase, three different sampling methods - with and without topical anesthesia, and with topical anesthesia and drying of the conjunctiva - were compared employing the BM encased in the intended BM device (BMD). Samples were evaluated for cellularity and quality of cells. RESULTS: In the first phase, samples obtained from the superior bulbar conjunctiva with the BM had the most sufficient cellularity and quality. In the second phase, BMD with topical anesthesia and additional drying of the conjunctiva was the most ideal method. CONCLUSION: The BMD may prove to be a suitable diagnostic tool for clinicians. Sampling is quick, processing is simple, and a large area of intact cells can be harvested.

A survey of veterinary radiation facilities in 2010.

A survey of veterinary radiation therapy facilities in the United States, Canada, and Europe was done in 2010, using an online survey tool, to determine the type of equipment available, radiation protocols used, caseload, tumor types irradiated, as well as other details of the practice of veterinary radiation oncology. The results of this survey were compared to a similar survey performed in 2001. A total of 76 facilities were identified including 24 (32%) academic institutions and 52 (68%) private practice external beam radiation therapy facilities. The overall response rate was 51% (39/76 responded). Based on this survey, there is substantial variation among facilities in all aspects ranging from equipment and personnel to radiation protocols and caseloads. American College of Veterinary Radiology boarded radiation oncologists direct 90% of the radiation facilities, which was increased slightly compared to 2001. All facilities surveyed in 2010 had a linear accelerator. More facilities reported having electron capability (79%) compared to the 2001 survey. Eight facilities had a radiation oncology resident, and academic facilities were more likely to have residents. Patient caseload information was available from 28 sites (37% of radiation facilities), and based on the responses 1376 dogs and 352 cats were irradiated in 2010. The most frequently irradiated tumors were soft tissue sarcomas in dogs, and oral squamous cell carcinoma in cats.

Lagochilascaris causing in cats (Felis catus domesticus) in southern Brazil.

Lagochilascarisiasis, a parasitic disease little known in Brazil, is caused by an ascarid nematode that has a peculiar life cycle, with a predilection site for the cervical region in the final hosts: humans, cats and dogs. We aimed to record the occurrence
Relationship of Body Size to Metabolic Markers and Left Ventricular Hypertrophy in Cats.

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.

A Ten-Year Molecular Survey on Parvoviruses Infecting Carnivores in Bulgaria.

Parvoviruses represent the most important infectious agents that are responsible for severe to fatal disease in carnivores. This study reports the results of a 10-year molecular survey conducted on carnivores in Bulgaria (n = 344), including 262 dogs and 19 cats with gastroenteritis, and 57 hunted wild carnivores. Real-time polymerase chain reaction (qPCR), followed by virus characterization by minor groove binder (MGB) probe assays, detected 216 parvovirus positive dogs with a predominance of canine parvovirus type 2a (CPV-2a, 79.17%) over CPV-2b (18.52%) and CPV-2c (2.31%). Rottweilers and German shepherds were the most frequent breeds among CPV-2a positive pedigree dogs (n = 96). Eighteen cats were found to shed parvoviruses in their faeces, with most strains being characterized as FPLV (n = 17), although a single specimen tested positive for CPV-2a. Only two wild carnivores were parvovirus positive, a wolf (Canis lupus) and a red fox (Vulpes vulpes), both being infected by CPV-2a strains.

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.

Relationship of Body Size to Metabolic Markers and Left Ventricular Hypertrophy in Cats.
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.

### Perioperative Mortality and Long-Term Survival in 80 Dogs and 32 Cats Undergoing Excision of Thymic Epithelial Tumors.


**OBJECTIVE:** To examine perioperative mortality, long-term survival, causes of death, and prognostic factors for dogs and cats undergoing surgical excision of thymic epithelial tumors (TETs). **STUDY DESIGN:** Multi-institutional case series. **ANIMALS:** Eighty dogs and 32 cats. **METHODS:** Follow-up information was obtained for dogs and cats that underwent surgical excision of a TET between 2001 and 2012. **RESULTS:** Perioperative mortality was 20% in dogs and 22% in cats. No independent risk factors for perioperative mortality were identified. The estimated median survival time for all dogs was 1.69 years (95% CI 0.56-4.32) and the 1- and 4-year survival rates were 55% (95% CI 44-67) and 44% (95% CI 32-56). The estimated median survival time for all cats was 3.71 years (95% CI 0.56-unestimatable) and the 1- and 4-year survival rates were 70% (95% CI 53-87) and 47% (95% CI 0-100). Of animals that survived to discharge, 42% of dogs and 20% of cats eventually died of TET-related causes. The presence of paraneoplastic syndromes (hazard ratio [HR] 5.78, 95% CI 1.64-20.45, P = .007) or incomplete histologic margins (HR 6.09, 95% CI 1.50-24.72, P = .01) were independently associated with decreased survival in dogs. No significant predictors of survival were identified in cats. Conclusions regarding the effect of chemotherapy or radiation therapy could not be made. **CONCLUSIONS:** While there is substantial risk of perioperative death in dogs and cats undergoing surgery for TETs, many animals that survive to discharge have prolonged survival. Survival is significantly decreased in dogs with paraneoplastic syndromes or incomplete histologic margins.

### Personality structure in the domestic cat (Felis silvestris catus), Scottish wildcat (Felis silvestris grampia), clouded leopard (Neofelis nebulosa), snow leopard (Panthera uncia), and African lion (Panthera leo): a comparative study.


Although the study of nonhuman personality has increased in the last decade, there are still few studies on felid species, and the majority focus on domestic cats. We assessed the structure of personality and its reliability in five felids-domestic cats, clouded leopards, snow leopards, African lions, and previous data on Scottish wildcats-and compared the results. In addition to the benefits of understanding more about this taxonomy, comparative studies of personality structure have the potential to provide information on evolutionary relationships among closely related species. Each of the species studied was found to have three factors of personality. Scottish wildcats’ factors were labeled Dominance, Agreeableness, and Self Control; domestic cats’ factors were Dominance, Impulsiveness, and Neuroticism; clouded leopards’ factors were Dominance/Impulsiveness, Agreeableness/Openness, and Neuroticism; snow leopards’ factors were Dominance, Impulsiveness/Openness, and Neuroticism; and African lions’ factors were Dominance, Impulsiveness, and Neuroticism. The Neuroticism and Impulsiveness factors were similar, as were two of the Dominance factors. A taxon-level personality structure also showed three similar factors. Age and sex effects are also discussed.

### Relation between Aelurostrongylus abstrusus larvae excretion, respiratory and radiographic signs in naturally infected cats.


A study was carried out to assess the possible relation between the number of Aelurostrongylus abstrusus larvae per gram of feces (LPG) with respiratory signs and radiographic findings in naturally infected cats. Out of 196 owned cats, 52 (26.5%)
were found infected with A. abstrusus. Positive cats were divided into 4 age groups (1, 2–6 months; 2, 7–11 months; 3, 1–5 years and, 4, >6 years). Thoracic radiographs in double orthogonal views were carried out and cats were ranked on the basis of the respiratory signs (0, no symptoms; 1, mild; 2, moderate and 3, severe symptoms) and radiographic changes. Data showed that increasing LPGs were associated with higher probability to develop more severe symptoms, although some asymptomatic cats had high number of LPGs. Radiographic score and LPGs decreased with increasing cat age. A. abstrusus should be included in the differential diagnosis of lung diseases also in cats with mild respiratory symptoms.

**Histological and dermatoscopic description of sphenx cat skin.**


**BACKGROUND:** Histological and hair coat abnormalities of the alopecic sphenx cat have not been described in detail. The hairless allele (hr) in sphenx cats represents a mutation in the gene for keratin 71, a protein expressed in the inner root sheath of humans and mice. **HYPOTHESIS/OBJECTIVES:** To describe the histological and dermatoscopic abnormalities of sphenx cat skin. **ANIMALS:** Skin biopsies were collected from 14 sphenx cats and five cats with normal coats. Dermatoscopic examinations were performed on 11 sphenx cats and six additional control cats. **METHODS:** Vertical and horizontal sections of skin biopsy samples from sphenx and control cats were reviewed. Dermatoscopic images were compared between sphenx and control cats. **RESULTS:** Sphenx cat hair follicles were often small, curved and kinked and demonstrated infundibular hyperkeratosis and dilatation. Changes in the inner root sheath of sphenx cats included a poorly defined Henle’s layer in addition to vacuolar-like changes and eosinophilic globules in Huxley’s layer. Dermal papillae in sphenx cat anagen bulbs lacked the normal flame shape and were surrounded by epithelial cells arranged in a disorderly manner. The degree of follicular abnormalities varied between follicles. Follicular density was similar for both sphenx cats and control animals. Sphenx cat hair shafts were misshapen, smaller in diameter and rarely medullated. Dermatopyc revealed similar hair coat density in sphenx and control cats. **CONCLUSIONS AND CLINICAL IMPORTANCE:** Sphenx cats demonstrated hair follicle dysplasia, with abnormal shaft production but without a decrease in follicle quantity. Abnormalities in sphenx cat follicles are similar to those in murine KRT71 mutants and suggest abnormal hair shaft keratinization.

**Molecular epidemiology of rotavirus in UK cats.**


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 twenty-five rescue catteries across the UK. Morning litter tray faecal samples were collected during winter and summer 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 polymerase chain reaction and positive samples were G and P genotyped using nested VP4 and VP7 PCR assays. A total of 1727 faecal samples were collected from 1105 pens. Overall, rotavirus prevalence was 3.0% (95% CI 1.2–4.9), 52% (13/25; CI 31.3–72.2) centres housed at least one rotavirus-positive cat. Prevalence was associated with season, odds ratio 14.8 (CI 1.1–200.4), p=0.04, but not age or diarrhoea. It was higher during the summer (4.7% CI 1.2–8.3) than winter (0.8%, CI 0.2–1.5). Asymptomatic epidemics of infection were detected in two centres. G genotypes were characterised 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 was of bovine origin.

**Style over substance: what can parenting styles tell us about ownership styles and obesity in companion animals?**


Obesity is a major medical concern in human subjects, and most concerning is the rapid recent increase in childhood obesity. Children are more likely to be obese if their parents are obese, an effect that is mediated both by genetics and environment, most notably parental influence. Four major parenting styles have been recognised: authoritarian; authoritarian; indulgent; uninvolved. Too much parental control, as with the authoritarian style, is associated with a higher weight status in children. Conversely, indulgent feeding styles can also have negative consequences and, where control is too lax, a poor relationship with food develops, which may also lead to weight gain. Obesity is also a growing concern in companion animals, and it has parallels with obesity in children. For instance, overweight people are more likely to own
Who’s behind that mask and cape? The Asian leopard cat’s Agouti (ASIP) allele likely affects coat colour phenotype in the Bengal cat breed.


Coat colours and patterns are highly variable in cats and are determined mainly by several genes with Mendelian inheritance. A 2-bp deletion in agouti signalling protein (ASIP) is associated with melanism in domestic cats. Bengal cats are hybrids between domestic cats and Asian leopard cats (Prionailurus bengalensis), and the charcoal coat colouration/pattern in Bengals presents as a possible incomplete melanism. The complete coding region of ASIP was directly sequenced in Asian leopard, domestic and Bengal cats. Twenty-seven variants were identified between domestic and leopard cats and were investigated in Bengals and Savannahs, a hybrid with servals (Leptailurus serval). The leopard cat ASIP haplotype was distinguished from domestic cat by four synonymous and four non-synonymous exonic SNPs, as well as 19 intronic variants, including a 42-bp deletion in intron 4. Fifty-six of 64 reported charcoal cats were compound heterozygotes at ASIP, with leopard cat agouti (A(P) (be)) and domestic cat non-agouti (a) haplotypes. Twenty-four Bengals had an additional unique haplotype (A2) for exon 2 that was not identified in leopard cats, servals or jungle cats (Felis chaus). The compound heterozygote state suggests the leopard cat allele, in combination with the recessive non-agouti allele, influences Bengal markings, producing a darker, yet not completely melanistic coat. This is the first validation of a leopard cat allele segregating in the Bengal breed and likely affecting their overall pelage phenotype. Genetic testing services need to be aware of the possible segregation of wild felid alleles in all assays performed on hybrid cats.

Quality of life measurement in prospective studies of cancer treatments in dogs and cats.


BACKGROUND: Quality of life (QOL) is an important consideration in healthcare decision-making for pets with cancer. To determine the effect of disease and treatment on pet QOL, this important variable should be objectively measured as an outcome in veterinary cancer studies. OBJECTIVES: To determine the prevalence and methodology of QOL measurement in a sample of recently published reports of prospective studies evaluating cancer treatments in client-owned dogs and cats; to characterize reporting of QOL outcomes and to identify article characteristics associated with QOL measurement. METHODS: English-language reports of prospective studies of cancer treatments in dogs and cats published from 2008 to 2013 were identified using medical research databases combined with a hand-searching strategy. Data pertaining to general article characteristics and QOL measurement were abstracted and summarized. RESULTS: Reports of 144 eligible studies were identified. QOL was measured in 16 (11.1%) studies, with 8 (5.6%) reporting the results. All studies that measured QOL reported using unvalidated instruments, or did not report how QOL was assessed. Only 1 study provided sufficient information for QOL measurements to be replicated. Recently published articles (2011-2013) were significantly more likely to report measuring QOL, compared with earlier articles. CONCLUSIONS: Quality of life of pets undergoing cancer treatment is largely unreported and cannot be meaningfully compared across treatments or disease states using the existing literature. Reliable, validated instruments are needed to facilitate the measurement and comparison of pet QOL in veterinary cancer research. Consistent reporting practices could improve transparency and interpretation of QOL results.

Hydroxyethyl starch: A review of pharmacokinetics, pharmacodynamics, current products, and potential clinical risks, benefits, and use.


OBJECTIVE: To review and summarize the pharmacokinetics and pharmacodynamics of hydroxyethyl starch (HES), as well as reported risks and benefits of HES infusion, and to provide administration and monitoring recommendations for HES use in dogs and cats. DATA SOURCES: Veterinary and human peer-reviewed medical literature, including scientific reviews, clinical and laboratory research articles, and authors’ clinical experience. SUMMARY: HES solutions are the most frequently used synthetic colloid plasma volume expanders in human and veterinary medicine. The majority of research in human medicine has focused on the adverse effects of HES infusion, with emphasis on acute kidney injury and coagulation derangements. The studies often differ in or fail to report factors, such as the type, amount, interval, and concentration of
HES administered; the patient population studied; or concurrent fluids administered. Currently, there is no definitive clinical evidence that the reported adverse effects of HES use in human medicine occur in veterinary species. There is little information available on HES administration techniques or simultaneous administration of additional fluids in human and veterinary medicine. The rationale for HES use in small animals has been largely extrapolated from human medical studies and guidelines. A controlled approach to intravenous fluid resuscitation using crystalloid and HES volumes titrated to reach desired resuscitation end point parameters is outlined for small animal practitioners. CONCLUSION: The extrapolation of data from human studies directly to small animals should be done with the knowledge that there may be species variations and different pharmacokinetics with different HES solutions. Veterinary reports indicate that bolus and continuous rate infusions of 6% hetastarch solutions at moderate doses are well tolerated in feline and canine subjects. Further research in domesticated species is necessary to better define and expand the knowledge regarding use of HES solutions in small animal medicine.

340 biological characteristics and functional capability of feline adipose tissue-derived mesenchymal stem cells.


Chronic kidney disease is a major cause of mortality in cats (Boyd et al. 2008J. Vet. Intern. Med. 22, 1111-1117). Similarly, the black-footed cat (Felis nigripes; BFC) frequently suffers from kidney failure caused by amyloidosis (Terio et al. 2008 Vet. Pathol. 45, 393-400). Adipose tissue-derived mesenchymal stem cells (AMSC) are a valuable cell source in regenerative medicine for treating certain diseases, including those suffered by endangered species. In the domestic cat (DSH), AMSC have been isolated from subcutaneous (SQ; Quimby et al. 2011 J. Feline Med. Surg. 13, 418-426) and epididymal adipose tissue (Zhang et al. 2014 Stem Cell Rev. Rep. 10, 600-611). Whether AMSC isolated from visceral fat of the abdominal cavity (AB) have similar developmental potential has not been studied. In this study, we (1) compared the biological characteristics of DSH-AMSC isolated from AB and SQ adipose tissue, and (2) evaluated the functional capability of DSH and BFC-AMSC to differentiate into other cell types. The AB and SQ adipose tissues were harvested via laparoscopy or from an incision in the ventral abdomen, respectively. Tissues were digested with collagenase II (1mg/mL(1) at 37 degrees C for 20 to 40min with shaking at 150rpm for 20 to 40min. Cells from the stromal vascular fraction were cultured in DMEM-F12 medium with 12% fetal bovine serum under 5% CO2 in air at 38 degrees C. Results showed that AB biopsies were smaller (1.2+/-.2g) than that of SQ biopsies (3.6+/-.7g). The mean number of nucleated cells per gram from AB biopsies (0.6 to 22x10(6)) was similar to that of SQ biopsies (4.5+/-.2x10(6)). The cell-doubling numbers (days) per passage (P1 to P5) in both cell types remained constant (0.9 to 2.6), but SQ-AMSC at P5 required more cell doublings (4.5+/-.21) to reach 50% confluence. The AB-AMSC showed more colony-forming units (CFU; 7.0%) after 8 to 10 days of seeding at 8000 per cm(2) than did SQ-AMSC (1.5% CFU). The SQ-AMSC did not form colonies at cell densities below 4000 per cm(2). However, AB-AMSC colony formation only substantially decreased when the cell densities were below 1000 per cm(2) (0.1%). Flow cytometry analysis revealed higher percentages of CD90+ (92%), CD105+ (80%), and CD146+ (17%) cells in AB-AMSC than in SQ-AMSC (77, 57, and 9%, respectively). Both AB and SQ-AMSC showed negative expressions of CD14, CD45, CD73, and HLA-DR-. Gene expression analysis revealed that pluripotent genes Nanog, KLF4, Oct-4, and proto-oncogene C-Myc were expressed by both cell types, while Sox2 was not expressed in either type of AMSC. Under appropriate stimuli, DSH- and BFC-AMSC demonstrated differentiation potential towards adipogenic, osteogenic, chondrogenic, and neurogenic lineages. The AMSC from both species were less responsive towards osteogenesis than adipogenesis, and BFC cells had more capability to differentiate towards chondrocytes. These results suggest that the defined AMSC population (regardless of site of collection) could potentially be employed as a therapeutic agent for diseased or injured felids, both domestic and endangered.

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.

**Effect of gentle stroking and vocalization on behaviour, mucosal immunity and upper respiratory disease in anxious shelter cats.**


Emotional, behavioural, and health benefits of gentle stroking and vocalizations, otherwise known as gentling, have been documented for several species, but little is known about the effect of gentling on cats in stressful situations. In this study, 139 cats rated as anxious upon admission to an animal shelter were allocated to either a Gentled or Control group. Cats were gentled four times daily for 10 min over a period of 10 days, with the aid of a tool for cats that were too aggressive to handle. The cats’ mood, or persistent emotional state, was rated daily for 10 d as Anxious, Frustrated or Content. Gentled cats were less likely to have negatively valenced moods (Anxious or Frustrated) than Control cats (Incidence Rate Ratio [IRR]=0.61 CI 0.42-0.88, P=0.007). Total secretory immunoglobulin A (S-IgA) was quantified from faeces by enzyme-linked immunosorbent assay. Gentled cats had increased S-IgA (6.9 +/- 0.7 logemug/g) compared to Control cats (5.9 +/- 0.5 logemug/g) (P=0.0001). Within the Gentled group of cats, S-IgA values were higher for cats that responded positively to gentling (7.03 +/- 0.6, logemug/g), compared with those that responded negatively (6.14 +/- 0.8, logemug/g). Combined conjunctival and oropharyngeal swab specimens were tested by quantitative real-time polymerase chain reaction (rPCR) for feline herpesvirus type 1 (FHV-1), feline calicivirus (FCV), Mycoplasma felis, Chlamyдophila felis, and Bordetella bronchiseptica. There was a significant increase in shedding over time in Control cats (23%, 35%, 52% on days 1, 4 and 10, respectively), but not in gentled cats (32%, 26%, 30% on days 1, 4 and 10, respectively) (P=0.001). Onset of upper respiratory disease was determined by veterinary staff based on clinical signs, in particular ocular and/or nasal discharge. Control cats were 2.4 (CI: 1.35-4.15) times more likely to develop upper respiratory disease over time than gentled cats (P<0.0001). It is concluded that gentling anxious cats in animal shelters can induce positive affect (contentment), increase production of S-IgA, and reduce the incidence of upper respiratory disease.

**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 Fundacao 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.

**Animal domestication. The genes that turned wildcats into kitty cats.**


**Intensive intravenous infusion of insulin in diabetic cats.**


BACKGROUND: Remission occurs in 10-50% of cats with diabetes mellitus (DM). It is assumed that intensive treatment
improves beta-cell function and increases remission rates. HYPOTHESIS: Initial intravenous infusion of insulin that achieves tight glycemic control decreases subsequent insulin requirements and increases remission rate in diabetic cats.

ANIMALS: Thirty cats with newly diagnosed DM. METHODS: Prospective study. Cats were randomly assigned to one of 2 groups. Cats in group 1 (n = 15) received intravenous infusion of insulin with the goal of maintaining blood glucose concentrations at 90-180 mg/dL, for 6 days. Cats in group 2 (n = 15) received subcutaneous injections of insulin glargine (cats <=4 kg: 0.5-1.0 IU, q12h; >4 kg 1.5-2.0 IU, q12h), for 6 days. Thereafter, all cats were treated with subcutaneous injections of insulin glargine and followed up for 6 months. Cats were considered in remission when euglycemia occurred for >/=4 weeks without the administration of insulin. Nonparametric tests were used for statistical analysis. RESULTS: In groups 1 and 2, remission was achieved in 10/15 and in 7/14 cats (P = .46), and good metabolic control was achieved in 3/5 and in 1/7 cats (P = .22), respectively. Overall, good metabolic control or remission occurred in 13/15 cats of group 1 and in 8/14 cats of group 2. In group 1, the median insulin dosage given during the 6-month follow-up was significantly lower than in group 2 (group 1: 0.32 IU/kg/day, group 2: 0.51 IU/kg/day; P = .013). CONCLUSIONS AND CLINICAL IMPORTANCE: Initial intravenous infusion of insulin for tight glycemic control in cats with DM decreases insulin requirements during the subsequent 6 months.

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.

Comparison of serum concentrations of symmetric dimethylarginine and creatinine as kidney function biomarkers in cats with chronic kidney disease.


BACKGROUND: Symmetric dimethylarginine (SDMA) has been shown to be an accurate and precise biomarker for calculating estimated glomerular filtration rate (GFR) in humans, as well as a more sensitive biomarker than serum creatinine concentration (sCr) for assessing renal dysfunction. OBJECTIVES: The purpose of this retrospective study was to report on the utility of measuring serum SDMA concentrations in cats for detection of chronic kidney disease (CKD) before diagnosis by conventional measurement of sCr. ANIMALS: Chronic kidney disease cats (n = 21) included those persistently azotemic for >/=3 months (n = 15), nonazotemic cats with GFR >30% decreased from median GFR of normal cats (n = 4), and nonazotemic cats with calcium oxalate kidney stones (n = 2). Healthy geriatric cats (n = 21) were selected from the same colony. METHODS: Symmetric dimethylarginine concentrations (liquid chromatography-mass spectroscopy) and sCr (enzymatic colorimetry) were determined retrospectively from historical data or banked serum samples in azotemic cats or at the time GFR (iohexol clearance) was measured in nonazotemic cats. RESULTS: Serum SDMA (r = -.79) and sCr (r = -.77) concentrations were significantly correlated to GFR (both P < .0001). Symmetric dimethylarginine became increased before sCr in 17/21 cats (mean, 17.0 months; range, 1.5-48 months). Serum SDMA had higher sensitivity (100%) compared with sCr (17%), but lower specificity (91% versus 100%) and positive predictive value (86% versus 100%). CONCLUSION AND CLINICAL IMPORTANCE: Using serum SDMA as a biomarker for CKD allows earlier detection of CKD in cats compared with sCr, which may be desirable for initiating renoprotective interventions that slow progression of CKD.
Comparison of serum concentrations of symmetric dimethylarginine and creatinine as kidney function biomarkers in healthy geriatric cats fed reduced protein foods enriched with fish oil, L-carnitine, and medium-chain triglycerides.


The purpose of this study was to determine whether feeding cats reduced protein and phosphorus foods with added fish oil, L-carnitine, and medium-chain triglycerides (MCT) altered serum biomarkers of renal function. Thirty-two healthy cats, mean age 14.0 (8.3-19.6) years, were fed control food or one of two experimental foods for 6 months. All foods had similar concentrations of moisture, protein, and fat (approximately 8.0%, 26.5%, and 20.0%, respectively). Both experimental foods contained added fish oil (1.5%) and L-carnitine (500 mg/kg). Experimental-food 2 also contained increased MCT (10.5% from coconut oil), 1.5% added corn oil, and reduced animal fat. Glomerular filtration rate (GFR), serum biochemistries, renal function biomarkers including serum creatinine (sCr) and symmetrical dimethylarginine (SDMA), and plasma metabolomic profiles were measured at baseline, and at 1.5, 3, and 6 months. Body composition was determined by dual-energy X-ray absorptiometry. Although both experimental foods altered plasma fatty acids, carnitine and related metabolites, and lysophospholipid concentrations, there were no changes in renal function biomarkers. There was, however, a benefit in using SDMA versus sCr to assess renal function in older cats with less total lean mass. Compared with cats <12 years, those >15 years had lower total lean mass (P < 0.01), lower GFR (P = 0.04), and lower sCr concentrations (P < 0.01). However, SDMA concentrations (P < 0.01) were higher in older cats. This study shows that in cats, serum SDMA concentration is more highly correlated with GFR than sCr concentration, and, unlike sCr, which declines with age because of muscle wasting, SDMA increases as GFR declines with age.

Nucleic acid-based differential diagnostic assays for feline coronavirus.


Feline coronavirus (FCoV) is a pleomorphic, enveloped, positive-sense single-stranded RNA virus. Owing to the differences in its genotype, FCoV belongs to a separate clade along with other viruses, such as transmissible gastroenteritis virus (TGEV) and canine coronavirus (CCoV), which can be isolated from cats. In this study, a PCR assay was developed to differentiate these coronaviruses concurrently. Multiplex differential RT-PCR was performed with primers based on the highly conserved coronavirus membrane protein. Three primer sets were designed: a primer pair (S1 and S2) that can bind to conserved sequences in all target coronaviruses, a CCoV-specific primer (S3), and a TGEV-specific primer (S4). Because of the high sequence homology among FCoV, CCoV, and TGEV, a nucleotide preceding the last pair of dissimilar nucleotides in S3 and S4 was substituted with an inosine to allow primer binding. This assay could detect and differentiate FCoV (n=7), CCoV (n=4), and TGEV (n=8) precisely and did not show any cross-reactivity with other pathogens. These results suggest that this molecular approach provides a rapid and reliable way to detect FCoV, especially in feline clinical specimens.

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 regessively 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); approximately 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.

**Oxidative modification, inflammation and amyloid in the normal and diabetic cat pancreas.**

The pathogenesis of beta-cell dysfunction leading to pancreatic beta-cell failure seen in type 2 diabetes mellitus is incompletely understood. Pancreatic tissues were collected from nine control cats and nine diabetic cats and labelled immunohistochemically to examine expression of interleukin (IL)-1beta, insulin, islet amyloid polypeptide (IAPP) and 4-hydroxynonenal (4-HNE). Thioflavin-S was used to stain for amyloid. All control cats showed positive labelling for IL-1beta and 4-HNE. Diabetic cats showed varying degrees of inflammation and oxidative modification, owing in large part to the very small amount of islet structure remaining in the typical diabetic cat pancreas. Amyloid deposition was identified in 8/9 diabetic cats and 1/9 control cats. In order to validate these findings, paired biopsy samples taken from an additional group of cats enrolled in a study of obesity and hyperglycaemia (sampling at baseline and after 8-16 weeks of obesity and hyperglycaemia) were labelled for IL-1beta and 4-HNE. A similar pattern of labelling was identified in the baseline samples to that seen in control cats. A significant increase in IL-1beta and 4-HNE expression was seen after a period of hyperglycaemia and obesity. Taken together, these findings suggest that while present in normal cats, markers of inflammation and oxidative modification increase very early during the development of disease. Future studies focusing on these earlier time points are needed to understand the factors that function in protection of the islet beta cell and the development of islet pathology in type 2 diabetes mellitus in the cat.

**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.

**Zoonoses research in the German National Cohort : feasibility of parallel sampling of pets and owners.**

Cats and dogs live in more than 20 % of German households and the contact between these pets and their owners can be very close. Therefore, a transmission of zoonotic pathogens may occur. To investigate whether zoonotic research questions can be examined in the context of population-based studies like the German National Cohort (GNC), two studies on different study populations were conducted as part of the feasibility tests of the GNC. The aim of the first study was to quantify the actual exposure of participants of the GNC to cats and dogs. In the second study summarised here the feasibility of the sampling of cats and dogs by their owners was tested. To quantify the exposure of participants of the GNC to cats and dogs 744 study participants of the Pretests of the GNC were asked whether they had contact with animals. Currently 10 % have a dog and 14 % have a cat in their household. These figures confirm that a large proportion of the
German population has contact with pets and that there is a need for further zoonoses research. To establish the collection of biological samples from cats and dogs in the context of large-scale population-based studies feasible methods are needed. Therefore, a study was conducted to test whether pet owners can take samples from their cats and dogs and whether the quality of these samples is comparable to samples taken by a qualified veterinarian. A total of 82 dog and 18 cat owners were recruited in two veterinary practices in Hannover and the Clinic for Small Animals at the University of Veterinary Medicine in Hannover. Sampling instructions and sample material for nasal and buccal swabs, faecal samples and, in the case of cat owners, a brush for fur samples, were given to the pet owners. The pet owners were asked to take the samples from their pets at home and to send the samples by surface mail. Swab samples were cultured and bacterial growth was quantified independent of bacterial species. The growth of Gram-positive and Gram-negative bacteria from samples taken by the veterinarian and the pet owners were compared. For Gram-positive bacteria the agreement of laboratory results was 71 % for nasal swabs and 78 % for oral swabs while for Gram-negative bacteria the agreement of laboratory results was 55 % for nasal swabs and 87 % for oral swabs. In conclusion it has been shown that participants of the GNC are exposed to cats and dogs and that the sampling of cats and dogs by their owners is a feasible method which can be a useful tool for zoonoses research in population-based studies.

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

Evaluation of facial expression in acute pain in cats.
OBJECTIVES: To describe the development of a facial expression tool differentiating pain-free cats from those in acute pain. METHODS: Observers shown facial images from painful and pain-free cats were asked to identify if they were in pain or not. From facial images, anatomical landmarks were identified and distances between these were mapped. Selected distances underwent statistical analysis to identify features discriminating pain-free and painful cats. Additionally, thumbnail photographs were reviewed by two experts to identify discriminating facial features between the groups. RESULTS: Observers (n = 68) had difficulty in identifying pain-free from painful cats, with only 13% of observers being able to discriminate more than 80% of painful cats. Analysis of 78 facial landmarks and 80 distances identified six significant factors discriminating pain-free and painful faces including ear position and areas around the mouth/muzzle. Standardised mouth and ear distances when combined showed excellent discrimination properties, correctly differentiating pain-free and painful cats in 98% of cases. Expert review supported these findings and a cartoon-type picture scale was developed from thumbnail images. CLINICAL SIGNIFICANCE: Initial investigation into facial features of painful and pain-free cats suggests potentially good discrimination properties of facial images. Further testing is required for development of a clinical tool.

Microbiota alterations in acute and chronic gastrointestinal inflammation of dogs and cats.
The intestinal microbiota is the collection of the living microorganisms (bacteria, fungi, protozoa, and viruses) inhabiting the gastrointestinal tract. Novel bacterial identification approaches have revealed that the gastrointestinal microbiota of dogs and cats is, similarly to humans, a highly complex ecosystem. Studies in dogs and cats have demonstrated that acute and chronic gastrointestinal diseases, including inflammatory bowel disease (IBD), are associated with alterations in the small intestinal and fecal microbial communities. Of interest is that these alterations are generally similar to the dysbiosis observed in humans with IBD or animal models of intestinal inflammation, suggesting that microbial responses to inflammatory conditions of the gut are conserved across mammalian host types. Studies have also revealed possible underlying susceptibilities in the innate immune system of dogs and cats with IBD, which further demonstrate the intricate relationship between gut microbiota and host health. Commonly identified microbiome changes in IBD are decreases in bacterial groups within the phyla Firmicutes and Bacteroidetes, and increases within Proteobacteria. Furthermore, a reduction in the diversity of Clostridium clusters XIVa and IV (i.e., Lachnospiraceae and Clostridium cocoides subgroups) are associated with IBD, suggesting that these bacterial groups may play an important role in maintenance of gastrointestinal health. Future studies are warranted to evaluate the functional changes associated with intestinal dysbiosis in dogs and cats.
### Auditory feedback modulates development of kitten vocalizations.


Effects of hearing loss on vocal behavior are species-specific. To study the impact of auditory feedback on feline vocal behavior, vocalizations of normal-hearing, hearing-impaired (white) and congenitally deaf (white) cats were analyzed at around weaning age. Eleven animals were placed in a soundproof booth for 30 min at different ages, from the first to the beginning of the fourth postnatal month, every 2 weeks of life. In total, 13,874 vocalizations were analyzed using an automated procedure. Firstly, vocalizations were detected and segmented, with voiced and unvoiced vocalizations being differentiated. The voiced isolation calls (‘meow’) were further analyzed. These vocalizations showed developmental changes affecting several parameters in hearing controls, whereas the developmental sequence was delayed in congenitally deaf cats. In hearing-impaired and deaf animals, we observed differences both in vocal behavior (loudness and duration) and in the calls’ acoustic structure (fundamental frequency and higher harmonics). The fundamental frequency decreased with age in all groups, most likely due to maturation of the vocal apparatus. In deaf cats, however, other aspects of the acoustic structure of the vocalizations did not fully mature. The harmonic ratio (i.e., frequency of first harmonic divided by fundamental frequency) was higher and more variable in deaf cats than in the other study groups. Auditory feedback thus affects the acoustic structure of vocalizations and their ontogenetic development. The study suggests that both the vocal apparatus and its neuronal motor control are subject to maturation processes, whereas the latter is additionally dependent on auditory feedback in cats.

### Heart rate and arrhythmia frequency of normal cats compared to cats with asymptomatic hypertrophic cardiomyopathy.


OBJECTIVES: To compare heart rate and arrhythmia frequency and complexity in a normal population of cats to a population of cats with hypertrophic cardiomyopathy (HCM). ANIMALS: 17 cats with HCM and 15 cats with normal echocardiograms. METHODS: Results for echocardiography, electrocardiography, Doppler blood pressure, and 24-h Holter monitoring were compared between groups. RESULTS: There was no difference in heart rate between HCM cats and normal cats regardless of modality used. All (17/17) HCM cats had ventricular arrhythmias (geometric mean 124 complexes/24 h) with 82% (14/17) exhibiting complex arrhythmias (couplets, triplets, or ventricular tachycardia). Most (14/15) normal cats had ventricular arrhythmias (geometric mean 4 complexes/24 h), but only 20% (3/15) exhibited complexity. HCM cats had significantly more total ventricular complexes, ventricular premature complexes and accelerated idioventricular rhythm than normal cats (P < 0.0001, P < 0.0001, and P = 0.01, respectively). Eighty eight percent (15/17) of HCM cats had supraventricular arrhythmias (geometric mean 9 complexes/24 h) with 23% (4/17) exhibiting complexity. Sixty percent (9/15) of normal cats had supraventricular arrhythmias (geometric mean 1 complex/24 h) with 13% (2/15) exhibiting complexity. Cats with hypertrophic cardiomyopathy had significantly more supraventricular complexes than normal cats (P = 0.0148). CONCLUSION: Cats with asymptomatic HCM have more frequent and complex ventricular and supraventricular arrhythmias than normal cats but do not have different overall heart rates compared to normal cats. Further studies are needed to determine if these arrhythmias are associated with an increased risk of sudden cardiac death or influence long-term survival.

### Alfaxalone or ketamine-medetomidine in cats undergoing ovariohysterectomy: a comparison of intra-operative parameters and post-operative pain.


OBJECTIVE: To compare post-operative pain in cats after alfaxalone or ketamine-medetomidine anaesthesia for ovariohysterectomy (OHE) and physiologic parameters during and after surgery. STUDY DESIGN: Prospective ‘blinded’ randomized clinical study. ANIMALS: Twenty-one healthy cats. METHODS: Cats were assigned randomly into two groups: Group A, anaesthesia was induced and maintained with alfaxalone [5 mg kg(-1) intravenously (IV)] followed by boli (2 mg kg(-1) IV); Group MK, induction with ketamine (5 mg kg(-1) IV) after medetomidine (30 mug kg(-1) intramuscularly (IM)), and maintenance with ketamine (2 mg kg(-1) IV). Meloxicam (0.2 mg kg(-1) IV) was administered after surgery. Basic physiological data were collected. At time T = -2, 0, 0.5, 1, 2, 4, 6, 8, 12, 16, 20, and 24 hours post-operatively pain was assessed by three methods, a composite pain scale (CPS; 0-24 points), a visual analogue scale (VAS 0-100 mm), and a mechanical wound threshold (MWT) device. Butorphanol (0.2 mg kg(-1) IM) was administered if CPS was scored >/=13. Data were analyzed using a general linear model, Kruskal-Wallis analyses, Bonferroni-Dunn test, unpaired t-test and
Fisher’s exact test as relevant. Significance was set at p < 0.05. RESULTS: VASs were significantly higher at 0.5, 1, 2, 4, and 20 hours in group A; MWT values were significantly higher at 8 and 12 hours in group MK. Post-operative MWT decreased significantly compared to baseline in both groups. There was no difference in CPS at any time point. Five cats required rescue analgesia (four in A; one in MK). CONCLUSION AND CLINICAL RELEVANCE: Anaesthesia with ketamine-medetomidine was found to provide better post-surgical analgesia than alfaxalone in cats undergoing OHE; however, primary hyperalgesia developed in both groups. Alfaxalone is suitable for induction and maintenance of anaesthesia in cats undergoing OHE, but administration of additional sedative and analgesic drugs is highly recommended.

Preliminary study of interaction of clarithromycin with tacrolimus in cats.
Tacrolimus (Tac) is a core immunosuppressive drug in human organ transplantation. In feline kidney transplantation, however, the cost of Tac therapy is a significant obstacle. Clarithromycin (CLM) increases the blood trough level of Tac, effectively reducing the Tac dosage in human transplant patients. The interaction between CLM and Tac in cats has not been reported. In this study, the effect of multiple CLM dosing on the pharmacokinetics of Tac in three healthy cats was investigated. The treatments included Tac at 0.3 mg/kg and Tac at 0.3 mg/kg + multiple-dose CLM at 10 mg/kg. Co-administration of CLM and Tac resulted in significant increases in the oral bioavailability of Tac. These preliminary findings suggest that administration of multiple doses of CLM may decrease the required Tac dosage in Tac-based immunosuppressive therapy used as an alternative to the classic cyclosporine-based protocol for feline renal transplantation.

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 Chlamydophila 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
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.

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

Therapeutic efficacy of Broadline against notoedric mange in cats.
The efficacy of a novel topical combination of fipronil 8.3% w/v, (S)-methoprene 10 % w/v, eprinomectin 0.4% w/v, and praziquantel 8.3% w/v (Broadline, Merial) was evaluated in 18 cats naturally infested by Notoedres cati in a controlled, blinded clinical efficacy study. Cats were blocked on pretreatment bodyweight and randomly allocated to two groups of nine cats each. One group served as control (untreated) and one group was treated once topically with Broadline according to the label instructions. Skin scrapings (three scrapings per animal per occasion) were collected prior to treatment and every other week for 8 weeks thereafter and examined for live N. cati mites. In addition, lesions were evaluated at each sampling to monitor the clinical recovery. Based on live mite counts, efficacy against N. cati of a single topical administration with Broadline was >99%, and all treated cats recovered from clinical signs of notoedric mange. No treatment-related adverse events were observed.

Feline double pigtail ureteric stents for management of ureteric obstruction: short- and long-term follow-up of 26 cats.
The objective of this study was to determine the outcome of cats with ureteric obstruction managed with double pigtail ureteric stents and to document the incidence of lower urinary tract signs at long-term follow-up. Data were obtained retrospectively from the medical records (2009-2012) of 26 cats that underwent ureteric stent placement. Owners were contacted for follow-up, and a quality of life questionnaire completed. Survival to discharge after stent placement was 85% (22/26). Prevalence of postoperative uroabdomen necessitating further surgery was 15% (4/26). Stents were replaced 4-28 months after the initial surgery in four cats because of migration, fracture, encrustation causing luminal obstruction or sterile cystitis, respectively. Nine cats were alive at follow-up, which was 3-28 months after the original surgery. Nine cats had azotaemic chronic kidney disease and nine had signs related to sterile cystitis; three of these cats were euthanased as a result.
of the severity of the signs. Preoperative serum creatinine of the survivors (9.4 mg/dl, n = 9) was not significantly different from that of the non-survivors (6.5 mg/dl, n = 13; P = 0.295). Quality of life was assigned a mean score of 8/10. Median survival of cats following discharge was 419 days (range 44-994 days). Signs consistent with sterile cystitis affected 35% of cats. It was concluded that ureteric stent placement in cats was associated with a 15% mortality rate before hospital discharge. Long-term management of ureteric stents is associated with a high rate of lower urinary tract signs.

**Comparison of an indirect fluorescent antibody test with Western blot for the detection of serum antibodies against Encephalitozoon cuniculi in cats.**


Current clinical research indicates that *Encephalitozoon* (E.) cuniculi infections in cats may be underdiagnosed, especially in animals with typical ocular signs (cataract/anterior uveitis). Although molecular detection of the pathogen in tissue appears promising, serology remains the major diagnostic tool in the living animal. While serological tests are established for the main host of *E. cuniculi*, the rabbit, the routine serological diagnosis for cats still needs validation. The aim of the study was to evaluate the consistency of indirect fluorescence antibody test (IFAT) and Western blot (WB) for the detection of IgG antibodies against *E. cuniculi* in the serum of 84 cats. In addition, PCR of liquefied lens material or intraocular fluid was performed in those of the cats with a suspected ocular *E. cuniculi* infection. Twenty-one cats with positive PCR results were considered as a positive reference group. Results obtained by IFAT and WB corresponded in 83/84 serum samples, indicating a very good correlation between both serological methods. Using WB as the standard reference, sensitivity and specificity for the detection of antibodies against *E. cuniculi* by the IFAT were 97.6 and 100%, respectively. The positive and negative predictive values for the IFAT were 100 and 97.7%, respectively. The accuracy (correct classified proportion) for the detection of IgG antibodies against *E. cuniculi* in cats was 98.8%. The comparison of both serological methods with the PCR results also revealed a good agreement as 20 out of 21 PCR-positive samples were seropositive both in IFAT and WB. Both tests can be considered as equally reliable assays to detect IgG antibodies against *E. cuniculi* in cats. As the IFAT is quicker and easier to perform, it is recommended for routine use in the diagnosis of feline encephalitozoonosis.

**Prevalence of antimicrobial resistance in enteric Escherichia coli from domestic pets and assessment of associated risk markers using a generalized linear mixed model.**


Antimicrobial resistance (AMR) is a growing global public health problem, which is caused by the use of antimicrobials in both human and animal medical practice. The objectives of the present cross-sectional study were as follows: (1) to determine the prevalence of resistance in *Escherichia coli* isolated from the feces of pets from the Porto region of Portugal against 19 antimicrobial agents and (2) to assess the individual, clinical and environmental characteristics associated with each pet as risk markers for the AMR of the *E. coli* isolates. From September 2009 to May 2012, rectal swabs were collected from pets selected using a systematic random procedure from the ordinary population of animals attending the Veterinary Hospital of Porto University. A total of 78 dogs and 22 cats were sampled with the objective of isolating *E. coli*. The animals’ owners, who allowed the collection of fecal samples from their pets, answered a questionnaire to collect information about the markers that could influence the AMR in the enteric *E. coli*. Chromocult tryptone bile X-glucuronide agar was used for *E. coli* isolation, and the disk diffusion method was used to determine the antimicrobial susceptibility. The data were analyzed using a multilevel, univariable and multivariable generalized linear mixed model (GLMM). Several (49.7%) of the 396 isolates obtained in this study were multidrug-resistant. The *E. coli* isolates exhibited resistance to the antimicrobial agent’s ampicillin (51.3%), cephalothin (46.7%), tetracycline (45.2%) and streptomycin (43.4%). Previous quinolone treatment was the main risk marker for the presence of AMR for 12 (ampicillin, cephalothin, ceftazidime, cefotaxime, nalidixic acid, ciprofloxacin, gentamicin, tetracycline, streptomycin, chloramphenicol, trimethoprim-sulfamethoxazole and aztreonam) of the 15 antimicrobials assessed. Coprophagic habits were also positively associated with an increased risk of AMR for six drugs, ampicillin, amoxicillin-clavulanic acid, cephaparin, ciprofloxacin, streptomycin, and trimethoprim-sulfamethoxazole. In summary, pets with a record of one or more previous quinolone treatments and exhibiting coprophagic habits were at an increased risk of harboring multidrug-resistant *E. coli* strains in their feces compared to pets without these characteristics. AMR is a serious global problem, and assessing the risk markers for the presence of drug-resistant bacteria in pets, a very close source of resistance determinants to humans, is essential for the implementation of safe handling procedures for companion animals and for the prudent selection of antimicrobial compounds in veterinary practice.
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.

Validity of aqueocentesis as a component of anterior uveitis investigation in dogs and cats.


OBJECTIVE: To describe aqueocentesis cytopathology results from dogs and cats presenting for uveitis investigation and to determine whether this is a useful and safe procedure. ANIMAL STUDIED: Dogs and cats presenting for investigation of anterior uveitis (April 2008-December 2013). PROCEDURES: Aqueous was collected via limbal entry under sedation/general anesthesia, for cytopathology and occasionally bacterial culture or polymerase chain reaction (PCR) testing. Further workup included blood testing (hematology, biochemistry, and serology), diagnostic imaging, nonocular cytopathology, and available histopathology. RESULTS: Fifty-six dogs and 39 cats were included in the study. An aqueous cytopathologic diagnosis of lymphoma (or discrete cell neoplasia) was made in six dogs and seven cats, and a diagnosis of large cell carcinoma made in one dog. This diagnosis of lymphoma was confirmed by ocular histopathology in two dogs and one cat; nonocular cytopathology corroborated lymphoma in another three dogs and five cats. Lymphoma was not evident on aqueous cytopathology but confirmed on nonocular histopathology in two dogs and by cytopathology in one cat.
Additionally, aqueous cytopathology in three cats suggested, but was not considered diagnostic of, lymphoma; one of these cats had a confirmatory diagnosis of lymphoma on subsequent clinical investigation. Aqueous humor cytopathology alone was not diagnostic in non-neoplastic anterior uveitis cases, but supplemented the clinical picture with other systemic diagnostic tests. No clinically important complications were reported in association with aqueocentesis. CONCLUSIONS: Aqueocentesis is performed readily with minimal risk. The results were primarily useful in aiding a diagnosis of lymphoma in both dogs and cats.

**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.

**Abdominal ultrasonographic findings in acromegalic cats.**


OBJECTIVES: Acromegaly is increasingly recognized as a cause of insulin resistance in cats with diabetes mellitus (DM). The objective of this study was to determine if ultrasonographic changes in selected abdominal organs of acromegalic cats could be used to raise the index of suspicion for this condition. METHODS: In this retrospective case-control study, medical records of cats presenting to North Carolina State University or Colorado State University from January 2002 to October 2012 were reviewed. Cats were included in the acromegaly group if they had insulin-resistant DM with increased serum insulin-like growth factor (IGF-1) concentrations and had an abdominal ultrasound examination performed with report available. A control group included age-matched cats that had abdominal ultrasound examination performed for investigation of disease unlikely to involve kidneys, adrenal glands, pancreas or liver. RESULTS: Twenty-four cats were included in each group. IGF-1 concentrations in the acromegaly group ranged from >148 to 638 nmol/l. When compared with age-matched controls, cats with acromegaly demonstrated significantly increased median left and right kidney length, significantly increased median left and right adrenal gland thickness, and significantly increased median pancreatic thickness. Hepatomegaly and bilateral adrenomegaly were reported in 63% and 53% of acromegalic cats, respectively, and in none of the controls. Pancreatic abnormalities were described in 88% of the acromegalic cats and 8% of the controls. CONCLUSIONS AND RELEVANCE: These findings indicate that compared with non-acromegalic cats, age-matched acromegalic patients have measurably larger kidneys, adrenal glands and pancreas. Diagnostic testing for acromegaly should be considered in poorly regulated diabetic cats exhibiting organomegaly on abdominal ultrasound examination.

**Absence of bacterial DNA in culture-negative urine from cats with and without lower urinary tract disease.**


A diagnosis of bacterial cystitis commonly relies on a positive microbiological culture demonstrating the presence of a significant number of colony-forming units/ml urine, as urine within the upper urinary tract, bladder and proximal urethra generally is considered sterile. Recent studies from human and veterinary medicine indicate the presence of non-culturable bacteria in culture-negative urine samples. The aim of the present study was to determine the occurrence of bacterial DNA in culture-negative urine samples from cats with signs of feline lower urinary tract disease (FLUTD) and healthy control cats by 16S ribosomal DNA PCR and subsequent sequencing. The study sample included 38 culture-negative urine samples from cats with FLUTD and 43 culture-negative samples from control cats. Eight culture-positive urine samples from cats with FLUTD were included as external positive controls in addition to negative reaction controls. Of possible methodological limitations, degradation of DNA due to storage, the use of non-sedimented urine for DNA isolation and lack of internal positive reaction controls should be mentioned. The positive controls were recognised, but occurrence of
bacterial DNA in culture negative urine from cats with or without signs of lower urinary tract disease was not demonstrated. However, considering the possible methodological limitations, the presence of bacterial DNA in the urine of culture-negative FLUTD cats cannot be excluded based on the present results alone. Therefore, a prospective study reducing the possibility of degradation of DNA due to storage in combination with modifications enhancing the chance of detecting even lower levels of bacterial DNA in culture-negative samples seems warranted.

**Influence of olfactory enrichment on the exploratory behaviour of captive-housed domestic cats.**


**OBJECTIVE:** To evaluate the influence of olfactory stimulation on the exploratory activity of captive-housed domestic cats.

**METHODS:** To evaluate the cats’ exploratory behaviour, we devised three treatments. We placed a wooden cube (0.027 m³) covered with a cloth treated with rat scent on the floor of each cat enclosure (T3). We also used a cloth-covered cube that did not have rat scent (T2) and observed the cats’ behaviours in the same area without any object (T1). All cats participated in T1, T2, and T3. All treatments were performed equally and at the same time in two identical enclosures with 11 and 10 cats, respectively. The cats had lived in the enclosures since entering the permanent animal house. We used a continuous recording method associated with focal sampling to analyse the recordings. **RESULTS:** Exploration was induced in the presence of a novel object, the cube, irrespective of whether the object was associated with the scent. In T3, we observed sex differences in exploration time: females spent more time exploring the scent-impregnated cube than males. Female cats also spent more time exploring the scent-impregnated cube than the scent-free cube. Cats in T3 had shorter latency for exploration, spent more time sniffing the ground and rubbing the cube, and had a higher frequency of urine spraying than those in T2. **CONCLUSION:** Although exploratory behaviour was induced by novelty in the form of a new object, significant effects were observed in the presence of the scent, mainly regarding latency to explore, sex differences and sniffing, rubbing and urine spraying.

**Multi-centered investigation of a point-of-care NT-proBNP ELISA assay to detect moderate to severe occult (pre-clinical) feline heart disease in cats referred for cardiac evaluation.**


**OBJECTIVE:** To prospectively evaluate the diagnostic accuracy of a point-of-care (POC) N-terminal pro-B-type natriuretic peptide (NT-proBNP) ELISA to assess the likelihood of moderate to severe occult heart disease (OcHD) in a clinical population of cats suspected to have heart disease. **ANIMALS:** One hundred and forty-six asymptomatic client-owned cats with a heart murmur, gallop rhythm, arrhythmia, or cardiomegaly. **METHODS:** Physical examination, blood pressure measurement and echocardiography were performed prospectively. Point-of-care ELISA was visually assessed as either positive or negative by a reader blinded to the echocardiographic results. **RESULTS:** Forty-three healthy cats, 50 mild OcHD, 31 moderate OcHD, 6 severe OcHD, and 16 cats equivocal for OcHD were examined. Cats with OcHD included 65 with hypertrophic cardiomyopathy, 6 with restrictive or unclassified cardiomyopathy, 1 with arrhythmogenic right ventricular cardiomyopathy, and 15 with non-cardiomyopathic forms of heart disease. **CONCLUSION:** In a select sample of cats referred for cardiac evaluation, positive POC NT-proBNP ELISA result excludes moderate to severe OcHD.

**Emergence of Thelazia callipaeda Infection in Dogs and Cats from East-Central Portugal.**


The eyeworm Thelazia callipaeda (Spirurida, Thelaziidae) infects domestic animals, wildlife and human beings, and is considered an emerging pathogen in Europe. This study aimed at investigating the prevalence and risk factors of T. callipaeda infection in dogs and cats from east-central Portugal, a region where the parasite was previously detected in two red foxes (Vulpes vulpes). Thelazia callipaeda was found in 22 (3.8%) of 586 dogs and in four (23.5%) of 17 cats. A total of 178 adult worms (71.9% of females and 28.1% of males) were collected from the conjunctiva of the infected dogs. The number of worms collected per dog ranged from 1 to 35 (average +/- standard deviation: 8.08 +/- 9.49), with four dogs (18.2%) harbouring only a single parasite. Worms were gathered from dogs throughout all months of the year. A total of 17 adult worms (64.7% of females and 35.3% of males) were obtained from cats. The number of worms per cat ranged from 1
to 14 (4.3 +/- 6.5), with three cats (75.0%) having a single parasite. Eyeworm infection was statistically more prevalent in pastoral and farm dogs, in those dogs with contact with other animals and in dogs with ocular manifestations. T. callipeda is endemic in the east-central part of Portugal, reportedly infecting domestic (dogs and cats) and wild carnivores (red foxes) and evidencing a southerly dissemination. Future investigations should be focused on determining the local distribution and density of the insect vector (Phortica variegata) in this geographical area. This emergent zoonosis should be included by veterinarians, physicians and ophthalmologists in the differential diagnosis of ocular manifestations in their patients, particularly in areas where T. callipeda is endemic.

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

A comparison of low dose tiletamine-zolazepam or acepromazine combined with methadone for pre-anaesthetic medication in cats.
OBJECTIVE: To compare the level of sedation, cardiorespiratory changes, and quality of recovery in cats receiving methadone plus either low dose tiletamine-zolazepam or acepromazine for premedication prior to general anaesthesia for neutering. STUDY DESIGN: Prospective, randomized, blinded clinical study. ANIMALS: Twenty cats 0.54 +/- 0.12 years-old (mean +/- SD), weighing 3.17 +/- 0.65 kg (10 male and 10 female). METHODS: Cats were allocated randomly to receive intramuscularly either 0.03 mg kg(-1) acepromazine (ACE) or 3 mg kg(-1) tiletamine-zolazepam (TZ), both regimens combined with 0.2 mg kg(-1) methadone for premedication. Sedation was assessed 25 minutes after premedication using a visual analogue scale (VAS) and a simple descriptive scale (SDS). Anaesthesia was induced with alfaxalone and maintained with isoflurane. Physiological parameters were recorded at 1, 3 and 5 minutes post-endotracheal intubation. Recovery from cessation of isoflurane was timed and quality assessed using a SDS and a VAS. Data was analysed with Mann-Whitney U-test, students t-test, anova or ordinal logistic regression as relevant. Significance was taken as p < 0.05. RESULTS: Sedation was more pronounced in TZ than ACE as indicated by higher VAS (67 +/- 21 versus 13 +/- 5) and SDS scores [4 (1-4) versus 1 (0-1)]. Following sedation, Heart (HR) and respiratory (fR) rates did not differ between groups. After anaesthetic induction, at times 1, 3 and 5 HR, systolic arterial pressure and end tidal carbon dioxide were significantly higher and fR was significantly lower in TZ than ACE. Recovery quality was similar between groups. In both groups, times to extubation, head lift and sternal recumbency were similar, but time (minutes) until standing was significantly longer in TZ (31 +/- 16) than ACE (18 +/- 11). CONCLUSION AND CLINICAL RELEVANCE: Low dose tiletamine-zolazepam combined with methadone provided superior sedation to ACE. Recovery quality was similar, although time to standing was longer.

Outcome and prognostic indicators in 20 cats with surgically treated primary lung tumors.
The purpose of this retrospective study of 20 client-owned cats was to describe the clinical signs, surgical interventions, histological features, stage and treatments of primary lung tumors removed by surgical excision, and to determine which factors significantly influence survival. Any cat that underwent surgical resection of a primary lung tumor between 2000 and 2007 was included in the study. Patient records were reviewed and signalment, clinical signs, preoperative diagnostics, surgical findings and histopathological results recorded. Histological reports were reviewed and scored using World Health Organization criteria. The Kaplan-Meier test was used to evaluate each potential prognostic factor with survival. Twenty cats met the inclusion criteria. The presence of clinical signs (such as dyspnea) at the time of diagnosis (P = 0.032), pleural effusion (P = 0.046), stage M1 (P = 0.015), and moderately and poorly differentiated tumors on histopathology (P = 0.011)
were factors that were significantly correlated with reduced survival times. The median survival time of the 20 cats was 11 days. Cats presenting with no clinical signs had a median survival time of 578 days post-surgery vs 4 days post-surgery when presented with clinical signs. Cats staged T1N0M0 lived longer than cats at other stages (P = 0.044). Of the cats that survived to the time of suture removal, median survival time was 64 days. The results indicate that the presence of clinical signs, pleural effusion, moderately and poorly differentiated tumors on histopathology, evidence of metastasis and any stage beyond T1N0M0 are negative prognostic indicators for cats with primary lung tumors. The findings demonstrate that cats that presented with clinical signs, pleural effusion, any stage other than T1N0M0, or moderately and poorly differentiated tumors on histopathology had a poor prognosis. Therefore, extensive preoperative diagnostics, including computed tomography scans, should be performed before considering surgical intervention in these cats. These findings may be used to guide therapeutic decision-making in cats diagnosed with primary lung tumors.

Survey of dietary and medication practices of owners of cats with chronic kidney disease.
The objective of this study was to describe the dietary and medication patterns of cats with chronic kidney disease (CKD). In this prospective, cross-sectional descriptive study, owners of cats with CKD were asked to complete a web-based survey. The study was advertised on CKD-, pet-, veterinary- and breed-associated websites and list serves. Owners of 1089 cats with CKD participated in the study. The mean reported age of the cats with CKD was 13.7 +/- 4.2 years. Forty percent (430/1089) of cats had concurrent diseases, with hyperthyroidism, heart disease and inflammatory bowel disease being the most common. Veterinarian recommendation was the most common reason reported (684/1032; 66%) for diet selection, and 51% (556/1089) of owners fed a veterinary therapeutic diet formulated for kidney disease as some component of the diet. Many owners (466/1079; 43%) reported that their cats had an abnormal appetite; of these owners, 52% responded that their cats had a poor appetite or required coaxing to eat 5-7 days per week. Forty-seven and 51% of cats were receiving subcutaneous fluids and oral medications, respectively; however, most cats (811/1036; 78%) were not receiving phosphorus-binding medications. Fifty-six percent and 38% of cats received commercial cat treats and dietary supplements, respectively. Anorexia or hyporexia is a common problem for cats with CKD and may lead to cats being fed suboptimal diets for their disease. This information may be useful for treating or designing nutritional studies for cats with CKD.

Qualitative study of factors associated with antimicrobial usage in seven small animal veterinary practices in the UK.
Responsible use of antimicrobials by veterinarians is essential to contain antimicrobial resistance in pathogens relevant to public health. Inappropriate antimicrobial use has been previously described in practice. However, there is scarce information on factors influencing antimicrobial usage in dogs and cats. We investigated intrinsic and extrinsic factors influencing decision-making of antimicrobial usage in first opinion small animal practices in the UK through the application of qualitative research methods. Semi-structured interviews were conducted with 21 veterinarians from seven veterinary first opinion practices in the UK in 2010. Topics investigated included: a) criteria used for selection of antimicrobials, b) influences by colleagues, c) influences by clients, d) pet characteristics, e) sources of knowledge, f) awareness of guidelines and protocols implemented in practice that may affect antimicrobial usage by veterinarians. Hypothetical scenarios selected to assess appropriateness of antimicrobial usage were: a) vomiting in a Yorkshire Terrier due to dietary indiscretion, b) deep pyoderma in a Shar-Pei, c) Feline Lower Urinary Tract disease in an 7 year-old male neutered cat and d) neutering of a 6-months dog. Interviews were recorded and transcribed by the interviewer. Thematic analysis was used to analyse content of transcribed interviews. Data management and analysis was conducted with qualitative analysis software NVivo8 (QSR International Pty Ltd). Antimicrobial usage by participants was influenced by factors other than clinical evidence and scientific knowledge. Intrinsic factors included veterinarian’s preference of substances and previous experience. Extrinsic factors influencing antimicrobial selection were: perceived efficacy, ease of administration of formulations, perceived compliance, willingness and ability to treat by pet owners, and animal characteristics. Cost of therapy was only perceived as an influential factor in low, mixed socioeconomic areas. Veterinarians had limited awareness of current recommendations for responsible use in small animal practice. Social norms, particularly verbally agreed protocols influenced veterinarians. Inappropriate antimicrobial usage was identified in the therapy of non-infectious diseases and prophylaxis of routine clean surgical procedures. Discussion of clinical cases with peers and effectiveness meetings in the workplace were useful to veterinarians to share scientific knowledge. Effectiveness meetings can be a common ground for veterinarians to discuss and agree protocols for clinical conditions and surgical procedures. Protocols should be evidence-based, follow current recommendations and take into account the resources available in the workplace. Targeted training of veterinarians in the workplace with peer support should be used to promote responsible antimicrobial usage.
Prospective evaluation of access incision position for minimally invasive surgical organ exposure in cats.


OBJECTIVE: To evaluate the exposure obtained for minimally invasive abdominal organ biopsy (MIOB) from 3 access incisions in cats. DESIGN: Prospective experimental study and clinical case series. ANIMALS: 6 purpose-bred research cats and 6 feline clinical patients with indications for abdominal organ biopsy. PROCEDURES: Three 3-cm incisions into the peritoneal cavity were created at different locations along the linea alba in research cats in randomized order. A wound retraction device was inserted in each incision. Ability to exteriorize various abdominal organs to the extent required to reasonably perform a surgical biopsy was recorded, and results were compared among incision sites. On the basis of results obtained, the access incision that provided exposure of the most frequently biopsied abdominal organs was used to perform MIOB in 6 feline clinical patients with various underlying pathological conditions. RESULTS: On the basis of experiments with research cats, a 3-cm access incision centered midway between the caudal margin of the xiphoid cartilage and the umbilicus was found to provide access for MIOB for most organs. In 5 of 6 clinical patients, all of the organs of interest were biopsied successfully via this incision location, although access to all hepatic lobes and all parts of the pancreas was inconsistent. In 1 cat, conversion to an open approach was performed because a palpable mass was detected in the area of the duodenocolic ligament. CONCLUSIONS AND CLINICAL RELEVANCE: Optimization of access incision location for MIOB allowed biopsy specimen collection from organs of interest to be performed in a minimally invasive manner in cats.

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-beta-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 forebrain 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. Gene Therapy advance online publication, 4 December 2014; doi:10.1038/gt.2014.108.

Identification and characterisation of small molecule inhibitors of feline coronavirus replication.


Feline infectious peritonitis (FIP), a feline coronavirus (FCoV) induced disease, is almost invariably fatal with median life expectancy measured in days. Current treatment options are, at best, palliative. The objectives of this study were to evaluate a panel of nineteen candidate compounds for antiviral activity against FCoV in vitro to determine viable candidates for therapy. A resazurin-based cytopathic effect inhibition assay, which detects viable cells through their reduction of the substrate resazurin to fluorescent resorufin, was developed for screening compounds for antiviral efficacy against FCoV. Plaque reduction and virus yield reduction assays were performed to confirm antiviral effects of candidate compounds identified during screening, and the possible antiviral mechanisms of action of these compounds were investigated using virucidal suspension assays and CPE inhibition and IFA-based time of addition assays. Three compounds, chloroquine, mefloquine, and hexamethylene amiloride demonstrated marked inhibition of virus induced CPE at low micromolar concentrations. Orthogonal assays confirmed inhibition of CPE was associated with significant reductions in viral replication. Selectivity indices calculated based on in vitro cytotoxicity screening and reductions in extracellular viral titre were 217, 24, and 20 for chloroquine, mefloquine, and hexamethylene amiloride respectively. Preliminary experiments performed to inform the antiviral mechanism of the compounds demonstrated all three acted at an early stage of viral replication. These results suggest that these direct acting antiviral compounds, or their derivatives, warrant further
Assessment of cardiopulmonary resuscitation in 121 dogs and 30 cats at a university teaching hospital (2009-2012).


OBJECTIVE: To prospectively describe cardiopulmonary resuscitation (CPR) and evaluate factors associated with outcome in dogs and cats with cardiopulmonary arrest (CPA). DESIGN: Prospective observational study. SETTING: University teaching hospital. ANIMALS: One hundred twenty-one dogs and 30 cats that underwent CPR. INTERVENTIONS: None. MEASUREMENTS AND MAIN RESULTS: Supervising clinicians completed a data form immediately following completion of CPR. Eighty-seven (58%) animals attained return of spontaneous circulation (ROSC), 49 (32%) had ROSC >20 minutes, 15 (10%) were alive at 24 hours, and 8 (5%) were discharged alive. Cardiovascular abnormalities were the most common suspected precipitating cause of CPA (51/151, 34%). Presence of an IV catheter before CPA (P = 0.01) and the presence of palpable pulses during CPR (P = 0.007) were both associated with ROSC. Increased time from CPA to CPR (P = 0.04), longer duration of CPR (P < 0.0001), and neurologic cause of arrest (P = 0.02) were associated with not achieving ROSC. There was no association between ROSC and the initial arrest rhythm identified on ECG, animal weight, number of people present, and ventilation or compression rate. In patients achieving ROSC, those with a “survived event” were more likely to be euthanized and less likely to experience a second CPA than those with ROSC <= 20 minutes. Thirty-four percent of patients submitted for necropsy had gross and histological lesions considered secondary to CPR. CONCLUSIONS: Early CPR interventions were associated with a greater likelihood of ROSC, emphasizing the importance of prompt recognition, and initiation of CPR efforts. Although ROSC rates in this study were comparable or higher than previous human and veterinary studies, the rate of “survived events” was lower than that reported in human patients. This may suggest that advances in post CPR care could have benefits to the veterinary CPR patient in the future.

A Comparison of Biochemical and Histopathologic Staging in Cats With Chronic Kidney Disease.

Mcleland S.M., Cianciolo R.E., Duncan C.G. & Quimby J.M. (2014) *Vet Pathol*

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

Frequency of antibodies against Sarcocystis neurona and Neospora caninum in domestic cats in the state of Bahia, Brazil.


Sarcocystis neurona is the major agent of equine protozoal myeloencephalitis. It infects several mammalian species in the Americas, where the definitive hosts, marsupials of the genus Didelphis (D. virginiana and D. albiventeris) are found. Domestic cats are one of the confirmed intermediate hosts of the parasite; however, antibodies against S. neurona had never before been demonstrated in Brazilian cats. The aim of this study was to determine whether cats in Bahia, Brazil, are exposed to the parasite. A total of 272 feline serum samples (134 from feral and 138 from house cats) were subjected to an indirect fluorescent antibody test using cultured merozoites of S. neurona as antigen. Positivity was detected in 4.0% (11/272) of the tested samples, with titers ranging from 25 to 800. The feline sera were also tested for antibodies against the protozoan Neospora caninum, with an observed antibody frequency of 2.9%. To the author’s knowledge, this is the first study to report antibodies against S. neurona in Brazilian cats. We conclude that cats are exposed to the parasite in the region of this study. Further investigations are needed to confirm the role of cats in the transmission cycle of S. neurona in Brazil.
Simulating free-roaming cat population management options in open demographic environments.

Large populations of free-roaming cats (FRCs) generate ongoing concerns for welfare of both individual animals and populations, for human public health, for viability of native wildlife populations, and for local ecological damage. Managing FRC populations is a complex task, without universal agreement on best practices. Previous analyses that use simulation modeling tools to evaluate alternative management methods have focused on relative efficacy of removal (or trap-return, TR), typically involving euthanasia, and sterilization (or trap-neuter-return, TNR) in demographically isolated populations. We used a stochastic demographic simulation approach to evaluate removal, permanent sterilization, and two postulated methods of temporary contraception for FRC population management. Our models include demographic connectivity to neighboring untreated cat populations through natural dispersal in a metapopulation context across urban and rural landscapes, and also feature abandonment of owned animals. Within population type, a given implementation rate of the TR strategy results in the most rapid rate of population decline and (when populations are isolated) the highest probability of population elimination, followed in order of decreasing efficacy by equivalent rates of implementation of TNR and temporary contraception. Even low levels of demographic connectivity significantly reduce the effectiveness of any management intervention, and continued abandonment is similarly problematic. This is the first demographic simulation analysis to consider the use of temporary contraception and account for the realities of FRC dispersal and owned cat abandonment.

**Magnetic resonance volumetry of the hippocampus in familial spontaneous epileptic cats.**

A strain of familial spontaneous epileptic cats (FSECs) with typical limbic seizures was identified in 2010. The electroencephalographic features suggested that an epileptogenic zone is present in the mesial temporal structures (i.e., amygdala and/or hippocampus). In this study, visual evaluations and quantitative analyses were performed by using 3D MR hippocampal volumetry in comparing FSECs with age-matched controls. Visual hippocampal asymmetries were seen in 8 of 14 (57.1%) FSECs. The FSEC group showed a significantly higher asymmetric ratio (4.15%) than the control group (0.99%). The smaller side of hippocampal volume (HV) (0.206 cm(3))) in FSECs was significantly smaller than the mean HV in controls (0.227 cm(3)). However, the means of left and right HVs and total HVs in FSECs showed no differences because the laterality of hippocampal atrophy was different in each individual. Therefore, since FSECs represent a true model of spontaneous epilepsy, hippocampal volumetry should be evaluated in each individual as well as in human patients. The significant asymmetry of HV suggests the potential for hippocampal atrophy in FSECs.

**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.1342G>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.

**Comparative analysis of the domestic cat genome reveals genetic signatures underlying feline biology and domestication.**

Little is known about the genetic changes that distinguish domestic cat populations from their wild progenitors. Here we describe a high-quality domestic cat reference genome assembly and comparative inferences made with other cat breeds, wildcats, and other mammals. Based upon these comparisons, we identified positively selected genes enriched for genes involved in lipid metabolism that underpin adaptations to a hypercarnivorous diet. We also found positive selection signals within genes underlying sensory processes, especially those affecting vision and hearing in the carnivore lineage. We observed an evolutionary tradeoff between functional olfactory and vomeronasal receptor gene repertoires in the cat and dog genomes, with an expansion of the feline chemosensory system for detecting pheromones at the expense of odorant detection. Genomic regions harboring signatures of natural selection that distinguish domestic cats from their wild congeners are enriched in neural crest-related genes associated with behavior and reward in mouse models, as predicted by the domestication syndrome hypothesis. Our description of a previously unidentified allele for the gloving pigmentation pattern found in the Birman breed supports the hypothesis that cat breeds experienced strong selection on specific mutations drawn from random bred populations. Collectively, these findings provide insight into how the process of domestication altered the ancestral wildcat genome and build a resource for future disease mapping and phylogenomic studies across all members of the Felidae.

Feline sporotrichosis due to Sporothrix brasiliensis: an emerging animal infection in Sao Paulo, Brazil.

BackgroundSporotrichosis is a mycotic infectious disease that is generally acquired by traumatic inoculation of contaminated materials especially from plant debris or through bites and scratches from diseased animals, such as domestic cats. It affects the skin, lymphatic system, and other organs in the warm-blooded host. Etiological agents are embedded in the plant-associated order Ophiostomatales. With essential differences between possible outbreak sources and ecological niche, host-environment interactions are classic determinants of risk factors for disease acquisition. Sporotrichosis outbreaks with zoonotic transmission, such as those that are ongoing in southern and southeastern Brazil, have highlighted the threat of cross-species pathogen transmission. Sporothrix brasiliensis has emerged as a human threat owing to the intimate contact pattern between diseased cats and humans in endemic areas. ResultsWe describe the recent emergence of feline sporotrichosis in the metropolitan region of Sao Paulo, Brazil, with an overwhelming occurrence of S. brasiliensis as the etiological agent. A phylogenetic and a haplotype approach were used to investigate the origin of this epidemic and the impact of feline transmission on genetic diversity. During the last 3-year period, 163 cases of feline sporotrichosis were reported in Sao Paulo with proven S. brasiliensis culture. The haplotype diversity of feline S. brasiliensis isolates revealed the expansion of a clonal population with low genetic diversity. Haplotype analysis confirmed that isolates from Sao Paulo shared the haplotype originated in the long-lasting outbreak of cat-transmitted sporotrichosis in Rio de Janeiro, which differed from the haplotype circulating in the Rio Grande do Sul epidemic. ConclusionsThe fast spread of sporotrichosis in a short period of time highlights the potential for outbreaks and suggests that the mycosis may affect an urban population with a high concentration of susceptible felines. The feline sporotrichosis epidemic shows no signs of slowing, and this epidemiological pattern may require specific public health strategies to control future outbreaks.

First epidemiological report of feline heartworm infection in the Barcelona metropolitan area (Spain).

BackgroundThe metropolitan area of Barcelona is the most densely populated metropolitan area on the Mediterranean coast. Several studies have reported the presence of canine heartworm disease in this region; however, there are no published epidemiological data regarding feline heartworm in this region and the prevalence in this species remains unknown. MethodsSerum samples from 758 cats living in the metropolitan area of Barcelona (Spain) were collected between 2012 and 2013. To establish the seroprevalence of heartworm infection in cats, serological techniques for anti-D. immitis and anti-Wolbachia antibody detection were used while a commercial ELISA test kit was used to detect circulating D. immitis antigens. ResultsOf these samples, 11.47% were positive to D. immitis and Wolbachia surface protein antibodies and 0.26% were positive to D. immitis antigens. The higher antibody seroprevalences were found in the areas that follow the courses of the rivers Llobregat and Anoia (Baix Llobregat 11.5%, Valles Occidental 13.2%; Barcelones 11.7%) where humidity and vegetation favour the development of the mosquito vectors. High antibody seroprevalences were also found in the urban areas (Barcelona city 13.1%; Sabadell 15.5%), which demonstrates that city cats are also at risk from

A case of feline gastrointestinal eosinophilic sclerosing fibroplasia mimicking metastatic neoplasia.
CASE HISTORY: A 7-year-old cat developed sporadic vomiting, reduced appetite, and weight loss over the previous 3 months. CLINICAL FINDINGS: Palpation revealed a large mid-abdominal mass and the cat had marked eosinophilia. The cat progressively lost weight over the next 7 weeks when euthanasia was performed. PATHOLOGICAL FINDINGS: Necropsy revealed a 3 cm diameter firm white intramural mass in the colon and another in the pylorus. Mesenteric and cranial mediastinal lymph nodes were firm, pale, and enlarged. Histopathological examination revealed foci of necrosis surrounded by thick dense collagen trabeculae and predominantly eosinophilic inflammation within the intestine and lymph nodes. Marked eosinophilic infiltration of the liver was also present. DIAGNOSIS: The lesions were consistent with gastrointestinal eosinophilic sclerosing fibroplasia (FGESF). CLINICAL RELEVANCE: This is the first report of FGESF in a New Zealand cat and the first time lesions of FGESF have been observed in extra-abdominal tissues. Intestinal neoplasia can be clinically identical to FGESF and histopathology is required for differentiation. Evidence suggests that FGESF has a more favourable prognosis than intestinal neoplasia.

Kinetic measurements of gait for osteoarthritis research in dogs and cats.
Over the past 2 decades the measurement of ground reaction forces (GRF) has been extensively used in dogs and cats to gain insights on normal locomotion, discrepancies under pathologic conditions, and biomechanical changes following surgical procedures. Ground reaction forces have become a well-established outcome measure of pain-related functional impairment in animals affected by experimental and naturally occurring osteoarthritis. This paper comprehensively reviews the nature of GRF and presents arguments regarding its measurement in osteoarthritis research.

Comparative transcriptomics reveals striking similarities between the bovine and feline isolates of Tritrichomonas foetus: consequences for in silico drug-target identification.
BACKGROUND: Few, if any, protozoan parasites are reported to exhibit extreme organ tropism like the flagellate Tritrichomonas foetus. In cattle, T. foetus infects the reproductive system causing abortion, whereas the infection in cats results in chronic large bowel diarrhoea. In the absence of a T. foetus genome, we utilized a de novo approach to assemble the transcriptome of the bovine and feline genotype to identify host-specific adaptations and virulence factors specific to each genotype. Furthermore, a subset of orthologs was used to characterize putative druggable targets and expose complications of in silico drug target mining in species with indefinite host-ranges. RESULTS: Illumina RNA-seq reads were assembled into two representative bovine and feline transcriptomes containing 42,363 and 36,559 contigs, respectively. Coding and non-coding regions of the genome libraries revealed striking similarities, with 24,620 shared homolog pairs reduced down to 7,547 coding orthologs between the two genotypes. The transcriptomes were near identical in functional category distribution; with no indication of selective pressure acting on orthologs despite differences in parasite origins/host. Orthologs formed a large proportion of highly expressed transcripts in both genotypes (bovine genotype: 76%, feline genotype: 56%). Mining the libraries for protease virulence factors revealed the cysteine proteases (CP) to be the most common. In total, 483 and 445 bovine and feline T. foetus transcripts were identified as putative proteases based on MEROPS database, with 9 hits to putative protease inhibitors. In bovine T. foetus, CP8 is the preferentially transcribed CP while in the feline genotype, transcription of CP7 showed higher abundance. In silico druggability analysis of the proteases revealed that when host sequences are taken into account, drug targets are genotype-specific. CONCLUSION: Gene discovery analysis based on RNA-seq data analysis revealed prominent similarities between the bovine and feline T. foetus, suggesting recent adaptation to their respective host/niche. T. foetus represents a unique case of a mammalian protozoan expanding its parasitic grasp across distantly related host lineages. Consequences of the host-range for in silico drug targeting are exposed here, demonstrating that targets of the parasite in one host are not necessarily ideal for the same parasite in another host.

**OBJECTIVE:** To describe the technique and evaluate the outcome of laparoscopic treatment of ovarian remnant syndrome (ORS) in dogs and cats. **DESIGN:** Retrospective case series. **ANIMALS:** 7 client-owned dogs and cats. **PROCEDURES:** Medical records of dogs and cats with ORS that were treated laparoscopically at 3 large veterinary teaching hospitals were reviewed. Laparoscopic ovarian remnant resection was performed by means of either a 3-port or single-port technique with the patient in dorsal recumbency. The area caudal to both kidneys was thoroughly inspected for evidence of ovarian tissue by tilting the patient laterally. Any ovarian remnant tissue in these areas was resected with a bipolar vessel sealer. **RESULTS:** 5 female dogs and 2 female cats that had previously undergone ovariecctomy or ovariectomy were included in the study. Six procedures were performed with a standard 3-port technique, and 1 was performed with a single-port technique. Median surgery time was 90 minutes (range, 50 to 150 minutes). No patient required conversion to laparotomy. Six of the 7 patients had complete resolution of clinical signs after surgery. One patient underwent laparotomy 7 weeks after surgery for management of stump pyometra, but no further ovarian tissue was detected. **CONCLUSIONS AND CLINICAL RELEVANCE:** Laparoscopic management of ORS in this cohort of dogs and cats was associated with minimal morbidity. Laparoscopic treatment of ORS in dogs and cats may be recommended for appropriately selected patients.

**Genetic and phenotypic characterisation of Escherichia coli producing cefotaximase-type extended-spectrum beta-lactamasens: first evidence of the ST131 clone in cats with urinary infections in Italy.**


The incidence of cefotaximase (CTX-M)-type extended-spectrum beta-lactamase (ESBL)-producing *Escherichia coli* has increased dramatically in humans and animals since the middle of the last century. *E coli* that produce CTX-M beta-lactamase represent a major cause of urinary tract infections, and pose a significant therapeutic challenge to both human and veterinary medicine. As data on uropathogenic CTX-M-producing strains in cats are limited, the aim of this study was to describe the genetic character and antibiotic resistance phenotypes of CTX-M-producing *E coli* isolated from cats with cystitis. Seven of 15 *E coli* bacteria isolated from 138 urine samples had the CTX-M gene and were therefore included in this study. These isolates were screened by polymerase chain reaction for the presence of 14 extra-intestinal virulence factors, class 1 and class 2 integrons, and to identify their phylogenetic groups. Multi-locus sequence typing (MLST) of the strains and susceptibility testing (disc diffusion method) were also performed. Virulence factor iutA was the most frequent determinant identified (86.7%), and the majority of CTX-M-producing strains (n = 5) carried class 1 integrons. MLST allowed us to discriminate four known sequence types (ST131, ST555, ST602, ST155) and three novel sequence types (ST3847, ST3848, ST4181). To the best of our knowledge, this is the first study to report uropathogenic CTX-M-producing *E coli* ST131 in cats in Italy. Accurate diagnostics and prudent use of antimicrobials are recommended to avoid the spread of multidrug-resistant pathogens in veterinary medicine and to prevent their transmission to humans.

**Testicular disorder of sex development in four cats with a male karyotype (38,XY; SRY-positive).**


The molecular background of disorders of sex development (DSD) in cats is poorly recognized. In this study we present cytogenetic, molecular and histological analyses of four cats subjected for the analysis due to ambiguous external genitalia. Three cases, with rudimentary penises and an abnormal position of the urethral orifice, represented different types of hypospadias. The fourth case had a normal penis, a blind vulva and spermatogenetically active testes. Histological studies showed structures typical of testes, but spermatogenic activity was observed in two cats only. All the cats had a normal male chromosome complement (38,XY) and the Y-chromosome linked genes (SRY and ZFY) were also detected. Fluorescent in situ hybridization (FISH), with the use of the feline BAC probe harboring the SRY gene, excluded the possibility of chromosome translocation of the Y chromosome fragment carrying the SRY gene onto another chromosome. Sequencing of four candidate genes (SRY-sex determining region Y; AR-androgen receptor; SRD5A2-steroid-5-alpha reductase 2 and MAML1-mastermind-like domain containing 1) revealed one SNP in the SRY gene, one common polymorphism in exon 1 of the AR gene (tandem repeat of a tri-nucleotide motif-CAG), six polymorphisms (5 SNPs and 1 indel) in the SRD5A2 gene and one SNP in the MAML1 gene. Molecular studies of the candidate genes showed no association with the identified polymorphisms, thus molecular background of the studied DSD phenotypes remains unknown.

**Prevalence of disorders recorded in cats attending primary-care veterinary practices in England.**

Improved understanding of absolute and relative prevalence values for common feline disorders could support clinicians when listing differential diagnoses and also assist prioritisation of breeding, research and health control strategies. This study aimed to analyse primary-care veterinary clinical data within the VetCompass project to estimate the prevalence of the most common disorders recorded in cats in England and to evaluate associations with purebred status. It was hypothesised that common disorders would be more prevalent in purebred than in crossbred cats. From a study population of 142,576 cats attending 91 clinics across Central and South-East England from 1 September 2009 to 15 January 2014, a random sample of 3584 was selected for detailed clinical review to extract information on all disorders recorded. The most prevalent diagnosis-level disorders were periodontal disease (n = 499; prevalence, 13.9%, 95% confidence intervals [CI], 12.5-15.4), flea infestation (n = 285; prevalence, 8.0%; 95% CI, 7.0-8.9) and obesity (n = 239; prevalence, 6.7%; 95% CI, 5.7-7.6). The most prevalent disorder groups recorded were dental conditions (n = 540; prevalence, 15.1%, 95% CI, 13.6-16.6), traumatic injury (n = 463; prevalence, 12.9%; 95% CI, 11.6-14.3) and dermatological disorders (n = 373; prevalence, 10.4%; 95% CI, 9.2-11.7). Crossbred cats had a higher prevalence of abscesses (excluding cat bite abscesses) (P = 0.009) and hyperthyroidism (P = 0.002) among the 20 most common disorders recorded. Purebreds had a higher prevalence for coat disorders (P <0.001). Veterinarians could use these results to focus their diagnostic and prophylactic efforts towards the most prevalent feline disorders. The study did not show an increased prevalence of common disorders in purebred cats compared with crossbred cats. Primary-care veterinary clinical data were versatile and useful for demographic and clinical feline studies.

Identification and functional characterization of novel feline cytochrome P450 2A.

Abstract 1. Cytochrome P450s are the major metabolizing enzymes for xenobiotics in humans and other mammals. Although the domestic cat Felis catus, an obligate carnivore, is the most common companion animal, the properties of cytochrome P450 subfamilies are largely unknown. 2. We newly identified the feline CYP2A13, which consists of 494 deduced amino acids, showing the highest identity to CYP2As of dogs, followed by those of pigs, cattle and humans. 3. The feline CYP2A13 transcript and protein were expressed almost exclusively in the liver without particular sex-dependent differences. 4. The feline CYP2A13 protein heterogeneously expressed in Escherichia coli showed metabolic activity similar to those of human and canine CYP2As for coumarin, 7-ethoxycoumarin and nicotine. 5. The results indicate the importance of CYP2A13 in systemic metabolism of xenobiotics in cats.


OBJECTIVE: To immunologically phenotype and histologically classify canine and feline intraocular and periocular lymphomas. METHODS: The databases of four veterinary medical diagnostic laboratories were searched to identify cases of intraocular or periocular lymphoma in dogs and cats between 2001 and 2012. Hematoxylin and eosin (H&E) stained slides were reviewed for confirmation and classification of lymphoma, and immunohistochemistry for CD3 (T-cell marker) and CD79a and/or CD20 (B-cell markers) was examined to determine the lineage of the neoplastic lymphocytes. RESULTS: Six canine and 15 feline cases of ocular lymphoma were identified. In the canine cases, there were three intraocular and three periocular lymphomas where two intraocular and one periocular lymphomas were B-cell, one of each intraocular and periocular lymphomas were T-cell and one periocular lymphoma was nonreactive with CD3, CD79a or CD20. In the feline cases, there were six intraocular and nine periocular lymphomas where five intraocular and six periocular lymphomas were B-cell, and one intraocular and three periocular lymphomas were T-cell. Only one canine case had concurrent generalized lymphadenopathy, only one canine conjunctival lymphoma had simultaneous cutaneous lymphoma, and only one feline case had bilateral ocular involvement when they were diagnosed. CONCLUSION: Canine and feline intraocular and periocular lymphomas are often of B-cell phenotype. Although in general terms lymphoma is not considered a primary tumor when it occurs in or adjacent to the globe, these tumors frequently first become evident in the globe and/or periocular area. An accurate early diagnostic approach is crucial for the patient’s quality of life because B-cell lymphomas are generally more amenable to chemotherapy than T-cell lymphomas.

A VALENTINE-SHAPED CARDIAC SILHOUETTE IN FELINE THORACIC RADIOGRAPHS IS PRIMARILY DUE TO LEFT ATRIAL ENLARGEMENT.

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

**Routine kidney variables, glomerular filtration rate and urinary cystatin C in cats with diabetes mellitus, cats with chronic kidney disease and healthy cats.**


**OBJECTIVES:** Diabetic kidney disease (DKD) is a frequent and serious complication in human diabetic patients, but data are limited in cats. This study was undertaken to assess whether diabetic cats are susceptible to DKD. METHODS: Kidney function was compared between 36 cats with diabetes mellitus (DM), 10 cats with chronic kidney disease (CKD) and 10 age-matched healthy cats by measuring routine kidney variables (serum creatinine [sCreat], serum urea [sUrea], urine specific gravity [USG], urinary protein:creatinine ratio [UPC]), urinary cystatin C:creatinine ratio and glomerular filtration rate (GFR). Urinary cystatin C (uCysC) was measured with a human particle-enhanced nephelometric immunoassay, validated to measure feline cystatin C, in all but two diabetic cats. GFR was evaluated by exo-iohexol clearance in 17 diabetic cats, all cats with CKD and all healthy cats. RESULTS: Diabetic cats had significantly (mean +/- SD) lower sCreat (123 +/- 38 vs 243 +/- 80 micromol/l), sUrea (11 +/- 3 vs 18 +/- 7 mmol/l) and urinary cystatin C:creatinine ratio (6 +/- 31 vs 173 +/- 242 mg/mol), and a significantly higher USG (1.033 +/- 0.012 vs 1.018 +/- 0.006) and GFR (2.0 +/- 0.7 vs 0.8 +/- 0.3 ml/min/kg) compared with cats with CKD. Compared with healthy cats, diabetic cats only had significantly lower USG (1.033 +/- 0.012 vs 1.046 +/- 0.008). Proteinuria (UPC >0.4) was present in 39% of diabetic cats, in 30% of cats with CKD and in none of the healthy cats. However, the UPC did not differ statistically between the three groups. CONCLUSIONS AND RELEVANCE: Based on evaluation of routine kidney variables, GFR and uCysC as a tubular marker at a single time point, a major impact of feline DM on kidney function could not be demonstrated.

**Simplified methods for estimating glomerular filtration rate in cats and for detection of cats with low or borderline glomerular filtration rate.**


**OBJECTIVES:** Diagnosis of early feline chronic kidney disease (CKD) is challenging. Glomerular filtration rate (GFR) is the best overall indicator of kidney function, but multisample plasma clearance methods to determine GFR are labour intensive, time consuming and stressful for feline patients. This study aimed to develop simplified methods to detect decreased GFR in cats. METHODS: Data from a nine-sample combined plasma exogenous creatinine-iohexol clearance test of 73 cats were used. Limited sampling strategies were developed by comparing all sampling time combinations to complete all nine sampling times set and selecting the best sampling time combinations based on maximum relative error. By regression analysis, the ability of routine blood (serum creatinine, serum urea) and urine (urine specific gravity, urinary protein:creatinine ratio) variables to predict GFR or identify cats with low or borderline GFRs was examined. Cut-off clearance marker concentrations to predict low or borderline GFR was determined at three time points after marker injection. All procedures were analysed for three clearance markers (exo-iohexol, creatinine, endo-iohexol). RESULTS: For reliable estimation of GFR, at least three blood samples for clinical purposes and five blood samples for research purposes are required. Regression formulae based on routine variables did not reliably predict GFR, but accurately identified cats with low (sensitivity 96.5-98.2%; specificity 60-91.3%) or borderline (sensitivity 91.1-96%; specificity 76.5-81.8%) GFR. Clearance marker concentrations exceeding given marker cut-off concentrations also identified cats with low or borderline GFR with high sensitivities and specificities. CONCLUSIONS AND RELEVANCE: These simplified methods will facilitate the detection of early kidney dysfunction in cats. Early diagnosis allows timely therapeutic intervention, and future studies must reveal whether this improves the long-term outcome of cats with CKD.
Identification of a natural recombination in the F and H genes of feline morbillivirus.

Feline morbillivirus (FmoPV) has recently been identified in Hong Kong and Japan. FmoPV is considered to belong to the genus Morbillivirus, in the family Paramyxoviridae. In this study, the complete nucleotide sequences of three strains of FmoPV detected in cats in Japan were determined. Among the six genes in FmoPV; N, P/V/C, M, F, H and L, the F gene showed the highest polymorphism in the nucleotide and putative amino acid sequences among the FmoPV strains. There was no geographical association in terms of the FmoPV phylogeny; however, from extensive phylogenetic and recombination analyses, we found that one Japanese FmoPV strain, MiJP003, was a probable recombinant between two virus strains in the independent lineages found in Japan and Hong Kong, respectively. The recombination was considered to have occurred within the F and H genes. Such recombination is thought to be involved in the evolution of FmoPV.

Prevalence of Dirofilaria immitis Infection in Stray Cats by Nested PCR in Korea.

The purpose of this study was to conduct a survey of Dirofilaria immitis infection among stray cats in Korea using nested PCR. We included 235 stray cats (121 females and 114 males) and evaluated each for the presence of feline heartworm infection. Blood samples were collected from 135 cats in Daejeon, 50 cats in Seoul, and 50 cats from Gyeonggi-do (Province). Of the 235 DNA samples, 14 (6.0%) were positive for D. immitis. The prevalence of infection in male cats (8/114, 7.0%) tended to be higher than that in female cats (6/121, 5.0%), but the difference was not statistically significant. In each location, 8, 2, and 4 cats were positive for infection, respectively, based on DNA testing. No significant differences in the prevalence were observed among the geographic regions, although the rate of infection was higher in Gyeonggi-do (8.0%) than Daejeon (5.9%) and Seoul (4.0%). We submitted 7 of the 14 D. immitis DNA-positive samples for sequencing analysis. All samples corresponded to partial D. immitis cytochrome c oxidase subunit I gene sequences with 99% homology to the D. immitis sequence deposited in GenBank (accession no. FN391553). To the best of our knowledge, this is the first survey using nested PCR to analyze the prevalence of D. immitis in stray cats in Korea.

Determining the age of cats by pulp cavity/tooth width ratio using dental radiography.

The purpose of this study was to evaluate the effect of age on the ratio of pulp cavity/tooth width (P/T ratio) in healthy cats. The dental radiographs of 32 cats (16 males and 16 females) were generated with a digital dental X-ray unit with the animals under general anesthesia. Standardized measurement of the canine teeth was performed by drawing a line on the radiograph perpendicular to the cemento- enamel junction (CEJ) of the tooth. There was an inversely proportional correlation between chronological age and the P/T ratio. Moreover, a strong Pearson squared correlation (gamma(2) = 0.92) was identified by the curved regression model. No significant differences in the P/T ratio based on gender or breed were found. These results suggest that determination of age by P/T ratio could be clinically useful for estimating the chronological age of cats.

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 (alpha = 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.

The influence of age and genetics on natural resistance to experimentally induced feline infectious peritonitis.


Naturally occurring feline infectious peritonitis (FIP) is usually fatal, giving the impression that immunity to the FIP virus (FIPV) is extremely poor. This impression may be incorrect, because not all cats experimentally exposed to FIPV develop FIP. There is also a belief that the incidence of FIP may be affected by a number of host, virus, and environmental cofactors. However, the contribution of these cofactors to immunity and disease incidence has not been determined. The present study followed 111 random-bred specific pathogen free (SPF) cats that were obtained from a single research breeding colony and experimentally infected with FIPV. The cats were from several studies conducted over the past 5 years, and as a result, some of them had prior exposure to feline enteric coronavirus (FECV) or avirulent FIPVs. The cats were housed under optimized conditions of nutrition, husbandry, and quarantine to eliminate most of the cofactors implicated in FIPV infection outcome and were uniformly challenge exposed to the same field strain of serotype 1 FIPV. Forty of the 111 (36%) cats survived their initial challenge exposure to a Type 1 cat-passaged field strains of FIPV. Six of these 40 survivors succumbed to FIP to a second or third challenge exposure, suggesting that immunity was not always sustained. Exposure to non-FIP-inducing feline coronaviruses prior to challenge with virulent FIPV did not significantly affect FIP incidence but did accelerate the disease course in some cats. There were no significant differences in FIP incidence between males and females, but resistance increased significantly between 6 months and 1 or more years of age. Genetic testing was done on 107 of the 111 infected cats. Multidimensional scaling (MDS) segregated the 107 cats into three distinct families based primarily on a common sire(s), and resistant and susceptible cats were equally distributed within each family. Genome-wide association studies (GWAS) on 73 cats that died of FIP after one or more exposures (cases) and 34 cats that survived (controls) demonstrated four significant associations after 100k permutations. When these same cats were analyzed using a sib-pair transmission test, three of the four associations were confirmed although not with genome-wide significance. GWAS was then done on three different age groups of cases to take into account age-related resistance, and different associations were observed. The only common and strong association identified between the various GWAS case configurations was for the 34.7-45.8Mb region of chromosome A3. No obvious candidate genes were present in this region.

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.

Pennisì M.G. (2014) Vet Parasitol
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.

Animal models of disease: feline hyperthyroidism: an animal model for toxic nodular goiter.

Since first discovered just 35 years ago, the incidence of spontaneous feline hyperthyroidism has increased dramatically to the extent that it is now one of the most common disorders seen in middle-aged to senior domestic cats. Hyperthyroid cat goiters contain single or multiple autonomously (i.e. TSH-independent) functioning and growing thyroid nodules. Thus, hyperthyroidism in cats is clinically and histologically similar to toxic nodular goiter in humans. The disease in cats is mechanistically different from Graves’ disease, because neither the hyperfunction nor growth of these nodules depends on extrathyroidal circulating stimulators. The basic lesion appears to be an excessive intrinsic growth capacity of some thyroid cells, but iodine deficiency, other nutritional goitrogens, or environmental disruptors may play a role in the disease pathogenesis. Clinical features of feline toxic nodular goiter include one or more palpable thyroid nodules, together with signs of hyperthyroidism (e.g. weight loss despite an increased appetite). Diagnosis of feline hyperthyroidism is confirmed by finding the increased serum concentrations of thyroxine and triiodothyronine, undetectable serum TSH concentrations, or increased thyroid uptake of radiiodine. Thyroid scintigraphy demonstrates a heterogeneous pattern of increased radionuclide uptake, most commonly into both thyroid lobes. Treatment options for toxic nodular goiter in cats are similar to that used in humans and include surgical thyroidectomy, radiiodine, and antithyroid drugs. Most authorities agree that ablative therapy with radiiodine is the treatment of choice for most cats with toxic nodular goiter, because the animals are older, and the disease will never go into remission.

Immunohistochemical expression of ionized calcium binding adapter molecule 1 in cutaneous histiocytic proliferative, neoplastic and inflammatory disorders of dogs and cats.

Ionized calcium-binding adapter molecule 1 (Iba1) has been used widely as a marker for microglial cells and, recently, was also recognized as a ‘pan-macrophage marker’, as it is expressed by all subpopulations of cells of the monocyte/macrophage lineage. To determine the specificity of Iba1 as an immunohistochemical marker for canine and feline histiocytic proliferative, neoplastic and inflammatory disorders of the skin, we evaluated its expression in two types of histiocytic tumours, two non-neoplastic histiocytic proliferative conditions, one case of granulomatous dermatitis and four non-histiocytic tumours. Cells of the monocyte/macrophage lineage in all cases of canine cutaneous histiocytoma (9/9), reactive histiocytosis (9/9), histiocytic sarcomas (5/5), feline progressive dendritic cell histiocytosis (3/3) and macrophages in cutaneous mycobacteriosis (7/7) showed strong cytoplasmic expression of Iba1. Neoplastic cells of melanomas (10/10), lymphomas (7/7), mast cell tumours (7/7) and plasmacytomas (4/4) did not express Iba1. Iba1 is therefore a useful marker of cells of the monocyte/macrophage lineage in canine and feline inflammatory, proliferative and neoplastic conditions and
can be used to identify these cells in formalin-fixed, paraffin wax-embedded tissues. Iba1 is not able to differentiate between macrophages and dendritic antigen presenting cells and expression does not allow classification of these histiocytic disorders.

**Acute bronchointerstitial pneumonia in two indoor cats exposed to the H1N1 influenza virus.**


**OBJECTIVE:** To describe 2 cases of acute bronchointerstitial pneumonia in indoor domestic cats infected by anthropogenic transmission of pandemic 2009 influenza A H1N1 virus from their owners. **CASE SERIES SUMMARY:** Two indoor domestic shorthair cats from the same household were evaluated for acute onset of respiratory distress. The owners had been recovering from flu-like illness at the time of presentation. Venous blood gas showed increased pvCO2 while thoracic radiographs revealed severe bronchointerstitial to alveolar patterns in both cats. The cats were treated with oxygen supplementation, antimicrobials, analgesics, diuretics, corticosteroids, bronchodilators, mechanical ventilation (1 cat), and supportive care. Despite initial improvement in the clinical condition of each cat, respiratory function deteriorated and ultimately both cats were euthanized. Gross and histopathologic examination confirmed diffuse, severe bronchointerstitial pneumonia. Pandemic 2009 influenza A H1N1 virus, and the literature is briefly reviewed for treatment recommendations. H1N1 should be considered in the differential diagnosis for domestic cats presenting with peracute to acute onset of respiratory distress in the right context. While human-to-cat transmission of H1N1 seems probable in several reported cases, cat-to-human transmission has not been identified.

**In vitro effect of dietary protein level and nondigestible oligosaccharides on feline fecal microbiota.**


The aim of the present study was to evaluate in vitro the effect of some prebiotic substances and 2 dietary protein levels on the composition and activity of feline fecal microbiota. Two in vitro studies were conducted. First, 6 nondigestible oligosaccharides were studied; treatments were control diet (CTRL), gluconic acid (GA), carrot fiber (CF), fructooligosaccharides (FOS), galactooligosaccharides (GOS), lactitol (LAC), and pectins from citrus fruit (PEC).

Substrates were added to feline fecal cultures at 2 g/L for 24 h incubation. Compared with the CTRL, ammonia had been reduced (P<0.05) by GOS (-9%) after 6 h and by GA (-14%), LAC (-12%), and PEC (-10%) after 24 h. After 24 h, all treatments had resulted in a lower pH versus the CTRL. Putrescine concentrations at 24 h were greater (P<0.05) in cultures treated with FOS (+90%), GOS (+96%), and LAC (+87%). Compared with the CTRL, total VFA were higher (P<0.05) in bottles containing CF (+41%), whereas the acetate to propionic acid ratio was reduced by LAC (-51%; P<0.05). After 24 h, Enterobacteriaceae had been reduced (P<0.05) by LAC and PEC. In a second study, LAC and FOS were selected to be tested in the presence of 2 diets differing in their protein content. There were 6 treatments: low-protein (LP) CTRL with no addition of prebiotics (CTRL-HP), high-protein (HP) CTRL with no addition of prebiotics (CTRL-HP), LP diet plus FOS, CTRL-HP plus FOS, LP diet plus LAC, and CTRL-HP plus LAC. Both FOS and LAC were added to feline fecal cultures at 2 g/L for 24 h incubation. Ammonia at 24 h was affected (P<0.05) by the peptide level (36.2 vs. 50.2 mmol/L for LP and HP, respectively). The CTRL-HPs resulted in a higher pH and increased concentrations of biogenic amines were found after 6 and 24 h of incubation (P<0.05); putrescine at 24 h showed an increase (P<0.05) in cultures treated with FOS. Total VFA were influenced (P<0.05) by the protein level (40.9 vs. 32.6 mmol/L for LP and HP, respectively). At 24 h, the CTRL-HPs were associated with increased Clostridium perfringens and reduced Lactobacillus spp. and enterococci counts (P<0.05). The results from the present study show that different prebiotics exert different effects on the composition and activity of feline intestinal microbiota and that high dietary protein levels in a cat’s diet can have negative effects on the animal intestinal environment.

**Animal shelters: Managing heartworms in resource-scarce environments.**


Animal shelters must frequently make difficult decisions regarding the allocation of limited resources to appropriately care for the millions of dogs and cats that enter their doors annually. Insufficient staffing, expertise, and guidance on heartworm management in animal shelters creates significant confusion on how these facilities should appropriately address heartworm infection in dogs and cats. The American Heartworm Society (AHS) issues comprehensive guidelines for the diagnosis, prevention, and management of heartworm infection in pets, but shelters are often unable to fully comply with these guidelines due to resource constraints. In response, shelter staff is forced to either ignore the disease or implement
Japanese Bobtail: vertebral morphology and genetic characterization of an established cat breed.
Several cat breeds are defined by morphological variation of the tail. The Japanese Bobtail is a breed that has been accepted for registration only within the past 50 years; however, the congenital kinked tail variants defining this breed were documented in the Far East centuries ago and the cats are considered ‘good luck’ in several Asian cultures. The recent discovery of the mutation for the tailless Manx phenotype has demonstrated that the Japanese Bobtail does not have a causative mutation in the same gene (T-Box). Here, a simple segregation analysis of cats bred from a pedigreed Japanese Bobtail demonstrated a simple autosomal dominant mode of inheritance with variable expression of the tail length and kink placement. Unexpectedly, radiological examinations of the entire vertebral column of kink-tailed cats indicated variation from the normal vertebral feline formula (C7, T13, L7, S3, Cd20-24), including cats with mostly one reduction of thoracic vertebrae (C7, T12, L7, S3), and an average of 15.8 caudal vertebrae. A few cats had variation in the number of cervical vertebrae. Several transitional vertebrae and anomalous ribs were noted. One cat had a bifid vertebra in the tail. Most cats had hemivertebrae that were usually included in the tail kink, one of which was demonstrated by gross pathology and histopathology. The abnormal vertebral formula or the placement of the kink in the tail did not coincide with morbidity or mortality.

Comparative study of aural microflora in healthy cats, allergic cats and cats with systemic disease.
Twenty healthy cats (group 1) with clinically normal ears, 15 cats with systemic disease (group 2) and 15 allergic cats (group 3) were included in a prospective study. The experimental unit was the ear. A clinical score was established for each ear canal after otoscopic examination. Microbial population was assessed on cytological examination of smears performed with the cotton-tipped applicator smear technique. Fungal population was significantly more prominent in allergic cats (P <0.001) and in diseased cats compared with healthy cats (P <0.02). Bacterial population was significantly higher in allergic cats than in healthy cats (P <0.001) and cats suffering from systemic disease (P <0.001). Bacterial overgrowth was also higher in cats with systemic disease than healthy cats. In cats from group 2, only fungal overgrowth was associated with otitis severity. In group 3, only bacterial overgrowth was associated with otitis severity.

Effect of dilution rate on feline urethral sperm motility, viability, and DNA integrity.
This study was designed to investigate if the characteristics of feline urethral sperm can be affected by high dilution in an artificial medium. The semen collected by urethral catheterization from eight male cats was evaluated for sperm concentration and motility and subsequently diluted with a TRIS-based extender to the concentration of spermatozoa 10 x 10(6)/mL, 5 x 10(6)/mL, and 1 x 10(6)/mL. Immediately after the extension samples were assessed for motility, cell viability using SYBR-14 and propidium iodide, acrosome integrity using lectin from Arachis hypogaea Alexa Fluor 488 Conjugate, and propidium iodide and chromatin status by acridine orange. Compared with 10 x 10(6)/mL dilution rate, spermatozoa diluted to 1 x 10(6) sperm/mL had a significantly lower proportion of motile (31.1% +/- 19.8 and 0.7% +/- 1.6, respectively, P < 0.05) and viable spermatozoa (88.3% +/- 3.1 and 69.1% +/- 12.8, respectively, P < 0.01). There was no dilution-related difference in the acrosome integrity (76.7% +/- 11.9 vs. 75.9% +/- 10.6) and chromatin status (defragmentation index, 3.3% +/- 0.97 vs. 3.4% +/- 1.7). These results indicate that feline urethral semen is susceptible to high dilution rate, and some sperm characteristics can be artifactually changed by semen dilution. It also suggests the potential role of seminal plasma in maintaining sperm motility and viability in high dilution rates.

Effect of pre-cardiac and adult stages of Dirofilaria immitis in pulmonary disease of cats: CBC, bronchial lavage cytology, serology, radiographs, CT images, bronchial reactivity, and histopathology.
A controlled, blind study was conducted to define the initial inflammatory response and lung damage associated with the death of precardiac stages of Dirofilaria immitis in cats as compared to adult heartworm infections and normal cats. Three groups of six cats each were used: UU: uninfected untreated controls; PreS I: infected with 100 D. immitis L3 by subcutaneous injection and treated topically with selamectin 32 and 2 days pre-infection and once monthly for 8 months); IU: infected with 100 D. immitis L3 and left untreated. Peripheral blood, serum, bronchial lavage, and thoracic radiographic images were collected from all cats on Days 0, 70, 110, 168, and 240. CT images were acquired on Days 0, 110, and 240. Cats were euthanized, and necropsies were conducted on Day 240 to determine the presence of heartworms. Bronchial rings were collected for in vitro reactivity. Lung, heart, brain, kidney, and liver tissues were collected for histopathology. Results were compared for changes within each group. Pearson and Spearman correlations were performed for association between histologic, radiographic, serologic, hematologic and bronchoalveolar lavage (BAL) results. Infected cats treated with selamectin did not develop radiographically evident changes throughout the study, were heartworm antibody negative, and were free of adult heartworms and worm fragments at necropsy. Histologic lung scores and CT analysis were not significantly different between PreS I cats and UU controls. Subtle alveolar myofibrosis was noted in isolated areas of several PreS I cats and an eosinophilic BAL cytology was noted on Days 75 and 120. Bronchial ring reactivity was blunted in IU cats but was normal in PreS I and UU cats. The IU cats became antibody positive, and five cats developed adult heartworms. All cats with heartworms were antigen positive at one time point; but one cat was antibody positive, antigen negative, with viable adult females at necropsy. The CT revealed early involvement of all pulmonary arteries and a random pattern of parenchymal disease with severe lesions immediately adjacent to normal areas. Analysis of CT 3D reconstruction and Hounsfield units demonstrated lung disease consistent with restrictive pulmonary fibrosis with an interstitial infiltrate, absence of air trapping, and decrease in total lung volume in Group IU as compared to Groups UU and PreS I. The clinical implications of this study are that cats pretreated with selamectin 1 month before D. immitis L3 infection did not become serologically positive and did not develop pulmonary arterial hypertrophy and myofibrosis.

**Are Emotionally Attached Companion Animal Caregivers Conscientious and Neurotic? Factors That Affect the Human-Companion Animal Relationship.**


Few studies have examined how personality traits may be related to the amounts and types of attachments humans have toward companion animals (pets). In this study, 1,098 companion animal guardians (owners) completed a survey that included the Big Five Inventory, the Lexington Attachment to Pets Scale, and the Pet Attachment Questionnaire. Each participant chose whether he or she identified as a Cat Person, Dog Person, Both, or Neither. Results indicated that neuroticism, conscientiousness, choosing a dog as a favorite pet, and identifying as a Cat Person, Dog Person, or Both predicted affection for a pet. Conscientiousness, extraversion, and openness decreased avoidant attachment to pets, and neuroticism increased anxious attachment to pets. Both dogs and cats could benefit from pet owners who are conscientious, and there may be some benefits of neuroticism in pet owners. The findings of this study will advance understanding of the human-animal bond. As this understanding increases, measurements of human attachment and personality may be useful for the development of tools that could assist shelter employees and veterinarians in counseling people about pet ownership.

**Applied feline oral anatomy and tooth extraction techniques: an illustrated guide.**


PRACTICAL RELEVANCE: Tooth extraction is one of the most commonly performed surgical procedures in small animal practice. CLINICAL CHALLENGES: The clinician must be familiar with normal oral anatomy, utilize nomenclature accepted in dentistry and oral surgery, use the modified Triadan system for numbering teeth, identify normal structures on a dental radiograph, understand the tissues that hold the teeth in the jaws, know the biomechanical principles of tooth extraction, be able to choose the most appropriate instrument for removal of a tooth, extract teeth using closed and open techniques, and create tension-free flaps for closure of extraction sites. AUDIENCE: This review is intended to familiarize both the general and referral practitioner with feline oral anatomy and tooth extraction techniques. PATIENT GROUP: Tooth extraction is predominantly performed in cats with tooth resorption, chronic gingivostomatitis and periodontal disease. EQUIPMENT: The basic contents of a feline tooth extraction kit are explained. EVIDENCE BASE: The guidance contained within this review is based on a combination of the published literature, the authors’ personal experience and the experience of colleagues.
New treatment modalities for brain tumors in dogs and cats.

Despite advancements in standard therapies, intracranial tumors remain a significant source of morbidity and mortality in veterinary and human medicine. Several newer approaches are gaining more widespread acceptance or are currently being prepared for translation from experimental to routine therapeutic use. Clinical trials in dogs with spontaneous brain tumors have contributed to the development and human translation of several novel therapeutic brain tumor approaches.

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.


Exenatide extended-release (ER) is a microencapsulated formulation of the glucagon-like peptide 1-receptor agonist exenatide. It has a protracted pharmacokinetic profile that allows a once-weekly injection with comparable efficacy to insulin with an improved safety profile in type II diabetic people. Here, we studied the pharmacology of exenatide ER in 6 healthy cats. A single subcutaneous injection of exenatide ER (0.13 mg/kg) was administered on day 0. Exenatide concentrations were measured for 12 wk. A hyperglycemic clamp (target = 225 mg/dL) was performed on days 7, 14, and 21 (clamp II) with measurements of insulin and glucagon concentrations. Glucose tolerance was defined as the amount of glucose required to maintain hyperglycemia during the clamp. Continuous glucose monitoring was performed on weeks 0, 2, and 6 after injection. Plasma concentrations of exenatide peaked at 1 h and 4 wk after injection. Comparing clamp I with clamp II, fasting blood glucose decreased (mean +/- standard deviation = -11 +/- 8 mg/dL, P = 0.02), glucose tolerance improved (median [range] +33% [4%-138%], P = 0.04), insulin concentrations increased (+36.5% [-9.9% to 274.1%], P = 0.02), and glucagon concentrations decreased (-4.7% [0%-12.1%], P = 0.005). Compared with preinjection values on continuous glucose monitoring, glucose concentrations decreased and the frequency of readings <50 mg/dL increased at 2 and 6 wk after injection of exenatide ER. This did not correspond to clinical hypoglycemia. No other side effects were observed throughout the study. Exenatide ER was safe and effective in improving glucose tolerance 3 wk after a single injection. Further evaluation is needed to determine its safety, efficacy, and duration of action in diabetic cats.


OBJECTIVE: To describe the operative technique for single-port laparoscopic cryptorchidectomy (SPLC) in dogs and cats and evaluate clinical outcome for patients that underwent the procedure. DESIGN: Retrospective case series. ANIMALS: 25 client-owned dogs (n = 22) and cats (3). PROCEDURES: Dogs and cats that underwent SPLC with 3 commercially available single-port devices between 2009 and 2014 were retrospectively identified through a multi-institutional medical records review. Surgery was performed via a single-port device placed through a 1.5- to 3.0-cm abdominal incision either at the region of the umbilicus or caudal to the right 13th rib. The cryptorchidectomy was performed with graspers, a bipolar vessel sealing device, and a 30 degrees telescope. RESULTS: SPLC was performed with a single-incision laparoscopic surgery port (n = 15), a multirectoral wound-retractor access system (8), or a metal resterilizable single-port access device (2). Median age was 365 days (range, 166 to 3,285 days). Median body weight was 18.9 kg (41.6 lb; range, 1.3 to 70 kg [2.9 to 154 lb]). Median surgical time was 38 minutes (range, 15 to 70 minutes). Thirty-two testes were removed (12 left, 6 right, and 7 bilateral). Four patients had 1 additional abdominal surgical procedure performed concurrently during SPLC. No
Prevalence of methicillin-resistant Staphylococcus haemolyticus in companion animals: a cross-sectional study.


BACKGROUND: Among coagulase-negative staphylococci, Staphylococcus haemolyticus is the second most frequently isolated species from human blood cultures and has the highest level of antimicrobial resistance. This species has zoonotic character and is prevalent both in humans and animals. Recent studies have indicated that methicillin-resistant *S. haemolyticus* (MRSH) is one of the most frequent isolated Staphylococcus species among neonates in intensive care units. The aim of this study was to determine the presence of MRS in different groups of companion animals and to characterize isolates according to their antimicrobial resistance. METHODS: Samples (n = 754) were collected from healthy and diseased dogs and cats, female dogs in pure-breed kennels, healthy horses, and kennel owners. Classical microbiological tests along with molecular testing including PCR and 16S rRNA sequencing were performed to identify MRS. Clonality of the isolates was assessed by Pulsed Field Gel Electrophoresis using the Smal restriction enzyme. Antimicrobial susceptibility testing was performed using the broth micro-dilution method. Detection of genes encoding antimicrobial resistance was performed by PCR. Statistical analysis was performed using the R Project of Statistical Computing, “R 1.8.1” package. RESULTS: From a total of 754 samples tested, 12 MRS isolates were obtained. No MRS were found in horses and cats. Eleven isolates were obtained from dogs and one from a kennel owner. Ten of the dog isolates were detected in pure-breed kennels. The isolates demonstrated the same clonality only within separate kennels. The most frequent resistances of MRS isolates were demonstrated to benzylpenicillin (91.7%), erythromycin (91.7%), gentamicin (75.0%), tetracycline (66.7%), fluoroquinolones (41.7%) and co-trimoxazole (41.7%). One isolate was resistant to streptogramins. All isolates were susceptible to daptomycin, rifampin, linezolid and vancomycin. The clone isolated from the kennel owner and one of the dogs was resistant to beta-lactams, macrolides, gentamicin and tetracycline. CONCLUSIONS: Pure-breed kennels keeping 6 or more females were determined to be a risk factor for the presence of MRS strains. MRS identified from companion animals were frequently resistant to some classes of critically important antimicrobials, although they remain susceptible to antibiotics used exclusively in human medicine.

A soluble envelope protein of endogenous retrovirus (FeLIX) present in serum of domestic cats mediates infection of a pathogenic variant of feline leukemia virus.


T-lymphotropic feline leukemia virus (FeLV-T), a highly pathogenic variant of FeLV, induces severe immunosuppression in cats. FeLV-T is fusion-defective because in its PHQ motif, a gammaretroviral consensus motif in the N-terminal of an envelope protein, histidine is replaced with aspartate. Infection by FeLV-T requires FeLIX, a truncated envelope protein encoded by an endogenous FeLV, for transactivation of infectivity and Pit1 for binding FeLIX. Although Pit1 is present in most tissues in cats, the expression of FeLIX is limited to certain cells in lymphoid organs. Therefore, the host cell range of FeLV-T was thought to be restricted to cells expressing FeLIX. However, because FeLIX is a soluble factor and expressed constitutively in lymphoid organs, we presumed it to be present in blood and evaluated its activities in sera of various mammalian species using a pseudotype assay. We demonstrated that cat serum has FeLIX activity at a functional level, suggesting that FeLIX is present in cats and FeLV-T may be able to infect cells expressing Pit1 regardless of the expression of FeLIX in vivo. In addition, FeLIX activities in sera were detected only in domestic cats but not in other feline species tested. To our knowledge, this is the first report to prove that a large amount of truncated envelope protein of endogenous retrovirus is circulating in the blood to facilitate the infection of a pathogenic exogenous retrovirus.

A survey of the views of US veterinary teaching faculty to owned cat housing practices.


According to the American Pet Products Association, in the USA there are an estimated 86.4 million owned cats, and approximately 40% of these are allowed to roam outdoors. Little has been written about the contribution of owned cats to problems attributed to feral cats, including wildlife depredation, spread of zoonotic diseases and overpopulation. A recent study found that 64% of cats have visited the veterinarian within the past year, suggesting frequent opportunity for veterinarians to communicate risks and benefits with indoor vs outdoor living. We conducted the following survey to
evaluate current views about this role of veterinarians, by surveying veterinary school faculty (n = 158). Our objectives were to assess (i) the degree to which veterinary teaching faculty believe that the issue of clients maintaining owned cats indoors vs outdoors is appropriate for discussion with students within the veterinary school curriculum; (ii) the degree of agreement and understanding there is among the faculty as to the reasons that clients maintain cats either inside or outside the home; and (iii) the degree to which veterinary faculty believe owned cats that are allowed to go outdoors contribute to various identified problems. The results indicated that many participants believed that the discussion of maintaining cats indoors is relevant to the profession, that it belongs in the veterinary school curriculum, that they understand client motivations, that they feel that more practicing veterinarians should discuss cat housing practices with clients and that cat overpopulation continues to be a significant concern for owned cats being outdoors. Additional ways to help maintain the health and wellbeing of cats that are primarily housed indoors is briefly discussed, including through such means as environmental enrichment or by providing cats access to safe areas while outdoors.

**Molecular evidence of Leishmania infantum in Ixodes ricinus ticks from dogs and cats, in Italy.**
Leishmaniosis, caused by Leishmania infantum, is an endemic zoonosis in the Mediterranean basin. To date, phlebotomine sand flies are the only accepted biological vectors of Leishmania parasites to dogs and humans. The absence of the primary vector in autochthonous Leishmania outbreaks suggests a possible role of fleas or ticks as alternative vectors. In this study, 119 ticks were collected between August 2007-June 2008 and between March 2010-October 2010 from various animal species and humans living in Italian areas where canine leishmaniosis is endemic (i.e. rural areas of the North) and were tested for the presence of L. infantum DNA. Nine (7.5%) out of 119 ticks resulted PCR positive. All ticks were morphologically identified as Ixodes ricinus ticks, 3 from 1 cat, 6 from 4 dogs. To our knowledge, this is the first evidence of L. infantum DNA in ticks from cat, suggesting that the debate about the epidemiological role of ticks in canine leishmaniosis might be extended to feline leishmaniosis.

**Hemoplasma prevalence and hematological abnormalities associated with infection in three different cat populations from Southern Brazil.**
Three hemoplasma species are recognized in domestic cats: Mycoplasma haemofelis, ‘Candidatus Mycoplasma haemominutum’ and ‘Candidatus Mycoplasma turicensis’. We report the prevalence and hematological abnormalities of hemoplasma infection in 369 domestic cats from three different populations (blood donors, hospitalized cats and shelter cats) from Southern Brazil. Complete blood counts were performed at the time of blood collection, and DNA was extracted and tested by conventional PCR for each hemoplasma species. A total of 79 samples (21.40%) were positive for at least one species. The most prevalent hemoplasma was ‘Candidatus Mycoplasma haemominutum’, with 50/369 (13.55%) positive cats, followed by ‘Candidatus Mycoplasma turicensis’, 10/369 (2.71%), and Mycoplasma haemofelis, 8/369 (2.16%). Mycoplasma haemofelis and ‘Candidatus Mycoplasma haemominutum’ coinfection was observed in 4/369 (1.08%), whereas ‘Candidatus Mycoplasma haemominutum’ and ‘Candidatus Mycoplasma turicensis’ in 5/369 (1.35%). Three cats (0.81%) were infected with all three hemoplasmas. There was no association between infection and the different populations. Anemia was associated with Mycoplasma haemofelis and ‘Candidatus Mycoplasma haemominutum’, but not with ‘Candidatus Mycoplasma turicensis’. Male cats and cats with outdoor access were more likely to be infected. Although ‘Candidatus Mycoplasma haemominutum’ is believed to cause minimal or no hematological alterations, the infected cats studied herein were more likely to be anemic.

**Detection of feline Mycoplasma species in cats with feline asthma and chronic bronchitis.**
Little is known about the aetiology of inflammatory lower airway disease in cats. The aim of this study was to investigate the role of Mycoplasma species in cats with feline asthma (FA) and chronic bronchitis (CB). The study population consisted of 17 cats with FA/CB, and 14 sick cats without clinical and historical signs of respiratory disease, which were euthanased for various other reasons. Nasal swabs, nasal lavage and bronchoalveolar lavage fluid (BALF) samples were taken from patients from both groups. Mycoplasma species culture with modified Hayflick agar and Mycoplasma polymerase chain reaction (PCR) were performed on all samples followed by sequencing of all Mycoplasma species-positive samples for differentiation of subspecies. PCR testing detected significantly more Mycoplasma species-positive BALF samples than Mycoplasma culture (P = 0.021). When cats with oropharyngeal contamination were excluded from comparison, the
Comparison of peribulbar and retrobulbar regional anesthesia with bupivacaine in cats.

OBJECTIVE: To compare effectiveness and complications associated with peribulbar and retrobulbar anesthesia with bupivacaine in cats. ANIMALS: 6 healthy adult cats. PROCEDURES: Cats were sedated with dexmedetomidine and received a peribulbar injection of 0.5% bupivacaine (1.5 mL), iopamidol (0.5 mL), and saline (0.9% NaCl) solution (1 mL) or retrobulbar injection of 0.5% bupivacaine (0.75 mL) and iopamidol (0.25 mL) in a crossover study with >/= 2 weeks between treatments. The contralateral eye was the control. Injectate distribution was evaluated with CT. After atipamezole administration, periocular and corneal sensations, intraocular pressure (IOP), and ocular reflexes and appearance were evaluated for 24 hours. RESULTS: All peribulbar and 3 of 6 retrobulbar injections resulted in CT evidence of intracanal injectate. Corneal sensation and periocular skin sensation were absent or significantly reduced relative to that for control eyes for 3 hours after peribulbar injection. Mean +/- SD IOP immediately after injection was significantly higher for eyes with peribulbar injections (33 +/- 12 mm Hg) than for control eyes or eyes with retrobulbar injections (both 14 +/- 4 mm Hg) but 10 minutes later decreased to 18 +/- 3 mm Hg. Exophthalmos, chemosis, and ptosis were evident in most injected eyes, and irritation was evident in 3 of 6 peribulbar-injected and 1 of 6 retrobulbar-injected eyes. All conditions resolved within 14 hours. CONCLUSIONS AND CLINICAL RELEVANCE: Peribulbar injection resulted in intracanal deposition of bupivacaine in a higher percentage of cats than did retrobulbar injection and induced notable anesthesia relative to that for the control eye; however, IOP increased temporarily.

Trained vs untrained evaluator assessment of body condition score as a predictor of percent body fat in adult cats.

Body condition scoring (BCS) provides a readily available technique that can be used by both veterinary professionals and owners to assess the body condition of cats, and diagnose overweight or underweight conditions. The objective of this study was to evaluate a five-point BCS system with half-point delineations using dual-energy x-ray absorptiometry (DXA). Four evaluators (a veterinarian, veterinary technician, trained scorer and untrained scorer) assessed 133 neutered adult cats. For all scorers, BCS score was more strongly correlated with percent body fat than with body weight. Percent body fat increased by approximately 7% within each step increase in BCS. The veterinarian had the strongest correlation coefficient between BCS and percent fat (r = 0.80). Mean body fat in cats classified as being in ideal body condition was 12 and 19%, for 3.0 and 3.5 BCS, respectively. Within BCS category, male cats were significantly heavier in body weight than females within the same assigned BCS category. However, DXA-measured percent body fat did not differ significantly between male and female cats within BCS category, as assigned by the veterinarian (P >0.13). Conversely, when assessed by others, mean percent body fat within BCS category was lower in males than females for cats classified as being overweight (BCS >4.0). The results of this study show that using a BCS system that has been validated within a range of normal weight to moderately overweight cats can help to differentiate between lean cats and cats that may not be excessively overweight, but that still carry a higher proportion of body fat.

Feline ischaemic myelopathy with a predilection for the cranial cervical spinal cord in older cats.

All previous studies on feline ischaemic myelopathy (IM) have reported an acute onset of a single event with no recurrence of clinical signs. This study aimed to evaluate clinical and long-term follow-up data in cats presumptively diagnosed with cervical IM in the territory of the ventral spinal artery (VSA). Eight cats (four females and four males) were included with a mean age of 14 years and 2 months. Neurological status at the time of presentation ranged from ambulatory tetraparesis to tetraplegia with nociception present. Six cats had marked cervical ventroflexion. All eight cats were diagnosed with one or more concurrent medical conditions, including chronic kidney disease (n = 2), hypertrophic cardiomyopathy (n = 2) and hypertension (n = 6). Median time to ambulation was 5.7 days (range 2-14 days). Long-term follow-up ranged from 7 months to 3 years and 3 months (median 1 year and 2 months). Five cats had no reported recurrence of clinical signs and 3/8...
had a chronic relapsing disease course. One cat had an acute recurrence of clinical signs 4 months after the first event and was euthanased. Two cats had acute onsets of suspected intracranial infarctions, one of which had further suspected intracranial infarcts every 3 months and was euthanased after one of these. This study highlights the importance of performing ancillary diagnostic tests in older cats presenting with IM, particularly when VSA embolisation is suspected.

**Methadone in combination with medetomidine as premedication prior to ovariohysterectomy and castration in the cat.**


OBJECTIVES: To evaluate the tolerability, sedative and analgesic effects of methadone in combination with medetomidine for premedication prior to neutering in healthy cats. METHODS: This was an assessor-blinded, randomised, clinical research study. Forty-five cats were recruited and divided into three treatment groups of 15. Following premedication with medetomidine (20 microg/kg) and one of the three test drugs - methadone 0.5 mg/kg, buprenorphine 20 microg/kg or butorphanol 0.4 mg/kg intramuscularly - anaesthesia was induced with propofol and maintained with isoflurane, and neutering was carried out. Sedation and physiological parameters were assessed before premedication, after premedication before induction of anaesthesia, and at 90 mins and 2, 3, 4, 6, 7, 8 and 24 h after premedication. Pain and mechanical nociceptive threshold were assessed at similar time points. RESULTS: There were no differences between groups with respect to age, sex, duration of anaesthesia or surgery. Most cats had low pain scores in the postoperative period, with small differences in pain scores between groups at individual time points only. Five, two and no cats required additional rescue analgesia in the postoperative period in the butorphanol, methadone and buprenorphine groups, respectively, and was not significantly different between groups. CONCLUSIONS AND RELEVANCE: Medetomidine combined with methadone for premedication prior to neutering in healthy cats provided adequate analgesia for the first 6 h after administration with no adverse effects; effects overall were comparable with medetomidine combined with buprenorphine or butorphanol. Administration of further analgesia with methadone at 6 h and a non-steroidal anti-inflammatory drug at 8 h provided adequate analgesia for the first 24 h after surgery.

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


Norovirus (NoV) and Sapovirus (SaV) are important causes of human diarrhea. We herein examined the feces of dogs and cats with diarrhea to determine the prevalence of NoV and SaV infections in Japan. Fecal samples were collected from 97 dogs and 83 cats with diarrhea between 2007 and 2014. To detect a 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 4 canine and 9 feline samples: 2 canine and 1 feline isolates were classified as NoV, 2 canine isolates were classified as SaV, and the remaining 8 feline isolates were classified as Vesivirus (VeV). The three NoV isolates were classified into the same clade as that of known canine and feline NoVs, and their homologies (75.9-92.3%) were higher than those with human GIV NoVs (59.1-65.9%). The homology of the feline NoV isolate with the previous reported canine and feline NoVs was particularly high (91.7-92.3%). Regarding SaV, the 2 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 8 feline VeV isolates were assumed to be feline calicivirus. The present study is the first report of the distribution of NoV- and SaV-infected dogs and cats in Japan, and suggests the species-specific circulations of NoV and SaV among dog and cat populations, respectively.

**Traumatic Dentoalveolar and Maxillofacial Injuries in Cats: Overview of diagnosis and management.**


PRACTICAL RELEVANCE: Maxillofacial and traumatic dentoalveolar injuries can cause pain and inflammation, and reduce function of the mouth, impacting a cat’s quality of life. Many traumatically induced feline fractures have been reported to involve the mandible or skull and, in cats with maxillofacial trauma, traumatic dentoalveolar injuries are particularly prevalent. Traumatic dentoalveolar injuries can also often be found in otherwise healthy cats. CLINICAL CHALLENGES: Some traumatic dentoalveolar injuries require emergency treatment; timely recognition and management is therefore important for achieving the optimal outcome. Multiple approaches exist for the management and repair of maxillofacial traumatic injuries. However, those for traumatic dentoalveolar injuries may be more limited. AUDIENCE: This review is aimed at feline and general practitioners, as well as veterinarians with expertise in dentistry. EVIDENCE BASE: The authors draw on their clinical experience and evidence from the literature, where appropriate, to produce an overview of foundation guidelines. It is hoped that this will serve as a stimulus for deeper consideration as to what
Serological detection of Toxoplasma gondii, Leishmania infantum and Neospora caninum in cats from an area endemic for leishmaniasis in Brazil.


An investigation was made into the occurrence of antibodies to Toxoplasma gondii, Leishmania infantum and Neospora caninum in 151 domestic cats, based on the indirect fluorescent antibody test (IFAT). Serum samples were collected from 151 domestic cats (65 free-roaming and 86 domiciled cats; 55 males and 96 females) in Campo Grande, Mato Grosso do Sul, Brazil between January and April 2013. IgG antibodies to T. gondii, L. infantum and N. caninum were found, respectively, in 49 (32.5%), 34 (22.5%) and 10 (6.6%) sampled cats. A positive correlation was found between T. gondii and N. caninum, T. gondii and L. infantum, and N. caninum and L. infantum (p <0.05) infections. Also, a significant interaction was identified between gender and area of activity on the probability of T. gondii (p = 0.0324) infection. However, no significant interaction was observed between gender and area of activity on infections by either N. caninum or L. infantum. This study showed that cats from an area endemic for visceral leishmaniasis in Brazil are exposed to three different protozoans, two of which are causal agents of important zoonosis.

A pilot study to assess the feasibility of transcutaneous glomerular filtration rate measurement using fluorescence-labelled sinistrin in dogs and cats.


In dogs and cats an assessment of renal function is often needed, however, existing methods including urine and plasma clearances are invasive, cumbersome and time consuming. This pilot study evaluated the feasibility of a transcutaneous glomerular filtration rate (GFR) measurement in dogs and cats. Additionally the optimal dose and location for the transcutaneous measurement device were investigated. Renal elimination of fluorescein-isothiocyanate-labelled sinistrin (FITC-S) was measured transcutaneously for 4 hours. The procedures were performed in awake, freely moving animals using escalating doses of FITC-S (10 mg/kg, 30 mg/kg, 50 mg/kg) with a wash-out period of at least 24 h in between. Multiple devices were placed on each animal. The resulting FITC-S disappearance curves were visually assessed to determine the most suitable location and the appropriate dose to reach an adequate transcutaneous peak signal for kinetic analysis. In both species 30 mg/kg were adequate for kinetic calculation. The most suitable place for the device was the lateral thoracic wall in dogs and the ventral abdominal wall in cats, respectively. Transcutaneous FITC-S clearance was then repeated using the optimal dose and location and in parallel with an additional plasma sinistrin clearance. Plasma elimination half-lives [min] were 26, 31 and 35, and corresponding transcutaneous elimination half-lives [min] were 26, 34 and 55, respectively in the dogs. Plasma elimination half-lives [min] were 51, 60 and 61, and corresponding transcutaneous elimination half-lives [min] were 75, 96 and 83, respectively in the cats. In conclusion, transcutaneous FITC-S clearance is a feasible method for the assessment of GFR in awake dogs and cats. It is noninvasive, well tolerated and easy to perform even in a clinical setting with results being readily available. A dose of 30 mg/kg of FITC-S seems adequate for kinetic assessment. Further studies are now needed to establish reference values and evaluate transcutaneous renal clearance in various conditions.

Feline hyperthyroidism reported in primary-care veterinary practices in England: prevalence, associated factors and spatial distribution.


Feline hyperthyroidism is a commonly diagnosed endocrinopathy that can have a substantial deleterious impact on the welfare of affected cats. This study aimed to estimate the prevalence, associated factors and geographical distribution for feline hyperthyroidism in England, using primary-care veterinary practice clinical data from the VetCompass Animal Surveillance Project. Prevalence was estimated from the overall cat cohort. Associated factor analysis used an age-matched, nested, case-control design with multivariable logistic regression. There were 2,276 cases of feline hyperthyroidism identified from 95,629 cats attending 84 practices from September 2009 to December 2011. Cases were aged 6-25 years. 3.7 per cent of cases and 9.9 per cent of controls were purebred, 56.4 per cent of cases and 56.5 per cent of controls were female, and 88.1 per cent of cases and 86.0 per cent of controls were neutered. The apparent prevalence was 2.4 per cent (95% CI 2.3 to 2.5 per cent) overall, and 8.7 per cent (95% CI 8.3 to 9.0 per cent) in cats aged 10 years or above. Burmese (OR 0.15, 95% CI 0.07 to 0.32, P<0.0001), Persian (OR 0.17, 95% CI 0.08 to 0.33, P<0.0001), Siamese (OR 0.4, 95% CI
The effect of anesthesia with propofol and sedation with butorphanol on quantitative contrast-enhanced ultrasonography of the healthy feline kidney.


Contrast-enhanced ultrasonography of the left kidney was performed using a commercial contrast agent in six healthy adult purpose-bred cats. A cross-over design was used to compare three protocols: (1) awake, (2) butorphanol (0.4 mg/kg IM), and (3) propofol (3.5-7.7 mg/kg IV boluses to effect). Time-intensity curves were created from two regions-of-interest drawn in the renal cortex. The curves were analyzed for blood flow parameters representing blood volume (base intensity, peak intensity, area-under-curve) and blood velocity (arrival time, time-to-peak, wash-in/out). There was no difference in the subjective enhancement pattern between the three protocols. No significant effect of butorphanol was observed in any of the perfusion parameters (P > 0.05). Propofol did not influence the most important perfusion parameter, area-under-the-curve, and is adequate for use in contrast-enhanced ultrasound studies.

Equine influenza A(H3N8) virus infection in cats.


Interspecies transmission of equine influenza A(H3N8) virus has resulted in establishment of a canine influenza virus. To determine if something similar could happen with cats, we experimentally infected 14 cats with the equine influenza A(H3N8) virus. All showed clinical signs, shed virus, and transmitted the virus to a contact cohort.

Diagnostic imaging and endoscopic finding in dogs and cats with gastric tumors: A review.


Medical imaging is an essential part of the diagnostic workup of many gastrointestinal disorders. This paper reviews imaging and endoscopy of gastric tumors in dogs and cats and the techniques used. The appearance of the normal as well as the various aspects of gastric tumors are described for these different modalities. Plain radiography is widely available but has limited diagnostic value. Contrast radiography has higher sensitivity but is laborious and time-consuming. Ultrasonography (if an adequate acoustic window is available), endosonography and endoscopy are the most appropriate modalities for diagnosing gastric tumors. They are especially useful when obtaining samples for cytologic or histopathologic examination, because the imaging modalities do not always differentiate between inflammatory or infectious conditions and neoplastic disorders. Hydro-helical CT was found helpful for evaluating the location and local invasiveness of the lesion. Ultrasonography and endoscopy are useful modalities for taking adequate biopsies.

Tackling feline infectious peritonitis via reverse genetics.


Feline infectious peritonitis (FIP) is caused by feline coronaviruses (FCoVs) and represents one of the most important lethal infectious diseases of cats. To date, there is no efficacious prevention and treatment, and our limited knowledge on FIP pathogenesis is mainly based on analysis of experiments with field isolates. In a recent study, we reported a promising approach to study FIP pathogenesis using reverse genetics. We generated a set of recombinant FCoVs and investigated their pathogenicity in vivo. The set included the type I FCoV strain Black, a type I FCoV strain Black with restored accessory gene 7b, two chimeric type I/type II FCoVs and the highly pathogenic type II FCoV strain 79-1146. All recombinant FCoVs and the reference strain isolates were found to establish productive infections in cats. While none of the type I FCoVs and chimeric FCoVs induced FIP, the recombinant type II FCoV strain 79-1146 was as pathogenic as the parental isolate. Interestingly, an intact ORF 3c was confirmed to be restored in all viruses (re)isolated from FIP-diseased animals.

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.

**Pilot study to evaluate the role of Mycoplasma species in cat bite abscesses.**
Torrres-Henderson C., Hesser J., Hyatt D.R., Hawley J., Brewer M. & Lappin M.R. (2014) *J Feline Med Surg* 16: 997-1000. Mycoplasma species are common inhabitants of the feline oral cavity, and so likely contaminate many cat bite abscesses. The objectives of this study were to determine whether Mycoplasma species are common contaminants of cat bite abscesses and whether they are associated with beta-lactam-resistant clinical disease. Twenty-six privately owned cats with clinical evidence of an abscess suspected to be from a cat bite were included in the study. Samples from each cat were evaluated by aerobic and anaerobic culture, as well as Mycoplasma species culture and polymerase chain reaction (PCR). All cats were initially treated with appropriate wound management and were administered an antibiotic of the beta-lactam class (amoxicillin, amoxicillin clavulanate or cefovecin sodium). Mycoplasma species DNA was amplified by PCR from 4/26 samples (15.4%); one of these cases was concurrently culture positive. Adequate DNA for sequencing was present for 2/4 positive PCR samples; one was most homologous with Mycoplasma felis, and the other was most homologous with Mycoplasma equigenitalium and Mycoplasma elephantis. Of the 26 cats, 25 responded to the initial treatment by day 7. The cat that failed initial treatment was positive for *M* equigenitalium or *M* elephantis DNA on days 0 and 12, and ultimately responded to administration of enrofloxacin and clindamycin. The results suggest that while Mycoplasma species can contaminate cat bite abscesses, routine wound management and beta-lactam antibiotic therapy is adequate for treatment in most cases of abscess. However, as Mycoplasma species infections do not respond to beta-lactam class antibiotic therapy, these organisms should be on the differential list for cats with abscesses that fail treatment with this antibiotic class.

**Clinicopathological and ultrasonographic features of cats with eosinophilic enteritis.**
Tucker S., Penninck D.G., Keating J.H. & Webster C.R. (2014) *J Feline Med Surg* 16: 950-956. Eosinophilic enteritis (EE) in cats is poorly characterized. The aim of the current study was to retrospectively evaluate the clinical and ultrasonographic findings in cats with histologic evidence of eosinophilic inflammation on gastrointestinal biopsy. Twenty-five cats with tissue eosinophilia on surgical (10) or endoscopic (15) biopsy of the gastrointestinal tract, having an abdominal ultrasound performed within 48 h of biopsy acquisition, were enrolled. History, clinical presentation, clinical pathology and abdominal ultrasound findings were reviewed. Intestinal biopsies were evaluated by a single pathologist and separated into two groups based on the degree of eosinophilic infiltrate: mild (<10 eosinophils/high power field [HPF], 11/25 cats), or moderate/marked (>10 eosinophils/HPF, 14/25 cats). The former were considered primary lymphoplasmacytic or lymphocytic inflammatory bowel disease (LPE) with subtle eosinophilic infiltrates, and the latter to have EE. Signalment, history and clinical signs were similar in all cats. Only cats with EE (6/14) had palpably thickened intestines. The only distinguishing clinicopathological feature of cats with EE was the presence of peripheral eosinophilia (6/14). On ultrasound, when compared with cats with LPE, cats with EE had a greater mean jejunal wall thickness (3.34 mm +/- 0.72 mm vs 4.07 mm +/- 0.58 mm, respectively) and an increased incidence of thickening of the muscularis layer (1/11 and 11/14, respectively). In conclusion, ultrasonographic evidence of a prominent intestinal muscularis layer, palpably thickened intestines and peripheral eosinophilia can serve as biomarkers for the presence of EE in cats with chronic intestinal signs.

**Effects in cats of atipamezole, flumazenil and 4-aminopyrididine on stress-related neurohormonal and metabolic responses induced by medetomidine, midazolam and ketamine.**
Ueoka N. & Hikasa Y. (2014) *J Feline Med Surg*
The study aimed to investigate the antagonistic effects of a fixed dose of atipamezole (ATI), flumazenil (FLU) and 4-
primary hepatic neoplasms. Hepatic tumours in dogs have recently been re-classified to follow a revised human classification system that takes account of identified hepatic progenitor cells. This study investigated the presence and relative frequency of morphological types of feline primary hepatic neoplasms and aimed to determine whether a similar new classification scheme could be applied in cats. Feline primary liver tumours (n = 61) were examined histologically and with a series of immunohistochemical markers. Six cases of nodular hyperplasia and 21 tumours of hepatocellular origin were diagnosed. The latter were subdivided into hepatocellular tumours that were well differentiated and had no evidence of metastases (n = 18) and those that showed poorly differentiated areas with marked cellular and nuclear pleomorphism and had intrahepatic and, or, distant metastases (n = 3). These malignant feline hepatocellular tumours maintained their hepatocellular characteristics (HepPar-1, MRP2, pCEA positive) and were negative, or only <5% positive, for K19. Twenty-five cholangiocellular tumours were diagnosed and all had intrahepatic and, or, distant metastases. Eight NSE positive small cell carcinomas (carcinoids) were diagnosed and subdivided into small cell carcinomas with HPC characteristics (K19 positive) and neuroendocrine carcinomas (K19 negative). In addition, one squamous cell carcinoma originating from the distal part of the choledochal duct was recognised. Feline primary hepatic neoplasms can be sub-divided into benign and malignant hepatocellular tumours, cholangiocellular carcinomas, small cell carcinomas with HPC characteristics, neuroendocrine carcinomas and squamous cell carcinomas. The marked species difference justifies a specific classification for feline primary hepatic neoplasms.

Bioassay-guided fractionation of extracts from Easter lily (Lilium longiflorum) flowers reveals unprecedented structural variability of steroidal glycoalkaloids.


Several Lilium species are nephrotoxic in cats (Felis silvestris catus), among them Easter lilies (Lilium longiflorum). Although clinical trials have been carried out, the causative toxic phytochemicals have not yet been identified. We thus aimed to determine the toxic constituents of Easter lily flowers applying a bioassay-guided approach based on a feline kidney cell line model. The bioassay-guided fractionation traced the observed cytotoxicity to a complex mixture of compounds that were tentatively identified as steroidal glycoalkaloids of the solasodine-type, based on multiple-fragmentation ion trap and high-resolution mass spectrometry. The glycoalkaloids in the active fraction possessed trisaccharide chains, and at least 16 different congeners could be separated using liquid chromatography-mass spectrometry. The two principal compounds were solasodine trisaccharide containing two hexose and one deoxy-hexose unit. In the remaining 14 analogues, one or two of the hydroxyl groups of the second hexose from the aglycone were acetylated. In addition, some of the analogues appeared to be carbonate esters. Esterification of steroidal glycoalkaloids in plants has only been reported once and was in accordance with higher antifungal activity of the acetylated versus the parent congener. Our pilot study shows that esterification of steroidal glycoalkaloids in Lilium species might be common resulting in an array of different analogues with largely unexplored structural variability and bioactivity.

Classification of primary hepatic tumours in the cat.


Hepatic tumours in dogs have recently been re-classified to follow a revised human classification system that takes account of identified hepatic progenitor cells. This study investigated the presence and relative frequency of morphological types of feline primary hepatic neoplasms and aimed to determine whether a similar new classification scheme could be applied in cats. Feline primary liver tumours (n = 61) were examined histologically and with a series of immunohistochemical markers. Six cases of nodular hyperplasia and 21 tumours of hepatocellular origin were diagnosed. The latter were subdivided into hepatocellular tumours that were well differentiated and had no evidence of metastases (n = 18) and those that showed poorly differentiated areas with marked cellular and nuclear pleomorphism and had intrahepatic and, or, distant metastases (n = 3). These malignant feline hepatocellular tumours maintained their hepatocellular characteristics (HepPar-1, MRP2, pCEA positive) and were negative, or only <5% positive, for K19. Twenty-five cholangiocellular tumours were diagnosed and all had intrahepatic and, or, distant metastases. Eight NSE positive small cell carcinomas (carcinoids) were diagnosed and subdivided into small cell carcinomas with HPC characteristics (K19 positive) and neuroendocrine carcinomas (K19 negative). In addition, one squamous cell carcinoma originating from the distal part of the choledochal duct was recognised. Feline primary hepatic neoplasms can be sub-divided into benign and malignant hepatocellular tumours, cholangiocellular carcinomas, small cell carcinomas with HPC characteristics, neuroendocrine carcinomas and squamous cell carcinomas. The marked species difference justifies a specific classification for feline primary hepatic neoplasms.
Computed tomographic findings in 44 dogs and 10 cats with grass seed foreign bodies.

OBJECTIVE: To supplement recent reports of computed tomographic (CT) findings in dogs and cats with grass seed foreign bodies. METHODS: Retrospective review of cases that had CT scan and subsequent retrieval of a grass seed during the same period of hospitalisation from a site included in the scan. RESULTS: Records of 44 dogs and 10 cats were reviewed. Most were presented in the months July to December. Median duration of clinical signs was 4 weeks (range 2 days to 2 years). The most frequent clinical signs were soft tissue swelling (30% cases), coughing (28%), sneezing (28%) and discharge (26%). Grass seeds were retrieved from the thorax (35% cases), nasal cavity (31%), ear (7%), other sites in the head and neck (22%), sublumbar muscles (2%) and pelvic limb (2%). The grass seed was visible in CT images in 10 (19%) cases. Secondary lesions were visible in CT images of 52 (96%) cases, including collection of exudate (37%), abscess (24%), enlarged lymph nodes (22%) and pulmonary consolidation (20%). CT images appeared normal in 4% animals. CLINICAL SIGNIFICANCE: Grass seeds within the respiratory tract are frequently visible in CT images, but in general CT appears to be more useful for localisation of secondary lesions than as a method of definite diagnosis.

Angiostrongylus chabaudi Biocca, 1957: a new parasite for domestic cats?

Background Natural infection with a species of Angiostrongylus has been reported only once in wildcats from central Italy by Biocca in 1957. The causative species of this infection was identified as Angiostrongylus chabaudi. Following this report, this parasite had never been found in either wild or domestic cats. Findings The lungs and the pulmonary arteries of an adult female cat (Felis silvestris catus), road-killed in Sardinia, Italy, were macroscopically examined and dissected under a light microscope for the presence of parasites. A slender nematode was detected and its morphometrical features were consistent with those of A. chabaudi. Morphological data were supplemented by sequencing of the partial cytochrome oxidase c subunit 1 (cox1) gene, as well as the internal transcribed spacer 2 (ITS2) of the rDNA. Nucleotide sequences displayed 99% homology with the ITS2 sequence [GenBank KM216825.1] of a specimen of Angiostrongylus sp. recovered recently from the pulmonary artery of a wildcat in Germany and 91% with cox1 sequence [GenBank GU138118.1] of Angiostrongylus vasorum. Conclusion The results of the present study indicate, for the first time, that A. chabaudi may also infect domestic cats, and thus should be considered in the diagnosis of metastrongyloid species infecting their cardio-pulmonary system.

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

Besides Aeluurostrongylus abstrusus, other parasites belonging to the superfamily Metastrongyloidea, namely Oslerus rostratus, Troglostrongylus brevior and to the family Trichuridae, i.e. Eucoleus aerophilus, 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.

Abstract AIM: To determine the pharmacokinetics of ketorolac tromethamine (0.5mg/kg) when administered I/V to cats undergoing gonadectomy. METHODS: Ketonolac was administered to nine female and three male shorthair domestic cats as an I/V bolus of 0.5mg/kg after intubation, and 20 minutes prior to ovariectionomy 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 base 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.

Blood and seminal plasma concentrations of selenium, zinc and testosterone and their relationship to sperm quality and testicular biometry in domestic cats.


The aim of this study was to assess seminal plasma (SP) and serum concentrations of zinc (Zn), selenium (Se) and testosterone (T) in domestic cats and determine whether these are related to sperm quality and testicular biometry. Six tomcats were collected using an artificial vagina and sperm analysis included motility by CASA, morphology, plasma membrane integrity, and sperm count. Serum and SP were submitted to total T concentration determination using a solid-phase radioimmunoassay technique while Zn and Se were measured by atomic absorption spectroscopy. Serum T concentrations were greater compared to SP concentrations, but both values were significantly correlated. Se concentrations were higher in serum, whereas SP had greater Zn values. Concentrations of Se, Zn and T were not correlated with each other either in serum or SP. Negative correlations were detected between Se concentrations in SP and total sperm head defects, and between Se concentrations in serum and VAP, VSL, STR, and LIN. Serum concentrations of Zn were negatively correlated with total abnormal sperm and midpiece defects and positively related to progressive motility. Both serum and SP concentrations of T had no relationship with sperm quality. Concentrations of Se exhibited a negative correlation with total testicular weight, whereas T concentrations in SP and serum were correlated with total testicular volume and weight. In conclusion, both Se and Zn concentrations in serum were correlated to sperm quality variables in the domestic cat, thus, making these potential candidates for fertility markers.

Aging in the canine and feline brain.


Aging dogs and cats show neurodegenerative features that are similar to human aging and Alzheimer disease. Neuropathologic changes with age may be linked to signs of cognitive dysfunction both in the laboratory and in a clinic setting. Less is known about cat brain aging and cognition and this represents an area for further study. Neurodegenerative diseases such as lysosomal storage diseases in dogs and cats also show similar features of human aging, suggesting some common underlying pathogenic mechanisms and also suggesting pathways that can be modified to promote healthy brain aging.

Bioavailability of cyclophosphamide and vincristine after intraperitoneal administration in cats.


Cyclophosphamide and vincristine are widely used intravenous chemotherapeutic agents in both human and veterinary oncology. Although intravenous administration of these chemotherapeutics is the gold standard in most treatment protocols, this route of administration has several disadvantages (e.g. long infusion times and risk of extravasation). Therefore, alternative routes have been explored in the past. Recently, good clinical results were achieved with intraperitoneal (i.p.) administration of cyclophosphamide and vincristine in cats. However, the bioavailability following i.p. administration of cyclophosphamide and vincristine providing proof of principle has not been investigated and is the focus of the present study. The pharmacokinetics of cyclophosphamide and vincristine after i.p. and intravenous administration was investigated in six cats in a cross-over study by analysis of plasma levels of cyclophosphamide and vincristine after simultaneously administration of 0.6 mg/m vincristine and 200 mg/m cyclophosphamide. The median bioavailability on i.p. administration was 76% for cyclophosphamide and 100% for vincristine. Median areas under the curve for i.p. and intravenous administration were 11.4 and 16.0 ng h/ml for cyclophosphamide and 16.7 and 16.5 ng h/ml for vincristine, respectively. No specific i.p. administration-related adverse events were observed after i.p. administration. The high bioavailability of both
cyclophosphamide and vincristine after i.p. administration and the absence of specific i.p. administration-related side effects suggest that i.p. administration is a suitable route of systemic chemotherapy for both chemotherapeutics. These results are promising and may serve as a stepping stone for the investigation of the pharmacology, safety, and efficacy of i.p. administration of cyclophosphamide and vincristine in humans.

Parasite communities in stray cat populations from Lisbon, Portugal.
Stray cats live in high-density colonies in urban areas and pose a health hazard to household cats and humans. In Portugal, information on the parasitic fauna of stray cats is limited and relies mostly on results from faecal analysis. The present survey aimed to determine the prevalence, diversity and intensity of parasites in stray cats from the urban area of Lisbon by means of parasitological necropy. Internal organs were collected from 162 cats captured in different areas of the city and systematically subjected to parasitological dissection. Helminths were identified by macro- and microscopic examination and protozoa by faecal flotation and sedimentation techniques. The overall prevalence of parasites was 90.7% (95% confidence interval (CI): 85.3-94.6%). A total of 12 parasite species was recorded: Cystoisospora felis (14.2%), Cystoisospora rivolta (46.3%), Sarcocystis sp. (1.2%), Ancylostoma tubaeforme (19.1%), Toxocara cati (38.3%), Ollulanus tricuspis (30.9%), Aeluropstrongylus abstrusus (12.4%), Eucoleus aerophilus (0.6%), Taenia taeniaformis (3.1%), Dipylidium caninum (53.1%), Joyeuxiella pasqualei (15.4%) and Diplopylidium nolleri (3.7%). Overall mean species richness was 2.36 +/- 1.52. Helminth mean intensity was highest for O. tricuspis (285.8), followed by D. caninum (42.4), J. pasqualei (14.4), A. tubaeforme (8.1) and T. cati (5.9). The prevalence and variety of parasites found in our sampling are substantially higher than the numbers previously reported in Portugal. Some of the parasites, including T. cati and A. tubaeforme, are zoonotic, which emphasizes the need for parasite control strategies based on demographic containment of stray cat populations in urban areas to promote public health protection.

Hippocampal sclerosis in feline epilepsy.
Hippocampal sclerosis (HS) refers to loss of hippocampal neurons and astrogliosis. In temporal lobe epilepsy (TLE), HS is a key factor for pharmacoresistance, even though the mechanisms are not quite understood. While experimental TLE models are available, there is lack of models reflecting the natural HS development. Among domestic animals, cats may present with TLE-like seizures in natural and experimental settings. With this study on the prevalence, segmental pattern and clinicopathological correlates of feline HS, we evaluated the translational value for human research. Evaluation schemes for human brains were applied to epileptic cats. The loss of neurons was morphometrically assessed and the degree of gliosis was recorded. Hippocampal changes resembling human HS were seen in about one third of epileptic cats. Most of these were associated with infiltrative diseases such as limbic encephalitis. Irrespective of the etiology and semiology of seizures, total hippocampal sclerosis was the most prevalent form seen in epileptic animals. Other HS types also occur at varying frequencies. Segmental differences to human HS can be explained by species-specific synaptic connectivities and a different spectrum of etiologies. All these variables require consideration when translating results from feline studies regarding seizure-associated changes of the temporal lobe and especially HS.

Crystallization and preliminary crystallographic study of Feline infectious peritonitis virus main protease in complex with an inhibitor.
Feline infectious peritonitis virus (FIPV) causes a lethal systemic granulomatous disease in wild and domestic cats around the world. Currently, no effective vaccines or drugs have been developed against it. As a member of the genus Alphacoronavirus, FIPV encodes two polyprotein precursors required for genome replication and transcription. Each polyprotein undergoes extensive proteolytic processing, resulting in functional subunits. This process is mainly mediated by its genome-encoded main protease, which is an attractive target for antiviral drug design. In this study, the main protease of FIPV in complex with a Michael acceptor-type inhibitor was crystallized. The complex crystals diffracted to 2.5 Å resolution and belonged to space group I422, with unit-cell parameters a = 112.3, b = 112.3, c = 102.1 Å. There is one molecule per asymmetric unit.
Polymorphisms in the feline TNFA and CD209 genes are associated with the outcome of feline coronavirus infection.

Feline infectious peritonitis (FIP), caused by feline coronavirus (FCoV) infection, is a highly lethal disease without effective therapy and prevention. With an immune-mediated disease entity, host genetic variant was suggested to influence the occurrence of FIP. This study aimed at evaluating cytokine-associated single nucleotide polymorphisms (SNPs), i.e., tumor necrosis factor alpha (TNF-alpha), receptor-associated SNPs, i.e., C-type lectin DC-SIGN (CD209), and the five FIP-associated SNPs identified from Birman cats of USA and Denmark origins and their associations with the outcome of FCoV infection in 71 FIP cats and 93 FCoV infected non-FIP cats in a genetically more diverse cat populations. A promoter variant, rTNFA - 421 T, was found to be a disease-resistance allele. One SNP was identified in the extracellular domain (ECD) of ICD209 at position +1900, a G to A substitution, and the A allele was associated with FIP susceptibility. Three SNPs located in the introns of ICD209, at positions +2276, +2392, and +2713, were identified to be associated with the outcome of FCoV infection, with statistical relevance. In contrast, among the five Birman FIP cat-associated SNPs, no genotype or allele showed significant differences between our FIP and non-FIP groups. As disease resistance is multifactorial and several other host genes could involve in the development of FIP, the five genetic traits identified in this study should facilitate in the future breeding of the disease-resistant animal to reduce the occurrence of cats succumbing to FIP.

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

Alfaxalone-2-hydroxpropyl-beta-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.

Stem cell therapy in cats with chronic enteropathy: a proof-of-concept study.

OBJECTIVES: The current treatment of cats with chronic enteropathy frequently includes use of a prescription diet and daily medication administration, with the potential for side effects or problems with owner compliance, and may still result in treatment failure in some cases. The objective of this study was to determine if stem cell therapy was a safe and viable treatment in cases of feline chronic enteropathy. METHODS: Allogeneic adipose-derived feline mesenchymal stem cells (fMSC) were used to treat seven cats with diarrhea of no less than 3 months’ duration, while four cats with a similar clinical condition received placebo, in a blinded manner. Three additional cats were treated with an identical fMSC protocol, but owners were not blinded to the treatment. Owners completed a questionnaire characterizing clinical signs both before entering the study and 2 weeks following the second of two fMSC or placebo treatments. Owners were also surveyed for similar input by email 1-2 months later before being unblinded to their cat’s study group. Besides the fMSC or placebo treatment, no other changes were made in diet, supplement or medication administration during the study. RESULTS: No adverse reactions or side effects were attributed to the fMSC therapy in any of the cats. Owners of 5/7 fMSC-treated cats reported significant improvement or complete resolution of clinical signs, while the owner of the remaining two cats reported modest but persistent improvement. Owners of placebo-treated cats reported no change or worsening of clinical signs. Of the owners not blinded to the treatment, one reported marked improvement, one reported no change and one was lost to follow-up. CONCLUSIONS AND RELEVANCE: Although allogeneic adipose-derived fMSC therapy appears to be a safe and potentially effective treatment for cats suffering from chronic enteropathy, these preliminary results require significant follow-up study.

Management of feline distal tibial fractures using a hybrid external skeletal fixator.
OBJECTIVE: To document the results of management of feline distal tibial fractures with circular-linear hybrid external skeletal fixators. METHODS: Retrospective examination of case records and radiographs of cats with distal tibial fractures managed with hybrid external skeletal fixators. Signalment, pre-operative fracture conformation, post-operative fracture reduction, implant complications, time to tibial and fibular fracture healing and time to hybrid external skeletal fixators removal were analysed. RESULTS: Case records of eight cats were reviewed and included three closed fractures and five type 1 open fractures. Post-operative fracture reduction was considered appropriate in all cases. Healing of five tibial fractures was complete and hybrid external skeletal fixators were removed within a mean of 13 weeks. Healing of the fibular fracture was complete within a mean of 12.1 weeks. Three tibial fractures demonstrated non-union and were revised after a mean duration of 24 weeks. All three non-union fractures were open on presentation. CLINICAL SIGNIFICANCE: Feline distal tibial fractures may be managed with hybrid external skeletal fixators, however, non-union still occurs. In this study type I open feline distal tibial fractures appeared more likely to develop non-union.

OBJECTIVE: To describe the use of thoracoscopic-assisted pulmonary surgery (TAPS) for partial and complete lung lobectomy in small animal patients and to evaluate short-term outcome. DESIGN: Retrospective case series. ANIMALS: 11 client-owned dogs and cats. Procedures-Medical records of dogs and cats that underwent a partial or complete TAPS lung lobectomy were reviewed. All patients underwent general anesthesia and were positioned in lateral recumbency with the affected hemithorax uppermost. One-lung ventilation was not implemented in any patient. For initial exploration, a 5- to 10-mm incision was made for insertion of a 30 degrees telescope approximately 5 to 7 rib spaces away from the site of the pulmonary lesion in the dorsal third of the thorax. All subsequent incision placements were case dependent and determined by the location of the lesion to be resected. Following lesion localization, an 2- to 7-cm minithoracotomy incision was made with direct thoracoscopic visualization without the use of rigid rib retractors. In 10 of 11 patients, a 360 degrees wound retraction device was placed at the minithoracotomy site prior to exteriorization and resection of the affected lung. Lymph nodes were inspected intraoperatively, but biopsies were not performed; incisions were closed routinely, and a thoracostomy tube was placed in all patients. RESULTS: 3 cats and 8 dogs underwent successful partial (5) or complete (6) TAPS lung lobectomy over a 5-year period (2008 through 2013). Median surgery time was 92.7 minutes (range, 77 to 150 minutes). Thoracostomy tubes were removed a median of 22.3 hours after surgery (range, 18 to 36 hours). The median time to discharge was 3.1 days (range, 1 to 6 days). No intraoperative complications were encountered. All patients were discharged from the hospital, with 9 of 11 patients alive 6 months after surgery. CONCLUSIONS AND CLINICAL RELEVANCE: Results of this study suggested that lung lobectomy by means of TAPS can be successfully performed in dogs and cats. When compared with total thoracoscopic surgery, TAPS may offer a more technically feasible approach from both a surgical and anesthetic standpoint, because it provides the benefits of minimally invasive thoracic surgery without the necessity of 1-lung ventilation.

Femoral head and neck excision in cats: medium- to long-term functional outcome in 18 cats.
OBJECTIVE: To assess the medium- to long-term functional outcome of cats after femoral head and neck excision (FHNE) using an owner-completed questionnaire. METHODS: Cats that had FHNE and were free of other orthopaedic or medical conditions that could affect their mobility, other than the studied coxofemoral joint(s), were included. A specific owner-completed questionnaire was used at a minimum of 4 months postoperatively. The questionnaire assessed the ability of the cats to perform normal feline activities, change of demeanour or behaviour, the necessity for long-term analgesia and the time taken to resume normal activities. RESULTS: Eighteen cats had undergone uni- or bilateral FHNE and met the inclusion criteria. All but one cat could perform normal feline activities without or with slight difficulty at follow-up. The aforementioned cat had notable, persistent difficulty in climbing. The majority of the cats took between 1 and 2 months to resume normal activity. No change in demeanour or behaviour was noted in any of the cats and none of the cats required long-term analgesia. CONCLUSIONS AND RELEVANCE: Based on the owner-completed questionnaire, cats have good-to-excellent medium- to long-term functional outcome after adequately performed FHNE.

First report of Rickettsia felis in China.
Background Rickettsia felis is a recently described flea-borne spotted fever group Rickettsia that is an emerging human
pathogen. Although there is information on the organism from around the world, there is no information on the organism in China.

Methods
We used a commercial ELISA to detect antibodies reactive against R. felis in blood samples and developed a PCR to detect the gltA of the organism in blood samples and external parasites.

Results
We found reactive antibodies in people (16%; 28/180), dogs (47%; 128/271) and cats (21%; 19/90) and positive PCRs with DNA from people (0.1%; 1/822), dogs (0.8%; 8/1,059), mice (10%; 1/10), ticks (Rhipicephalus sanguineus); 10%; 15/146), lice (Linognathus setosus; 16%; 6/37), fleas (Ctenocephalides felis felis; 95%; 57/60) and mosquitoes (Anopheles sinensis, Culex pipiens pallens; 6%; 25/428), but not from cats (0/135) or canine fecal swabs (0/43).

Conclusions
This is the first report of R. felis in China where there is serological and/or PCR evidence of the organism in previously reported [people, dogs, cats, ticks (Rhipicephalus sanguineus), fleas (Ctenocephalides felis felis) and mosquitoes (Anopheles sinensis, Culex pipiens pallens)] and novel species [mice and lice (Linognathus setosus)].

Faecal virome of cats in an animal shelter.

We describe the metagenomics-derived feline enteric virome in the faeces of 25 cats from a single shelter in California. More than 90% of the recognizable viral reads were related to mammalian viruses and the rest to bacterial viruses. Eight viral families were detected: Astroviridae, Coronaviridae, Paroviridae, Circoviridae, Herpesviridae, Anelloviridae, Caliciviridae and Picobirnaviridae. Six previously identified viruses were also identified: feline coronavirus type 1, felid herpes 1, feline calcivirus, feline norovirus, feline panleukopenia virus and picobirnavirus. Novel species of astroviruses and bocaviruses, and the first genome of a cyclovirus in a feline were characterized. The RNA-dependent RNA polymerase region from four highly divergent partial viral genomes in the order Picornavirales were sequenced. The detection of such a diverse collection of viruses shed within a single shelter suggested that such animals experience robust viral exposures. This study increases our understanding of the viral diversity in cats, facilitating future evaluation of their pathogenic and zoonotic potentials.

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.

Renal morphology in cats with diabetes mellitus.

In humans, diabetes mellitus (DM) is an important cause of renal damage, with glomerular lesions being predominant. In cats, although diabetes is a common endocrinopathy, it is yet unknown whether it leads to renal damage. The aim of the study was to compare renal histologic features and parameters of renal function in diabetic cats against a control population matched for age, gender, breed, and body weight. Thirty-two diabetic and 20 control cats were included. Kidney sections from paraffin-embedded kidney samples were stained and examined with optical microscopy to identify glomerular, tubulointerstitial, and vascular lesions and to assess their frequency and severity. Serum creatinine and urea concentrations were also compared. Glomerular lesions were observed in 29 cats overall, with mesangial matrix increase being more common (19 cats). Tubulointerstitial lesions were observed in 42 cats, including lymphocytic infiltration (29), fibrosis (22), or tubular necrosis (21). Vascular lesions were observed in 5 cases. The frequency and severity of histologic lesions did not differ between diabetic and control cats; however, among diabetics, those that survived longer after diagnosis had more glomerular and vascular lesions. Serum creatinine and urea concentrations were similar between groups; in diabetic cats median creatinine was 109 µmol/l (range, 51-1200) and urea was 12 mmol/l (range, 4-63), and in controls creatinine was 126 µmol/l (range, 50-875) and urea 11 mmol/l (range, 3-80). The results suggest that DM in cats does not lead to
microscopically detectable kidney lesions or clinically relevant renal dysfunction. The authors hypothesize that the short life expectancy of diabetic cats may be the main reason for the difference from human diabetics.