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SMALL ANIMAL MEDICINE AND FELINE CHAPTER SCIENTIFIC ABSTRACTS

Benign paraganglioma: a potential cause of hypertension in cats

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Improved understanding of non-azotaemic hypertension in cats is required because 13-20% of feline hypertension is idiopathic.

A 16-year-old, neutered male cat presented with chronic weight loss, polydipsia, increased activity, bilateral pin-point multifocal grey retinal lesions, and non-azotaemic hypertension. Hyperthyroidism, hyperaldosteronism, hyperadrenocorticism, and adrenal/peri-adrenal tumour were excluded. Computed tomography revealed two craniodorsal, bilateral, mediastinal nodules consistent with enlarged cervicothoracic sympathetic ganglia; and pulmonary over-inflation and bronchiectasis, potentially due to excess catecholamines. Urinary catecholamines/metanephrines were compared with four control cats with similar signalment, including the littermate of the patient. Urine collected in a stress-free manner was immediately frozen at -20°C. Urine creatinine analysis via rate-blanking Jaffe reaction and catecholamines/metanephrines analyses via liquid chromatography coupled with tandem mass spectrometry (LC-MS/MS) were performed. Unpaired, one-tailed t-tests were used to compare results.

Urinary normetanephrine:creatinine ratios in the patient (median [range], 123 [93-228] nmol $mmol^{-1}$) were approximately three times higher than in the controls (43 [27-70] nmol $mmol^{-1}$) ($p = 0.06$). There were no differences for the other urinary catecholamines/metanephrines. Results were consistent with benign paraganglioma. Retinal lesions stabilised with 1.25 mg amlodipine PO q12h before diagnosis. After diagnosis, treatment with first 2.5 mg then 5.0 mg phenoxybenzamine PO q12h arrested weight loss.

This is the first feline case to fulfil criteria for diagnosis of benign paraganglioma in humans. This potential cause of hypertension in cats could have been previously overlooked. Urinary metanephrines measurement might be a practical screening test for this condition. Oral amlodipine and phenoxybenzamine provided effective long-term control of signs.

Head CT or MRI in dogs and cats with cryptococcosis

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Few reports document cross sectional imaging in canine and feline cryptococcosis.[1-3]

A multi-institutional (7 centres; 4 states) retrospective study was conducted. Twenty-eight cases (2008-2020) with radiologist-reviewed CT or MRI studies were found in medical records. For these, clinical and imaging data were tabulated.

There were 16 cats and 12 dogs. The median age was 5.5 and 2.1 years for cats and dogs, respectively. 25% of cats were Ragdolls. Using advanced imaging, sinonasal lesions were present in 69% of cats and 58% of dogs. Of these, extension of sinonasal infection into the brain occurred in 18% of cats and 57% of dogs. Retrobulbar and subcutaneous swellings due to disease extension were common (65% of canine lesions). Intra-axial lesions accounted for approximately half of the intracranial lesions (19% cats; 25% dogs) and were multifocal in 67% of cases (in both species). Lesions were found in olfactory, parietal or temporal lobes, cerebellopontine angle, cerebellum and throughout the brain. Meningeal abnormalities were uncommon (6% cats; 25% dogs). Osteolysis was observed in 19% of cats and 33% of dogs but suspected in an additional 6% of cats and 25% of dogs (based on disease extension). Some or all clinical signs could be explained by the imaging findings in all cats and 83% of dogs. Lesions without corresponding signs were not uncommon, with clinically silent CNS lesions in 1/16 cats and 2/12 dogs, and silent sinonasal involvement accompanying CNS disease in 4/12 dogs.

Insights from advanced imaging extend knowledge of disease pathogenesis and assists in therapeutic decision making.

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Feline parvovirus seroprevalence is high in domestic cats from disease outbreak and non-outbreak regions in Australia

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Multiple, epizootic outbreaks of feline panleukopenia (FPL) caused by feline parvovirus (FPV) occurred in eastern Australia between 2014 and 2018. Most affected cats were unvaccinated. We hypothesised that low population immunity was a major driver of re-emergent FPL. The aim of this study was to (i) determine the prevalence and predictors of seroprotective titres to FPV among shelter-housed and owned cats, and (ii) compare the prevalence of seroprotection between regions affected and unaffected by FPL outbreaks.

FPV antibodies were detected by haemagglutination inhibition assay on sera from 523 cats and titres ≥1:40 were considered protective. Socioeconomic indices based on postcode and census data were included in the risk factor analysis.

The prevalence of protective FPV antibody titres was high overall (94.3%), even though only 42% of cats were known to be vaccinated, and was not significantly different between outbreak and non-outbreak regions. On multivariable logistic regression analysis, vaccinated cats were 29.94 times more likely to have protective FPV titres than cats not known to be vaccinated. Cats from postcodes of relatively less socioeconomic disadvantage were 5.93 times more likely to have protective FPV titres.

The predictors identified for FPV seroprotective titres indicate that targeted vaccination strategies in regions of socioeconomic disadvantage would be beneficial to increase population immunity. The critical level of vaccine coverage required to halt FPV transmission and prevent FPL outbreaks should be determined.

Abdominal cryptococcosis: Evaluation of 38 cases (35 dogs, 3 cats) from Australia and a review of literature

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To report the clinical presentation, laboratory and imaging findings, treatment and outcome of abdominal cryptococcosis in dogs and cats in Australia.

Canine and feline cases from Australia were retrospectively identified (2000-2018) via laboratory and referral centre searches for abdominal cryptococcosis diagnosed by cytology (needle aspirates) or histopathology (biopsy or necropsy) of abdominal organs/tissues. Signalment, presenting complaints, clinical signs, laboratory findings, medical imaging, latex cryptococcal antigen agglutination test (LCAT) titres, treatment and outcome data was collected.

Thirty-eight cases were included (35 dogs, 3 cats) in the study. Median age of presentation was 2 years for dogs and 6 years for cats. Common presenting complaints included vomiting (23/38), lethargy (19/38) and inappetence/anorexia (15/38). Abdominal ultrasound revealed mesenteric and intestinal lesions in most of the cases. On surgical exploration, seven cases had an intestinal lesion associated with an intussusception. Nineteen cases had a pre-treatment LCAT performed, with a median initial titre of 2,048 (range 2 to 65,536). Twenty-four cases (23 dogs, one cat) received treatment, either medical, surgical or both. Median survival time for dogs with combined medical and surgical treatment, surgical treatment alone or medical treatment alone was 730, 140 and 561 days, respectively. Eleven remain alive at the time of writing (August 2019).

Abdominal cryptococcosis although rare should be a considered as a diagnostic possibility in a young dog presenting with gastro-intestinal signs. With appropriate treatment and monitoring many dogs may have a prolonged survival periods and some may be cured.

Expression of the cobalamin receptor in hypocobalaminaemic dogs with IBD

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Idiopathic inflammatory bowel disease (IBD) in dogs can be associated with cobalamin deficiency. Compromised intestinal uptake of cobalamin resulting from ileal cobalamin receptor deficiency is hypothesised in dogs with IBD. The aim of this study was to evaluate the expression of the cobalamin receptor subunits amnionless (AMN) and cubilin (CUBN) in ileal biopsies from dogs with IBD compared to healthy dogs.

Endoscopic ileal biopsies were evaluated from (1) dogs with IBD and severe hypocobalaminaemia (n=6), (2) dogs with IBD and suboptimal serum cobalamin status (n=7), (3) dogs with IBD and normocobalaminaemia (n=7), and (4) healthy control dogs (n=9). AMN and CUBN expression was quantified using confocal laser scanning microscopy, were compared among the groups of dogs, and were also correlated with clinical patient data.

Ileal mucosal expression of AMN and CUBN was significantly higher in hypocobalaminaemic dogs with IBD compared to healthy control dogs. There were no significant differences among any of the other groups of dogs. AMN expression in ileal biopsies was significantly correlated with age, sex, clinical score, the severity of ileal lacteal dilation, duodenal macrophage infiltration, and with serum folate, but not with serum cobalamin concentrations. CUBN expression was correlated with AMN expression, age, ileal macrophage infiltration, and serum folate concentration, but also not with serum cobalamin concentration.

Expression of both cobalamin receptor subunits is altered in hypocobalaminaemic dogs with IBD. Contrary to the previously proposed pathogenetic mechanism, cobalamin receptor downregulation does not appear to be the primary cause of hypocobalaminaemia in canine IBD.

Feline ureteral obstruction: a case-control study of risk factors (2016-2019)

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Ureteral obstruction (UO) in cats causes acute kidney injury and typically requires surgical intervention. Further information is required about potentially modifiable risk factors to inform prevention strategies.

A case-control study was performed to assess risk factors associated with feline UO. Cases had i) ureteral obstruction confirmed with pyelography or ii) a creatinine concentration >140 mcg ml^{-1} and both ureteral obstruction and pyelectasia ≥ 5 mm sonographically. Controls had no evidence of ureteral obstruction on history, physical examination and abdominal ultrasound. Age, sex, breed (domestic or pedigree), diet (predominantly dry, mixed or predominantly wet food), housing (indoors or mixed) and total calcium were evaluated for their association with UO using multivariable logistic regression. A receiver operator characteristics (ROC) curve was created to evaluate the final model.

One hundred and sixty-eight cats (28 cases, 140 controls) were included. Neither age (*P*=0.46), sex (*P*=0.78), total calcium (*P*=0.42), breed (*P*=0.89) nor housing (*P*=0.83) were significantly associated with UO.

Diet was significantly associated with UO. Compared to cats eating a predominantly wet food diet, cats fed a predominantly dry food diet were 15.9 times more likely to develop a UO (confidence interval 2.9-295, *P*=0.009). There was no difference in the association between diet and UO in cats fed a mixed or predominantly wet food diet (*P*=0.25). The area under the curve of the ROC curve was 72%.

While the study is limited by owner recollection of diet, changes in dietary formulation could provide a simple and economical method of reducing the risk of UO.

Complications of canine and feline cerebrospinal fluid collection: 391 cases

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Cerebrospinal fluid (CSF) collection is an important diagnostic procedure when evaluating patients with neurological dysfunction. To date, there have been no reports of the incidence of and risk factors for complications associated with CSF collection in dogs and cats.

The medical records of 391 client-owned animals (366 dogs, 25 cats) that underwent CSF collection between 2012 and 2019 at a small animal referral hospital were retrospectively reviewed for complications. Data was obtained regarding the signalment, clinical signs, clinicopathological results, anaesthesia, site of CSF collection, diagnosis and complications. Complications were classed as death (cardiorespiratory arrest or euthanasia) or major and minor complications. Univariate logistic regression was performed to assess for any associations between predictor variables and complications.

Complications were noted in 5.6% of cases. Patient death resulted in 4.3% (3.3% were euthanised and 1% suffered cardiorespiratory arrest). Major complications comprised 0.7% and 0.5% had minor complications. Animals that presented for anorexia (P=0.037), ataxia (P=0.001) and gait abnormalities (P=0.013) and those found to have mental alteration (P=0.000) or nystagmus (P=0.032) on neurological examination were more likely to develop complications. Animals that were diagnosed with an intracranial mass were more likely to suffer from complications compared to other diagnoses. The site of CSF collection was not associated with an increased risk of complications (P=0.156).

Results suggest that CSF collection is a relatively benign procedure with low incidence of complications. However, when complications did occur, they were major and affected survival to discharge.

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Are we treating dog and cat urinary tract infections well?

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Australian veterinarians overwhelmingly treat urinary tract infections (UTIs) in dogs with amoxycillin-clavulanate and in cats with cefovecin.[1] Antimicrobial susceptibility patterns of cat and dog urinary isolates were examined to evaluate current approaches to empirical therapy.

Microbiological culture and susceptibility test results of 5614 urine samples from dogs and cats submitted to a single laboratory in Victoria between January 2015 and December 2019 were analysed. The prevalence and susceptibility of specific pathogens were used to generate rational recommendations for empirical therapy.

Escherichia coli was isolated in 58% of samples. Other organisms identified included *Enterococcus faecalis* (11%), *Staphylococcus pseudintermedius* (9%), *Proteus mirabilis* (8%), other *Proteus* species (6%), *Enterobacter* species (3%), and coagulase-negative *Staphylococcus* species (3%).

Overall, there was little acquired antimicrobial resistance and very little multidrug resistance. However, *E. coli* isolates from animals with repeated urine samples showed increasing antimicrobial resistance, presumably due to selection by ongoing therapy. Despite this, 94% of all isolates were susceptible to at least one antimicrobial of low importance (by ASTAG classification)[2] .

In-clinic microscopy can refine empirical therapy choice. Trimethoprim-sulfonamide was effective in vitro against 87.8% of urinary rods and amoxycillin against 90.8% of urinary cocci. Amoxycillin-clavulanate had marginally higher efficacy against both groups, but considering the ASTAG importance ratings[2], preferred empirical therapy of rod UTIs in dogs is trimethoprim-sulfonamide and in cats (considering palatability), amoxycillin-clavulanate. In both species, amoxycillin is the preferred empirical choice for cocci. Only 0.7% of samples justified the use of enrofloxacin. There was no microbiological justification for using cefovecin in UTIs.

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The effect of age, parity and spermatozoal concentration on conception rates using frozen-thawed surgical intrauterine insemination in the bitch

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The objective of this study was to report conception rates obtained through surgical intrauterine insemination (SII) with the use of frozen-thawed semen and to assess whether parity, age and spermatozoal concentration of dose inseminated have an effect on conception rates. There are only two studies[1,2] reporting retrospective data on the success rates of SII, both reporting different success rates.

Medical histories of bitches bred throughout 2017 to 2019 via SII using frozen-thawed semen at a private veterinary hospital were reviewed retrospectively. Ovulation and insemination timing was assessed based on vaginal cytology and serum progesterone levels. Semen was analysed post-thawing at the time of insemination using a Makler® Chamber. Data on age and parity of the bitches were also assessed. Per oestrous, each bitch received one timed SII.

Analysis revealed that 196 canines were inseminated. The overall conception rate was 84%. Conception rates based on parity, age and progressively motile sperm are shown in Table 1.

	Nulliparous	***Uniparous***	***Pluriparous***	***Age (years)***							***Sperm (No. progressively motile sperm)***		
				0-1	**1-2**	**2-3**	**3-4**	**4-5**	**5-6**	**>6**	**<100**	**100-200**	**>/=200**
Pregnant (165 bitches)	71 (85%)	63 (87%)	31 (79%)	3 (100%)	34 (77%)	46 (88%)	35 (87%)	23 (96%)	15 (75%)	9 (75%)	43 (80%)	92 (86%)	30 (88%)
Non-Pregnant (30 bitches)	13 (15%)	9 (13%)	8 (21%)	0	10 (23%)	6 (12%)	5 (13%)	1 (4%)	5 (25%)	3 (25%)	11 (20%)	15 (14%)	4 (12%)

Data presented indicate that a high conception is achievable through SII with frozen-thawed semen. This study reports similar results to one study[1] and a higher conception rate than the other[2]. Parity, age and concentration of progressively motile sperm inseminated appear to have an effect on conception rates.

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Pharmacokinetics of mefloquine in cats, a potential treatment for FIP

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Treatment options for feline infectious peritonitis (FIP) are limited.[1] Mefloquine, a human anti-malarial drug, has been demonstrated to reduce the viral load of FIPV *in vitro*.[2,3] The aim of this study was to describe the pharmacokinetic profile of mefloquine in clinically normal cats.

Serial blood samples were collected at 0, 1, 2, 4, 8, 12, 24, 48, 96, 168, 240 and 336 hours after mefloquine (62.5 mg per cat) was administered orally to seven clinically normal cats on day 0, 4, 7 and 10. Haematology and biochemistry were performed at 0, 168 and 336 hours. Plasma samples were quantified for mefloquine concentrations by high performance liquid chromatography.

The mefloquine plasma concentration following oral administration is displayed in **Figure 1**. Pharmacokinetic (PK) analysis was undertaken using a non-compartmental analysis for four cats over the first 96 hours.

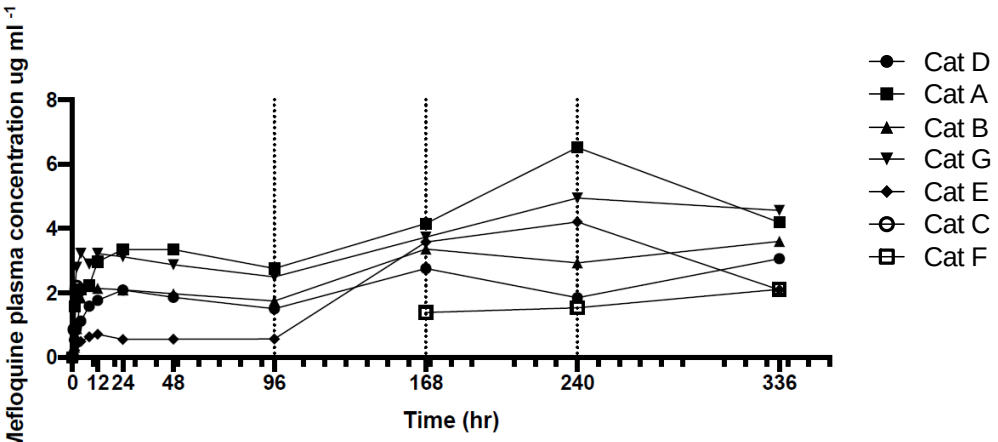

Figure 1. Mefloquine plasma concentrations of 7 cats over 336 hr. Treatment time denoted by vertical lines.

Haematology results were unremarkable. Biochemistry showed an increase trend in serum symmetric dimethylarginine (SDMA) concentrations at 168 and 336 hour in all cats (**Figure 2**). A repeated measures one-way ANOVA comparing SDMA at all time-points was statistically significant. Tukey's multiple comparisons test showed that the mean SDMA at each time-point was statistically different.

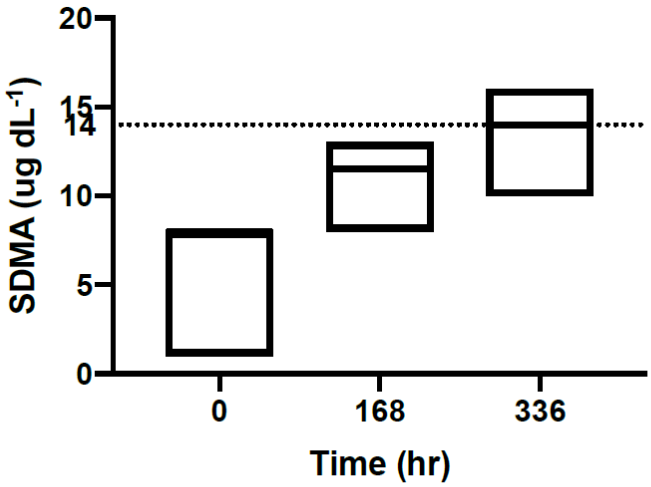

Figure 2: SDMA concentrations of 6 cats at 0, 168 and 336 hr. The median is shown with upper and lower range.

In summary, this study demonstrated favourable pharmacokinetic properties of mefloquine in clinically normal cats. Increase in SDMA was identified with mefloquine administration.

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