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The Swedish Exhibition & Congress Centre, Goteborg, Sweden, 8th to 10th September 2016

ORAL RESEARCH COMMUNICATIONS

ISCAID – International Society for Companion Animal Infectious Diseases

Thursday 8 September

11.20–11.35	ISCAID-O-1	Selder	Sensitivity and specificity of a rapid polymerase chain reaction for the diagnosis of canine leishmaniasis
11.35–11.50	ISCAID-O-2	Spencer	Prevalence and risk factors for Felis catus gammaherpesvirus 1 infection among pet cats in the United Kingdom
11.50–12.05	ISCAID-O-3	Hiebl	Detection rate of viral and bacterial pathogens as well as helminths associated with respiratory tract disease in Austrian dogs
12.05–12.20	ISCAID-O-4	Delaude	The role of the dog in the epidemiology of leptospirosis in Switzerland – seroprevalence and urinary shedding of pathogenic leptospires
12.20–12.35	ISCAID-O-5	Glaus	Characterisation of Angiostrongylus (A.) vasorum infected dogs with excessive bleeding as primary clinical complaint
12.35–12.50	ISCAID-O-6	Leutenegger	C. perfringens type A netE and netF toxins are associated with bloody diarrhea in dogs
14.25–14.40	ISCAID-O-7	Hapke	Determination of Leptospira antibody titers by microscopic agglutination test (MAT) in dogs after vaccination with a tetravalent leptospirosis vaccine
14.40–14.55	ISCAID-O-8	Bouzouraa	Implication, clinical and biological impact of Vector-Borne Pathogens in anemic dogs: A prospective study of 134 cases
14.55–15.10	ISCAID-O-9	Proksch	The role of canine circovirus in acute haemorrhagic diarrhoea syndrome and its impact on canine parvovirus infection
15.10–15.25	ISCAID-O-10	Fontaine	Leucofeligen® FeLV/RCP vaccine prevents persistent viremia in cats exposed to a pathogenic FeLV strain three years after the last annual vaccine injection
15.25–15.40	ISCAID-O-11	Pineda	Marbofloxacin treatment in dogs with leishmaniasis and chronic kidney disease
15.40–15.55	ISCAID-O-12	Fontaine	Canigen® DHPPi/L vaccine protects puppies against parvovirosis even in the presence of maternally derived antibodies
15.55–16.10	ISCAID-O-13	Lo Piccolo	Multidrug-resistant Extended-Spectrum-ß-Lactamase and Plasmid-Mediated AmpC ß-Lactamase-Producing Enterobacteriaceae isolated from diseased cats in Southern Italy
16.10–16.25	ISCAID-O-14	Segarra	A randomized, allopurinol-controlled trial evaluating the use of dietary nucleotides and AHCC in dogs with clinical leishmaniosis

SCH – Society of Comparative Hepatology

Thursday 8 September

14.25–14.40	SCH-O-1	Dirksen	Low sensitivity and specificity of alanine aminotransferase and alkaline phosphatase for detection of hepatocellular injury in 198 Labrador retrievers without clinical signs of liver disease
14.40–14.55	SCH-O-2	Twedt	Relationship of Hepatic Copper Concentrations to Histopathological Changes in the Dog
14.55–15.10	SCH-O-3	Dirksen	A panel of serum microRNAs differentiates between various types of canine hepatobiliairy diseases
15.10–15.25	SCH-O-4	van den Bossche	Lipid accumulation in canine portosystemic shunts
15.25–15.40	SCH-O-5	Kruitwagen	Long-term adult feline liver organoid cultures for disease modelling of hepatic lipidosis
15.40–15.55	SCH-O-6	Kuzi	Prognostic markers for mortality in feline hepatic lipidosis: a retrospective study of 71 cats

ESVC – European Society of Veterinary Cardiology

Thursday 8 September

15.55–16.10	ESVC-O-1	Crosara	Aorto-septal angle and systolic murmur in apparently healthy cats. A pilot study.
16.10–16.25	ESVC-O-2	Payne	Inter-observer variability for cardiac ultrasound measurements in cats between 12 and 24 months of age
16.25–16.40	ESVC-O-3	Sebastian	Anomalies and anatomical variations of the thoracic great vessels in dogs

Friday 9 September

09.00–09.15	ESVC-O-4	Johard	Effects of sedation with dexmedetomidine and buprenorphine on echocardiographic variables, blood pressure and heart rate in healthy cats
09.15–09.30	ESVC-O-5	Saponaro	Cardiovascular effects of medetomidine alone or in combination with propofol in stage B2 mixomatous mitral valve disease
09.30–09.45	ESVC-O-6	Darnis	Inter-observer agreement when measuring ultrasonographic inferior vena cava diameter and basic echocardiographic parameters by non cardiologist veterinarians following a 6-hour training course
09.45–10.00	ESVC-O-7	Hezzell	Focused cardiac ultrasound in the emergency room improves the differentiation of respiratory and cardiac causes of dyspnea in dogs
10.00–10.15	ESVC-O-8	Bartoszuk	Holter evaluation in cats with symptomatic heart disease and with thoracic trauma
10.15–10.30	ESVC-O-9	Blake	Poincaré plots as a measure of heart rate variability in normal dogs
11.20–11.35	ESVC-O-10	Kieler	Feline hypertrophic cardiomyopathy does not alter serum levels of symmetric dimethylarginine
11.35–11.50	ESVC-O-11	Spalla	Mitral annular plane systolic excursion (mapse) and tricuspid annular plane systolic excursion (tapse) in cats with hypertrophic cardiomyopathy
11.50–12.05	ESVC-O-12	Hoglund	Inter-breed variation in circulating concentrations of serotonin (5HT) in healthy dogs

12.05–12.20	ESVC-O-13	Porteiro Vázquez	Analysis of precordial lead system in dogs with different thoracic conformations
12.20–12.35	ESVC-O-14	Hannabuss	T wave inversion in precordial ECG leads as a marker of arrhythmogenic right ventricular cardiomyopathy in Boxer dogs
12.35–12.50	ESVC-O-15	Hezzell	A pilot study of bridging integrator-1 in boxer dogs with arrhythmogenic right ventricular cardiomyopathy
14.25–14.40	ESVC-O-16	Novo Matos	Transient myocardial thickening in cats associated with heart failure
14.40–14.55	ESVC-O-17	Dickson	History and clinical findings in 87 cats presenting with dyspnoea in general practice: a prospective investigation
14.55–15.10	ESVC-O-18	Wilkie	Cluster analysis of pathological features to reclassify feline cardiomyopathies
15.10–15.25	ESVC-O-19	Rishniw	"Soft", "not soft" or "palpable": more detailed murmur classification of pulmonic and subaortic stenosis provides no additional useful information
15.25–15.40	ESVC-O-20	Szatmári	Can NT-proBNP plasma levels and phonocardiography facilitate differentiation of innocent cardiac murmurs from congenital cardiac anomalies in asymptomatic puppies?
15.40–15.55	ESVC-O-21	Falk	Value of standard echocardiographic variables in predicting pulmonary transit time and myocardial perfusion in dogs with or without myxomatous mitral valve disease
16.30–16.45	ESVC-O-22	Tidholm	Comparison of real-time 3-dimensional and 2D-biplanar echocardiographic assessment of left atrial volumes in dogs with myxomatous mitral valve disease using the same acquisition
16.45–17.00	ESVC-O-23	Menciotti	Three-dimensional echocardiographic comparison of mitral valve morphology in Cavalier King Charles spaniels to mitral valve morphology in dogs of other breeds
17.00–17.15	ESVC-O-24	Olsen	Mitral Regurgitation Severity and Left Ventricular Systolic Dimension Predict Survival in Young Cavalier King Charles Spaniels
17.15–17.30	ESVC-O-25	Christiansen	Evaluating urinary 5-hydroxyindoleacetic acid (5-HIAA) as a biomarker of myxomatous mitral valve disease in Cavalier King Charles Spaniels
17.30–17.45	ESVC-O-26	Roels	Diagnostic value of pulmonary vein to pulmonary artery ratio in dogs with pulmonary hypertension of pre-capillary origin
17.45–18.00	ESVC-O-27	Vezzosi	Echocardiographic evaluation of the right atrial area index in dogs with pulmonary hypertension

Saturday 10 September

11.50–12.05	ESVC-O-28	Basili	Taurine deficiency in English Cocker Spaniels diagnosed with Dilated Cardiomyopathy
12.05–12.20	ESVC-O-29	Harris	Heart Rate Deceleration Capacity obtained from 24-hour ambulatory ECG in healthy Doberman pinschers and those with dilated cardiomyopathy
12.20–12.35	ESVC-O-30	Perego	Comparison of echocardiographic parameters in dogs with arrhythmia-induced cardiomyopathy and familiar dilated cardiomyopathy
12.35–12.50	ESVC-O-31	Brungs	Echocardiographic Indices of Age and Gender-Dependent Cardiac Remodeling over the Adult Lifespan in Irish Wolfhounds

ESVNU – European Society of Veterinary Nephrology and Urology

Friday 9 September

09.00–09.15	ESVNU-O-1	Conroy	Chronic Kidney Disease in cats presenting to primary-care practice in the UK
09.15–09.30	ESVNU-O-2	Lawson	Investigation of a cell culture model for the study of fibrosis in the feline kidney
09.30–09.45	ESVNU-O-3	Sanchez-Lara	Transglutaminase 2 following renal warm ischaemia in the rat: implication for feline chronic kidney disease
09.45–10.00	ESVNU-O-4	van den Broek	Fibroblast growth factor 23 and hypertension in feline chronic kidney disease
10.00–10.15	ESVNU-O-5	McCallum	Detection of morbillivirus and other paramyxoviruses in urine samples from geriatric cats with and without evidence of azotaemic chronic kidney disease (CKD) in the United Kingdom (UK)
10.15–10.30	ESVNU-O-6	Soerensen	Diagnostic work-up does not affect appropriate antibiotic prescription in dogs with suspected urinary tract infection – An observational study in Danish small animal practices
11.20–11.35	ESVNU-O-7	Jessen	Bacterial culture does not improve antibiotic choice in dogs with suspected urinary tract infection – An observational study in Danish small animal practices
11.35–11.50	ESVNU-O-8	Nivy	The diagnostic utility of urinary alkaline phosphatase and ?-glutamyl transpeptidase in early recognition of acute kidney injury in dogs
11.50–12.05	ESVNU-O-9	Giger	Molecular Heterogeneity of Feline Cystinuria Caused by Different Mutations in the SLC3A1 and SLC7A9 Gene
12.05–12.20	ESVNU-O-10	Teh	Urinalysis results as a predictor of subclinical bacteriuria in dogs
12.20–12.35	ESVNU-O-11	Maurey Guenec	Pyelonephritis in cats with ureteral obstruction: a retrospective study of 45 cases
12.35–12.50	ESVNU-O-12	Oliveira Leal	The medical perspective about the use of Subcutaneous Ureteral Bypass versus ureteral stent in feline ureterolithiasis management: a retrospective comparative study

ESVE – European Society of Veterinary Endocrinology

Friday 9 September

14.25–14.40	ESVE-O-1	Zini	Glucose concentrations following insulin-induced hypoglycemia in healthy cats and in cats with diabetes mellitus
14.40–14.55	ESVE-O-2	Fracassi	Comparison of lente insulin and nph insulin therapy for the treatment of newly diagnosed diabetic dogs
14.55–15.10	ESVE-O-3	Kieler	Healthy overweight and diabetic cats have increased levels of feline pancreatic lipase immunoreactivity
15.10–15.25	ESVE-O-4	Scudder	Molecular analyses of pituitary somatostatin and dopamine receptors in feline hypersomatotropism
15.25–15.40	ESVE-O-5	Arenas	Markers of pancreatic inflammation and lipid profile in dogs with diabetes mellitus
15.40–15.55	ESVE-O-6	Peterson	Thyroid cysts in cats: a retrospective study of 37 cases
16.30–16.45	ESVE-O-7	Williams	Does hypercalcitoninism contribute to hypocalcaemia in hyperthyroid cats?

16.45–17.00	ESVE-O-8	Peterson	Hyperthyroid cats develop transient or persistent subclinical hypothyroidism after successful radioiodine treatment
17.00–17.15	ESVE-O-9	Ramsey	The repeatability of various cortisol measurements in clinically stable dogs with hyperadrenocorticism being treated with trilostane
17.15–17.30	ESVE-O-10	Sanders	Steroidogenic factor-1 inverse agonists as a treatment modality of canine hypercortisolism: in vitro investigation
17.30–17.45	ESVE-O-11	Vicente Montaña	Long term follow up of dogs diagnosed with pitutary dependent hyperadrenocorticism treated by Gamma Knife radiosurgery
17.45–18.00	ESVE-O-12	Mason	Evaluation of the efficacy and safety of a new formulation of desoxycortone pivalate (DOCP) for treating primary hypoadrenocorticism (PH) in dogs either newly diagnosed with PH, or previously treated with fludrocortisone

ESCG – European Society of Comparative Gastroenterology

Friday 9 September

14.25–14.40	ESCG-O-1	Toresson	Methylmalonic acid concentrations in dogs with hypocobalaminemia treated with oral versus parenteral cobalamin supplementation
14.40–14.55	ESCG-O-2	Unterer	Long-term implications of canine parvovirus infection
14.55–15.10	ESCG-O-3	Suchodolski	Validation of a dysbiosis index to assess microbiota changes in fecal samples of dogs
15.10–15.25	ESCG-O-4	Williams	Microbiomic and metabolomic associations with increased serum pancreatic lipase (fPL) and trypsin-like immunoreactivity (fTLI) in geriatric cats with idiopathic chronic enteropathy (ICE)

Saturday 10 September

14.25–14.40	ESCG-O-5	Busch	Impact of different commercially available complete diets on the detectability of occult blood in faeces of cats
14.40–14.55	ESCG-O-6	Florey	Evaluation of Coeliac Disease Antibodies in Dogs with Chronic Enteropathies
14.55–15.10	ESCG-O-7	Castro-López	Expression of P-glycoprotein in the intestinal epithelium and lamina propria of cats with inflammatory bowel disease and alimentary lymphoma
15.10–15.25	ESCG-O-13	Freiche	Presumed acquired pyloric stenosis in cats: epidemiologic, clinical, histopathological and endoscopic data. A retrospective study of 34 cases
15.25–15.40	ESCG-O-9	Lamoureux	Endoscopic measurement of pyloric diameter in healthy cats A prospective study of 20 cases
15.40–15.55	ESCG-O-10	Kalenyak	Comparison of the microbiota of dogs suffering from inflammatory bowel diseases and food-responsive diarrhea
16.30–16.45	ESCG-O-11	Manz	Upregulation of signal transducer and activation of transcription (STAT)3 in dogs with inflammatory bowel disease (IBD)
16.45–17.00	ESCG-O-12	Luckschander	Clonality testing as an ajunct tool in canine chronic enteropathy patients
17.00–17.15	ESCG-O-8	Fabres	Identification of factors associated with short-term mortality in canine acute pancreatitis
17.15–17.30	ESCG-O-14	Allenspach	No linear correlation between Histopathological and Clinical Severity Grading in Canine Inflammatory Bowel Disease (IBD): 102 cases

17.30–17.45	ESCG-O-15	Herstad	How does inclusion of red meat in the canine diet affect the fecal microbiota? Results from high-throughput sequencing of the bacterial 16S rRNA gene
17.45–18.00	ESCG-O-16	Vessieres	Virulence Markers in Mucosa-Associated Escherichia coli from Dogs with Inflammatory Bowel Disease (IBD)

ESVIM – European Society of Veterinary Internal Medicine

Saturday 10 September

09.00–09.15	ESVIM-O-1	Swann	Evaluation of prognostic factors for mortality in dogs with non-regenerative forms of immune-mediated haemolytic anaemia
09.15–09.30	ESVIM-O-2	Zoia	Short-term response to human intravenous immunoglobulin (hIVIG) in the management of immune-mediated thrombocytopenia (IMT): a prospective cohort study in 27 dogs
09.30–09.45	ESVIM-O-3	Rehbein	Romiplostim treatment in 7 dogs with immune-mediated thrombocytopenia
09.45–10.00	ESVIM-O-4	Tress	Bacterial microbiome in the nose of healthy dogs and in dogs with nasal disease
10.00–10.15	ESVIM-O-5	Roels	Comparative analysis of the respiratory microbiota of healthy dogs and dogs with canine idiopathic pulmonary fibrosis
10.15–10.30	ESVIM-O-6	Viitanen	The Utility of Acute Phase Proteins in the Assessment of Treatment Response in Dogs with Bacterial Pneumonia
11.20–11.35	ESVIM-O-7	Vangrinsven	Investigation of laryngeal function and effect of surgery on laryngeal collapse in dogs with brachycephalic syndrome.
11.35–11.50	ESVIM-O-8	Lilja-Maula	Comparison of submaximal exercise test results and level of brachycephalic obstructive airway syndrome in the English Bulldog
11.50–12.05	ESVIM-O-9	Leshinsky	Pharmacokinetics of caspofungin in healthy cats
12.05–12.20	ESVIM-O-10	Canonne-Guibert	Detection of Aspergillus fumigatus by quantitative polymerase chain reaction assays in the bronchoalveolar lavage fluid of dogs with eosinophilic bronchopneumopathy
12.20–12.35	ESVIM-O-11	Spencer	Pyrexia in cats: a retrospective analysis of demographic characteristics, diagnostic investigations, diagnosis and influence of prior treatment in 106 cases
12.35–12.50	ESVIM-O-12	Swann	Evaluation of free magnesium concentration as a prognostic factor for mortality in dogs presented to a veterinary emergency service

ESVONC – European Society of Veterinary Oncology

Saturday 10 September

11.20–11.35	ESVONC-O-1	Mason	Big data: Presentation and treatment of companion animal neoplasia in UK first opinion practice
11.35–11.50	ESVONC-O-2	Fournier	Impact of pre-chemotherapy neutrophil count on chemotherapy administration and toxicity
11.50–12.05	ESVONC-O-3	Kreilmeier	Alternative lengthening of telomeres is used as telomere maintenance mechanism in various canine sarcomas
12.05–12.20	ESVONC-O-4	Boye	Dose escalation study to evaluate safety, tolerability and efficacy of intravenous etoposide phosphate administration (ETOPOPHOS®) in 27 dogs with multicentric lymphoma

12.20–12.35	ESVONC-O-5	Chamel	Case-control study of chemotherapy for the treatment of canine mesotheliomas : 16 cases
12.35–12.50	ESVONC-O-6	Mutsaers	Combination targeting of PI3 kinase and mTOR for treatment of canine melanoma

ESVCN – European Society of Veterinary Clinical Nutrition

Saturday 10 September

14.25–14.40	ESVCN-O-1	Scarpa	How does the nutritional assessment of dogs vary in a veterinary staff?
14.40–14.55	ESVCN-O-2	Paetau-Robinson	The body fat index chart is equivalent to DEXA for determination of percent body fat during weight loss and weight maintenance in dogs
14.55–15.10	ESVCN-O-3	Gómez Fernández-Blanco	Biochemical parameters related to the metabolic syndrome in healthy dogs and their relationships with body condition score
15.10–15.25	ESVCN-O-4	German	Clinicopathological findings in obese dogs before and after weight loss: a cohort study
15.25–15.40	ESVCN-O-5	Christmann	Effectiveness of a new dietetic food to achieve weight loss and to improve mobility in client-owned obese dogs with osteoarthritis
15.40–15.55	ESVCN-O-6	Aste	Early oral voluntary nutrition in anorexic critical ill dogs: a retrospective study in 137 dogs

POSTER RESEARCH COMMUNICATIONS

ISCAID – International Society for Companion Animal Infectious Diseases

ISCAID-P-1	Turan	Frequency and clinical, hematological and biochemical findings of feline immunodeficiency virus (fiv) and feline leukemia virus (felv) in cats, in Turkey
ISCAID-P-2	Greci	Lungworm occurrence in dogs and cats in Rome: a retrospective study (July 2010- March 2016)
ISCAID-P-3	Ali	The constituent profile of trans-tracheal wash fluid in complicated and non-complicated respiratory form of canine distemper infected dogs
ISCAID-P-5	Solano-Gallego	A descriptive study of clinical canine leishmaniosis in dogs vaccinated with CaniLeish
ISCAID-P-6	Leutenegger	Typing of Feline Coronavirus Biotypes in Cats with Fever of Unknown Origin
ISCAID-P-7	Breu	Seroprevalence of antibodies to Tick-borne encephalitis virus in 433 dogs with neurological signs
ISCAID-P-8	Yilmaz	Prevalence and Phylogenetic Analysis of Feline Morbillivirus in Cats in Istanbul, Turkey
ISCAID-P-9	Dorn	Bacterial microbiome in the nose of healthy cats and in cats with nasal disease
ISCAID-P-11	Dorn	Natural infection with Angiostrongylus vasorum in 23 dogs in Berlin/Brandenburg – a retrospective case series (2013-2016)
ISCAID-P-12	Crisi	Single and mixed feline lungworm infections: clinical, radiographic and therapeutic features of twenty-six cases (2013-2015)
ISCAID-P-13	Hapke	Evaluation of a Point of Care Rapid IgM Detection Test (WITNESS® Lepto) for Diagnosis of Canine Leptospirosis
ISCAID-P-14	Pomba	Nosocomial faecal colonization by extended-spectrum ß-lactamase producer Gram-negative bacteria in healthy dogs

SCH – Society of Comparative Hepatology

SCH-P-1	Grobelna	Real-time assessment of canine liver function: Variation of transcutaneously determined indocyanine green plasma disappearance rate (ICG-PDR) in healthy dogs
SCH-P-2	Nakata	Hybrid coil embolization technique for portosystemic shunt occlusion in five animals

ESVC – European Society of Veterinary Cardiology

ESVC-P-1	Pariaut	Rapid right ventricular pacing for interventional procedures in dogs: safety and rate titration
ESVC-P-2	Peyrou	Effect of benazepril and pimobendan on serum angiotensin-converting enzyme activity in dogs
ESVC-P-4	Rishniw	TAPSE-to-aortic ratio provides a bodyweight-independent assessment of right ventricular systolic function
ESVC-P-5	Noszczyk-Nowak	Analysis of hematlogical and biochemical blood parameters in dogs after electrical cardioversion of atrial fibrillation in dogs
ESVC-P-6	Noszczyk-Nowak	Short-term heart rate variability (HRV) in dogs with sick sinus syndrome compare with healthy dogs
ESVC-P-7	Kocaturk	Serum choline concentration: a potential biomarker for myocardial ischemia in dogs and cats
ESVC-P-8	Caivano	Right ventricular outflow tract fractional shortening: a new echocardiographic index of the right ventricular systolic function
ESVC-P-9	Marchesotti	Comparison of M-mode and two-dimensional echocardiography in evaluating the left atrium to aorta ratio in cats
ESVC-P-10	Locatelli	Survival and prognostic factors in cats with restrictive cardiomyopathy: a review of 103 cases
ESVC-P-11	Domanjko Petric	Plasma coenzyme Q10 concentration does not predict survival in canine cardiovascular patients
ESVC-P-12	Domanjko Petric	Inflammatory markers (TNF-alpha, IL-6, CRP) in dogs in congestive heart failure
ESVC-P-13	Fox	Characterization of atrial and ventricular pathology in feline hypertrophic and dilated cardiomyopathy
ESVC-P-14	van Meeuwen	Echocardiographic findings in 87 apparently healthy adult Bull Terriers
ESVC-P-15	Vollmar	Findings from Electrocardiography in Irish Wolfhounds with and without Cardiomyopathy
ESVC-P-17	Birettoni	Pulmonary vein-to-pulmonary artery ratio helps identify dogs with congestive heart failure secondary to mitral valve disease
ESVC-P-18	Thorn	Pilot study of the feasibility, safety, and tolerance of subcutaneous synthetic canine B-type natriuretic peptide in healthy dogs and dogs with stage B1 myxomatous mitral valve disease
ESVC-P-19	McDonald	Use of Torasemide in Cats for Congestive Heart Failure
ESVC-P-20	Savarese	Iron status in dogs with mitral valve disease
ESVC-P-21	Roels	Relationship between One-dimensional Left Atrial phasic function and post-capillary pulmonary hypertension in dogs with Degenerative mitral valve disease
ESVC-P-22	Sebastian	Prevalence and Association of Mineralisation of the Heart and Great Vessels in Dogs on Computed Tomographic Imaging
ESVC-P-23	Saftencu	Heart rate variability in dogs with chronic kidney failure
ESVC-P-24	Szatmári	A new standardized method for semi-quantitative assessment of left atrial size on canine thoracic radiographs
ESVC-P-25	Turgut	Quantification of mitral regurgitation in Anatolian shepherd dogs with asymptomatic degenerative mitral valve disease

ESVNU – European Society of Veterinary Nephrology and Urology

ESVNU-P-1	Bruni	Effectiveness of a feed supplement to control hyperphosphatemia and metabolic acidosis in advanced stages of feline Chronic Kidney Disease (CKD)
ESVNU-P-2	Bouzouraa	Relationship and clinical relevance of urine osmolality and specific gravity in healthy cats receiving various intravenous solutes
ESVNU-P-3	Bouzouraa	Formula for estimation of urine osmolality in healthy cats
ESVNU-P-4	Yerramilli	Symmetric Dimethylarginine (SDMA) As Kidney Biomarker In Canine And Feline Cancer
ESVNU-P-5	Serres	Acute renal failure secondary to leptospirosis in 29 dogs: impact of intermittent hemodialysis and other pronostic factors on survival
ESVNU-P-6	Oscarson	Comparison of bacterial cultures from three urine collection methods and ejaculates in healthy dogs
ESVNU-P-7	Cross	Performance evaluation of two commercially available symmetric dimethyl arginine (SDMA) assays
ESVNU-P-8	Dokuzeylül	The evaluation of enzymuria and microalbuminuria in dogs with lower urinary tract disorders
ESVNU-P-9	Dahlem	Plasma symmetric dimethylarginine (SDMA) concentration in dogs with acute kidney injury (AKI) and chronic kidney disease (CKD)
ESVNU-P-10	Manczur	Microalbuminuria in healthy dogs
ESVNU-P-11	Cocci	Transurethral ultrasound guided biopsy of urinary bladder lesions in male dogs: six cases
ESVNU-P-12	Pérez-Accino Salgado	Evaluation of a urine dipstick test and urine specific gravity together for confirmation or exclusion of proteinuria in cats
ESVNU-P-13	Lavoué	Presence of active urine sediment in dogs is not associated with significant changes of urine protein-to-creatinine ratio

ESVE – European Society of Veterinary Endocrinology

ESVE-P-1	Peterson	Validation of an in-clinic point-of-care immunoassay for measurement of total thyroxine (TT4) concentration in serum from euthyroid and hyperthyroid cats
ESVE-P-2	Nivy	The contribution of baseline cortisol measurement in the interpretation of the ACTH stimulation test in the diagnosis of canine spontaneous hyperadrenocorticism: a retrospective study of 73 cases
ESVE-P-3	Mclean	Prevalence of and risk factors for feline hyperthyroidism in South Africa
ESVE-P-4	Rochel	Clinical and biological evaluation of 66 hyperthyroid cats treated with iodine-deficient diet
ESVE-P-5	Clares Moral	Urinary tract infecctions in dogs with diabetes mellitus and/or hyperadrenocorticism: frequency, treatment and follow up
ESVE-P-6	Garcia	Use of simvastatin in dogs with hyperlipidemia
ESVE-P-7	Wolff	A side-by-side comparison of two assays for measuring canine and feline total thyroxine (TT4)
ESVE-P-8	García San José	Prevalence of hypertension in dogs with hyperadrenocorticism at diagnosis
ESVE-P-9	Mason	Evaluation of the efficacy and safety of a new formulation of desoxycortone pivalate (DOCP) for treating primary hypoadrenocorticism (PH) in client-owned dogs
ESVE-P-10	Hugonnard	First-line therapeutic choice and one-year follow up of 74 French newly diagnosed hyperthyroid cats in private practice: a prospective study
ESVE-P-11	Fracassi	Cushing's syndrome – An epidemiological study based on an Italian canine population of 21,281 dogs
ESVE-P-12	Öhlund	Elucidating Risk Factors for Feline Diabetes Mellitus

ESVE-P-13	Pérez Alenza	Evolution of systolic blood pressure in dogs with hyperadrenocorticism during the first six months of treatment with trilostane
ESVE-P-14	Selgas	Use of hydrocortisone in a cohort of dogs in the management of Addisonian crisis

ESCG – European Society of Comparative Gastroenterology

ESCG-P-1	McLean	Primary gastro-intestinal disease in cats and dogs with gastro-intestinal foreign bodies: 28 cases
ESCG-P-2	Cerquetella	Fecal microbiome and predicted gene function in Czechoslovakian Wolfdogs fed with either a bone and raw food diet or a commercial diet
ESCG-P-3	Oliveira Leal	Granulomatous colitis: more than a canine disease?
ESCG-P-4	Candido	Breed association of endoscopically diagnosed gastric neoplasia and metaplasia in purebred dogs – a retrospective study
ESCG-P-5	Freiche	Is f-PL value associated with mortality in feline chronic pancreatitis? A retrospective cohort of 19 cases
ESCG-P-6	Hugonnard	Agreement of feline and canine pancreas-specific lipase with pancreatic ultrasonographic findings in 62 cats and 54 dogs with suspicion of pancreatitis: a retrospective study (2007-2013)
ESCG-P-7	Pietra	Inflammatory bowel disease in dogs: Prognostic factors for therapeutic response
ESCG-P-8	Castro-López	Expression of cyclooxigenase 2 in the small intestinal epithelium of cats with inflammatory bowel disease and low grade alimentary lymphoma
ESCG-P-9	Konstantinidis	Expression of selected cytokines and CCL28 in colonic mucosa and mucus and correlation with clinical and endoscopic activity in canine lymphocytic- plasmacytic colitis
ESCG-P-10	Heilmann	Effect of antacid therapy and biological variation of serum gastrin concentrations in dogs with chronic enteropathy

ESVIM – European Society of Veterinary Internal Medicine

ESVIM-P-1	Bremer	C-reactive protein concentrations in Nova Scotia Duck Tolling Retrievers with an SLE-related disease
ESVIM-P-2	Miglio	Canine stored whole blood units: which is the real extent of bacterial contamination risk?
ESVIM-P-3	Lin	Quantificational assessment of ventilatory function in cats with respiratory distress
ESVIM-P-4	Vessieres	Pleural effusion in cats: 465 cases (2009-2014)
ESVIM-P-5	Slovak	Clinical Evaluation and Pharmacodynamics of Healthy Cats after Multi-Day Intravenous Dosing of Mycophenolate mofetil
ESVIM-P-6	Lubas	Primary immune-mediated hemolytic anemia: a retrospective study of 52 dogs from two veterinary teaching hospitals
ESVIM-P-7	Perego	Clinical efficacy of autologous platelet-rich plasma (prp) in canine perianal fistulas and aural hematomas
ESVIM-P-8	Hansson-Hamlin	Immunoglobulin A in Nova Scotia duck tolling retrievers with immune mediated disorders
ESVIM-P-9	Roels	Investigation of the coagulation system in canine idiopathic pulmonary fibrosis
ESVIM-P-10	Ruggerone	References intervals in Shetland Sheepdogs: is primary hyperlipidemia a real feature in this breed?
ESVIM-P-11	Timpano	A novel endoscopic laryngeal finding related to bronchial foreign bodies- retrospective study on 227 dogs

ESVONC – European Society of Veterinary Oncology

ESVONC-P-1	Calazans	Electrochemotherapy: efficacy of bleomycin plus doxorubicin protocol in dogs with squamous cell carcinoma
ESVONC-P-2	Bayle	Cellular pathway analysis of a turmeric and rosemary extract combination treatment on canine neoplastic cell lines
ESVONC-P-3	Arendt	Identification of germ-line genetic risk factors for development of cancer in golden retrievers
ESVONC-P-4	Pratscher	Phagocytic activity and metastatic potential of primary canine oral melanoma cell lines
ESVONC-P-6	Campigli	Assessment of the coagulation profile in canine multiple myeloma: a cohort investigation in 234 dogs

ESVCN – European Society of Veterinary Clinical Nutrition

ESVCN-P-1	Koizumi	A survey on the body condition score model for dog to clinical veterinarians and dog owners
ESVCN-P-2	Paetau-Robinson	The new body fat index chart as an alternative, non-invasive method to estimate percent body fat compared to DEXA during weight loss and weight maintenance in obese cats

VBPS – Veterinary Blood Pressure Society

VBPS-P-1	Martinelli	Comparison of high-definition oscillometric and wrist blood pressure monitor for arterial blood pressure measurements in dogs

ISCAID – International Society for Companion Animal Infectious Diseases

ISCAID-O-1

SENSITIVITY AND SPECIFICITY OF A RAPID POLYMERASE CHAIN REACTION FOR THE DIAGNOSIS OF CANINE LEISHMANIASIS.

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Canine leishmaniasis is an important infectious disease worldwide. Although commonly used, antibody tests are often falsely negative, and direct detection of the pathogen, such as polymerase chain reaction (PCR) is necessary. However, PCR is only performed in specialized laboratories and not available in less developed countries. The aim of this study was to evaluate sensitivity and specificity of a rapid in-house PCR for the diagnosis of canine *Leishmania infantum* infection.

Prospectively, 515 samples of 251 dogs (201 EDTA blood samples, 244 conjunctival swabs, 19 lymph node aspirates, 51 bone marrow aspirates) were analysed for the presence of *Leishmania* DNA using the PCRun System (Biogal, Galed Labs. Acs Ltd., Kibbutz Galed, Israel). The results were compared to those of a real time PCR (gold standard) for the identification of *Leishmania* kinetoplast DNA minicircle. DNA extraction was conducted using DNeasy Blood & Tissue kit (Qiagen GmbH). Sensitivity and specificity with 95% confidence range (CI 95%) were determined.

Specificity was 100% for all samples examined. Overall sensitivity of the PCRun was 36.5% (CI 95% 28.4–44.6). It was 57.1% (CI 95% 35.9–78.2) in bone marrow aspirates, 58.8% (CI 95% 35.4–82.2) in lymph node aspirates, 46.9% (CI 95% 32.9–60.9) in conjunctival swabs, and 10.0% (CI 95% 1.7–18.3) in blood. The test was easy to perform and provided unambiguous results. In conclusion, the test is recommended for use in practice, and a positive result is proving an infection. A negative result, however, does not exclude infection and therefore requires further diagnostics.

Disclosures: The study was financed by Biogal (Galed Labs. Acs Ltd., Kibbutz Galed, Israel).

ISCAID-O-2

PREVALENCE AND RISK FACTORS FOR FELIS CATUS GAMMAHERPESVIRUS 1 INFECTION AMONG PET CATS IN THE UNITED KINGDOM.

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Felis catus gammaherpesvirus 1 (FcaGHV1) is the first gammaherpesvirus (GHV) to be identified in domestic cats. Prevalence studies have identified this virus in domestic cats in the USA, Australia, Singapore and, most recently, Central Europe, but no data are available for UK cats. The consequences of FcaGHV1 for feline health are yet to be elucidated but in other species, GHV infections are typically clinically silent unless there is immune dysfunction in the natural host, in which case they can cause a range of lymphoproliferative and neoplastic diseases. The aim of this study was to determine the prevalence and risk factors for FcaGHV1 infection in pet cats in the UK.

Residual DNA from whole blood submitted to the Molecular Diagnostic Unit, Langford Veterinary Services, University of Bristol, for quantitative polymerase chain reaction (qPCR) testing for haemoplasmas was available for study. DNA from 90 samples testing positive for at least one haemoplasma species and 109 haemoplasma negative samples was shipped to Australia where a qPCR targeting the glycoprotein B gene of FcaGHV1 was performed. The operator (AM) was blinded to sample data (age, sex, neuter status, breed, haemoplasma PCR result). Univariable and multivariable logistic regression analyses were conducted to investigate the association of variables with FcaGHV1 detection. A *P*-value <0.05 was considered to be significant.

FcaGHV1 infection was detected in 23 (11.56%; 95% confidence interval [CI]: 7.47–16.84) of the 199 blood samples from UK cats. Entire male cats were more likely to be FcaGHV1 positive than neutered male cats (odds ratio 3.60, 95% CI: 1.22–10.46). Twenty-one of the 23 (91%) FcaGHV1 positive cats were coinfected with at least one haemoplasma species while only 69 of the 176 (39%) FcaGHV1 negative cats harboured haemoplasma DNA. Samples positive for DNA from any of three haemoplasma species had 19 times greater odds to test positive for FcaGHV1 than haemoplasma negative cats in multivariable analyses after adjusting for age, sex and neuter status of cats.

This study demonstrates that domestic cats in the UK can be infected with FcaGHV1, confirming that this virus is globally endemic. The identification of neuter status as a risk factor for FcaGHV1 detection provides novel evidence to support transmission of this virus during territorial encounters.

Disclosures: Disclosures to report.

Statement of Disclosure for ST: In the past ST has received financial support for haemoplasma research from Zoetis Animal Health and for vector-borne disease research from Bayer Animal Health.

ST receives financial support for current infectious disease research from BSAVA Petsavers, Langford Trust, Petplan Charitable Trust, Morris Animal Foundation, Dogs Trust, South West Biosciences DTP and Langford Veterinary Services Clinical Research Fund.

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ST is a member of the European Advisory Board on Cat Diseases, which is supported by Merial.

ST works for the Molecular Diagnostic Unit, Langford Veterinary Services, University of Bristol, which carried out the haemoplasma PCRs described in the study.

ST has been paid for providing continuing professional development for not-for-profit organisations, and occasionally for commercial companies, around the world.

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AM is supported by an Australian Postgraduate Award from the Australian Government Department of Education and Training.

JB receives financial support from the Morris Animal Foundation for oncogenic virus discovery.

JB's research is supported by speaker honoraria for continuing education provided to the Australian Veterinary Association, Australian Small Animal Veterinary Association and WSAVA.

ND provides consultancy services to Boehringer Ingelheim and Merial.

SS has no disclosures to report.

ISCAID-O-3

DETECTION RATE OF VIRAL AND BACTERIAL PATHOGENS AS WELL AS HELMINTHS ASSOCIATED WITH RESPIRATORY TRACT DISEASE IN AUSTRIAN DOGS.

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Multiple pathogens have been reported as potential causative agents of canine infectious respiratory disease complex (CIRDC) in dogs. The purpose of this study was to survey the occurrence of well-known and newly emerging pathogens in dogs with respiratory disease in and around Vienna, Austria.

Included in this study were 214 dogs (privately-owned or kennel-kept) that presented with acute or chronic signs of respiratory disease. Swabs of the nasal mucosa and tonsils from all animals as

well as bronchoalveolar lavage fluid (BALF) from 31 dogs were evaluated via bacterial culture and PCR for viral agents [*Canine parainfluenza virus* (CPiV), *Canine respiratory coronavirus* (CRCoV), *Canine adenovirus type 2* (CAV-2), *Canine distemper virus* (CDV), *Canine influenza virus* (CIV)]. In addition, paired serum samples were obtained from 30 acutely diseased dogs for serological testing for CRCoV antibodies via immunoflourescence antibody test (IFAT). Fecal samples from 133 dogs were examined for *Crenosoma vulpis* and *Angiostrongylus vasorum* by Baermann technique. Swabs and fecal samples from 50 clinically healthy dogs serving as a control group were obtained and evaluated as described above.

In 15.9% (n = 34) of the dogs, pathogens could be isolated from nasal and/or tonsillar swabs. 2.3% (n = 5) showed mixed infections. CRCoV was detected in 7.5% (n = 16), CPiV in 6.5% (n = 14) and CAV-2 in 0.5% (n = 1) of the dogs. In BALF, one dog tested positive for CDV. No evidence of CIV strains was found in any of the obtained samples. In 3.3% (n = 7) of the dogs, *Bordetella bronchiseptica* was detected, in three of these in nasal, tonsillar and BALF samples concurrently. Five bacterial isolates showed particular resistance to antibiotics. *Mycoplasma cynos* was recovered from BALF of 9.7% (n = 3) and swabs of 0.5% (n = 1) of the dogs respectively. A significant CRCoV antibody titer increase was detected in 56.7% (n = 17) of the paired serum samples collected (n = 30). Concurrently, eight of these dogs revealed CRCoV specific nucleic acid in obtained swabs. Fecal examination detected *C. vulpis* infection in 2.3% (n = 3) of the samples.

CRCoV seems to be an emerging respiratory pathogen in Austrian dogs with CIRDC. In contrast to other studies, the incidence of *B. bronchiseptica* infection in this study was low. Though *M. cynos* is considered as a co-factor in respiratory diseases in dogs, its occurrence was rare in this study.

Disclosures: No disclosures to report.

ISCAID-O-4

THE ROLE OF THE DOG IN THE EPIDEMIOLOGY OF LEPTOSPIROSIS IN SWITZERLAND–SEROPREVALENCE AND URINARY SHEDDING OF PATHOGENIC LEPTOSPIRES.

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Leptospirosis is an important worldwide zoonosis. While human leptospirosis remains rare in Switzerland, the incidence of canine leptospirosis is unusually high compared to other European countries and severe forms associated with pulmonary haemorrhage are common. The aims of this prospective study were to determine the exposure of apparently healthy dogs to pathogenic *Leptospira* spp in Switzerland and to examine whether dogs contribute to the spread of pathogenic *Leptospira* spp via urinary shedding.

Ethical approval was obtained for the study protocol. Sampling was stratified to cover the whole of Switzerland (n = 458). Samples were collected between April and December 2015. Inclusion criteria were: no clinical signs of leptospirosis, no anti-leptospiral vaccination within the last 16 weeks and no antibiotic treatment within the last month. Sera were tested by the microscopic agglutination test (MAT) for antibodies against serovars Grippotyphosa, Australis, Pomona, Tarassovi, Canicola, Icterohaemorrhagiae, Hardjo, Bratislava, Autumnalis, Altodouro, Copenhageni, Pyrogenes and Ballum. Urine was tested for pathogenic *Leptospira* spp using a LipL32 real time PCR (PCR).

Of 377 sera, 55.7% (CI 0.51–0.61) showed a reciprocal MAT titre of 1:40 and 24.9% (CI 0.21–0.3) of ≥1:100 to at least one serovar. Seropositivity (MAT ≥1:100) was most common to serovar Australis (14.9%; CI 0.06–0.12), Bratislava (8.8%; CI 0.11–0.19), Copenhageni (6.5%; CI 0.04–0.1), Canicola (5.7%; CI 0.03–0.09), Grippotyphosa (4.5%; CI 0.03–0.07)), Pomona (4%; CI 0.02–0.06), Autumnalis (2.7%; CI 0.01.0.05) and Icterohaemorrhagiae (1.6%; CI 0.01–0.05). Seropositivity was inversely correlated with the time since last anti-leptospiral vaccination ($P < 0.001$). In unvaccinated dogs (n = 87) the overall prevalence of a MAT titre ≥100 was 17.2% (CI 0.01–0.27), The serovars which sera reacted with were Australis (9%; CI 0.04–0.17), Bratislava (8.0%; CI 0.03–0.16), Copenhageni (3.8%; CI 0.01–0.11), Grippotyphosa (3.4%; CI 0.01–0.1), Canicola (3.0%; CI 0.01–0.12), Pomona (2.3%; CI 0–0.08) and Autumnalis (2.3%; CI 0–0.06). Urine PCR was performed in 408 dogs, only one of which had a positive PCR result (0.25%; CI 0–0.01).

These results suggest that anti-leptospiral vaccination leads to MAT seropositivity beyond 16 weeks post vaccination. Results from unvaccinated dogs show that dogs in Switzerland are commonly exposed to pathogenic *Leptospira* spp. without developing signs of disease. However, based on our findings urinary shedding of pathogenic leptospires by healthy dogs appears to be uncommon.

Disclosures: No disclosures to report.

ISCAID-O-5

CHARACTERISATION OF ANGIOSTRONGYLUS (A.) VASORUM INFECTED DOGS WITH EXCESSIVE BLEEDING AS PRIMARY CLINICAL COMPLAINT.

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The clinical presentation of *A. vasorum* infected dogs is most variable. Unexplained, excessive bleeding was the primary complaint in 15 infected dogs and observed in the mouth (n = 4), as external bleeding (n = 4), as large subcutaneous hematoma (n = 4), as hemoptysis (n = 4), as brain hemorrhage (n = 3), as hemoabdomen post ovariectomy (n = 2), and as epistaxis, around the eye and on the tracheal tube in 1 each. In 8 dogs the cause of bleeding initially was suspected to be minor trauma or surgical mistake and various surgical approaches were undertaken for problem solving. Four dogs had received NSAIDs before bleeding prompted referral.

Thrombocytopenia, lowest 33,000 /ul, was found in 7 of 14 dogs. Coagulation times were obtained in 14; PT was prolonged in 8 of 10, PTT in 6 of 11, ACT in 3 of 3, TT in 2 of 5, fibrinogen (Claus method) was below detection limit in 4 of 8, and buccal mucosal bleeding time was normal in 3 of 3. With one exception, at least one test was abnormal, but only mildly prolonged.

The median time elapsed between the first recognized clinical signs attributed to *A. vasorum* until diagnosis was 2 weeks (range1 day to 4 months); in only 2 dogs *A. vasorum* was the prime suspect at presentation. Respiratory signs occurred 10 days, 2 and 3 months after first bleeding in 3, occurred concurrently with bleeding in 1 (hemoptysis) and were absent in 8 dogs. In only 3 dogs cough was present before bleeding prompted referral, for 1 and 3 months in 2 with hemoptysis and for 3 months in 1 with bleeding from the lip. Most non-coughing dogs had only mild non-specific radiographic abnormalities.

Eleven dogs recovered quickly and uneventfully after initiation of appropriate therapy. Four dogs died, 3 on the day of admission and 1 dog 4 days after; causes of death were respiratory failure and cerebral hemorrhage (in 2 dogs each). Of 4 dogs pretreated with NSAIDs 2 presented with severe hemoptysis (1 died), 1 with brain hemorrhage (died), and 1 with peritarsal hematoma and marked anemia.

Bleeding may be the only recognized abnormality in *A. vasorum* infection. The cause of bleeding likely varies in individual dogs, and may be a combination of thrombocytopenia, (iatrogenic) abnormal platelet function, utilization of coagulation factors and hyperfibrinolysis. Without a high index of suspicion, the diagnosis may be delayed to the point of fatal outcome.

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ISCAID-O-6

C. PERFRINGENS TYPE A NETE AND NETF TOXINS ARE ASSOCIATED WITH BLOODY DIARRHEA IN DOGS. C. Leutenegger[1], M. Estrada[1], M. Seguin[1], J. Prescott[2]. [1]IDEXX Laboratories, Inc., West Sacramento, USA, [2]Department of Pathobiology, University of Guelph, Guelph, Canada

NetE and netF toxins of type A Clostridium perfringens have recently been described in acute hemorrhagic and necrotizing gastroenteritis in dogs.

Here we present a clinical validation of these toxins in 901 dogs including 200 healthy, 618 with non-bloody diarrhea and 83 with bloody diarrhea. A comprehensive canine diarrhea panel was used to analyze 9 well known infectious agents involved in causing or contributing to canine diarrhea, seven C. perfringens toxins (alpha, beta, beta-2, enterotoxin, netE, netF, and netG) and two C. difficile toxins (A&B).

Significant associations to bloody diarrhea were found with canine parvovirus 2 and C. perfringens toxins netE and netF. NetE was found in 16.9% of blood diarrhea compared to 6.6% in non-bloody diarrhea ($P = 0.0017$) and in 2.5% of healthy dogs ($P = 0.0001$). NetF was found in 15.7% of bloody diarrhea ($P = 0.0004$), 5.0% of non-bloody diarrhea ($P = 0.0002$), and 2.% of healthy dogs. NetF results were highly similar to netE.

An interesting association was also found when toxin genes were analyzed quantitatively between groups: netE was found at the lowest level in healthy dogs (avg Ct value 36.47) but at significantly elevated levels in non-bloody diarrhea dogs (avg 28.16, $P = 0.0128$) and bloody diarrhea dogs (avg 24.52, $P = 0.0036$). A similar quantitative disease association was found with the C. perfringens alpha toxin, which is thought to be ubiquitously present in type A strains.

Quantitative assessment of toxin genes in C. perfringens therefore allows to establish disease association and should be included into the results of diagnostic panels.

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CML, MME and MAS are employees of Idexx Laboratories, Inc.

ISCAID-O-7

DETERMINATION OF *LEPTOSPIRA* ANTIBODY TITERS BY MICROSCOPIC AGGLUTINATION TEST (MAT) IN DOGS AFTER VACCINATION WITH A TETRAVALENT LEPTOSPIROSIS VACCINE. H. Hapke[1], A. Mayer-Scholl[2], M.G. Doherr[3], H.L. Klaasen[4], E. Luge[2], D. Sutton[5], K. Nöckler[2], B. Kohn[1]. [1]Small Animal Clinic, Faculty Veterinary Medicine, Freie Universität of Berlin, Berlin, Germany, [2]Federal Institute for Risk Assessment, Berlin, Germany, [3]Institute for Veterinary Epidemiology und Biometry, Freie Universität of Berlin, Berlin, Germany, [4]Global Companion Animals Research and Development, MSD Animal Health, Boxmeer, The the Netherlands, [5]Global Marketing Department, MSD Animal Health, Milton Keynes, UK

Nowadays, leptospirosis in dogs is often caused by infection with serovars of the serogroups Australis (Aus), Grippotyphosa (Gri) and Pomona (Pom) in addition to serovars of serogroups Icterohaemorrhagiae (Ict) and Canicola (Can). Therefore, bivalent vaccines containing only serovars of the serogroups Can and Ict no longer provide adequate protection.

Aim of the study was to determine the development of antibody titers against vaccine and non-vaccine serovars in healthy dogs after vaccination with a tetravalent leptospirosis vaccine (Nobivac® L4) for one year.

80 healthy dogs were included into this prospective, monocentric cross-sectional study. Inclusion criteria was an initial MAT titer <1:100 for 17 *Leptospira* serovars. Dogs were vaccinated twice, at week 0 (w-0), and week 4 (w-4) with Nobivac® L4. In total, 5 serum samples per dog were taken over a year at w-0, w-4, w-12, w-26 & w-52 and MAT was performed.

Out of 80 dogs tested, 48 were initially MAT negative, 22 had titers >0 < 1:100 and 10 ≥ 1:100. The most common serovars were Can, Copenhageni (Cop) and Ict. Analysis of complete MAT courses was possible for 59 dogs. The titers in w-4 for the serovars Cop, Bratislava (Bra) and Gri were 0–1:800, median 1:100, lower titers were detected for serovars Can (0–1:400, median 1:50), Aus (0–1:200, median 1:25) and Ict (0–1:800, median 1:25). A significant decrease in titer for all tested serovars was observed in w-12. In w-26, 70% had titers <1:100; one year after initial vaccination 90% had no MAT titers ≥1:100.

The highest MAT titers were found 4 weeks after initial vaccination for the serovars Cop, Bra, Gri and Ict (1:800). Potentially higher antibody titers between the second vaccination in w-4 and the next blood draw in w-12 are likely to have occurred. One year after the first vaccination, 10% were still MAT positive (≥1:100) for at least one serovar. However, antibody titers induced by leptospiral vaccines, their height and persistence do not allow conclusions on immunity.

Disclosures: The study was sponsered by MSD. MSD is the producer of the vaccine Nobivac L4. The co-authors D. Sutton and HL. Klaasen are employees of MSD.

ISCAID-O-8

IMPLICATION, CLINICAL AND BIOLOGICAL IMPACT OF VECTOR-BORNE PATHOGENS IN ANEMIC DOGS: A PROSPECTIVE STUDY OF 134 CASES. T. Bouzouraa, J.L. Cadoré, J. Chêne, I. Goy-Thollot, M. Hugonnard, F. Ponce, K. Chalvet-Monfray, L. Chabanne. VetAgro Sup Lyon, Marcy l'étoile, France

Anemia is frequent in dogs and results from many clinical conditions that must be determined to allow for appropriate treatment and improve prognosis. Among reported causes, Vector-Borne Pathogens (VBPs) are emerging in Europe. Only 2 retrospective studies described the frequency of *infectious anemia* with 35/456 (7.68%) and 287/2037 (14.1%) cases, respectively. As screening for VBPs was not systematic, their occurrence might have been underestimated. There are, no published prospective studies using comprehensive PCR assessment to evaluate the implication of VBPs in anemic dogs.

We prospectively assessed the occurrence, clinical and biological impact of VBPs in anemic dogs, over 1 year, in a French Veterinary Teaching Hospital. The causes of anemia were also reported. Anemic client-owned dogs were included when Hematocrit (Ht) ≤ 37% and Hemoglobin (Hb) ≤ 12 g/dL and excluded if given doxycycline or imidocarb propionate within one month before appointment. We performed PCRs (*Ehrlichia canis*, *Anaplasma platys*/*phagocytophilum, Babesia*/*Theileria* spp, *Hepatozoon* sp., *Mycoplasma haemocanis* (MH)/*Candidatus* M.haematoparvum, *Leishmania* spp) and serological tests (SNAP®4Dx, SNAP®Leish). Signalment, history, treatments, clinical, laboratory and diagnostic-imaging findings were recorded. Three board-certified specialists determined the etiology of anemia (clinical pathologist, oncologist and internist). VBP-associated anemia (VBPAA) cases were those with positive PCR results.

Over 1 year, 155/7038 dogs were anemic (2.20%, CI, 1.87–2.57), 21 were excluded because of previous doxycycline or imidocarb proprionate administration. Bernese Mountain dogs were overrepresented as compared with the canine hospital population for the period ($P = .01$). VBPAA represented 26/134 cases (19.4%, CI, 13.1–27.1) whereas 10 (7.46%, CI, 3.63–13.3) and 1 (0.75%, CI, 0.02–4.09) dogs had positive SNAP®4Dx and SNAP®Leish, respectively. VBPAA cases included 11 dogs with positive PCR for MH (42.3%), 9 babesiosis (34.6%), 2 babesiosis positive for MH, 2 thrombocytic anaplasmosis (7.69%), 1 monocytic ehrlichiosis and 1 leishmaniasis (3.85%). VBPAA represented the first cause of hemolysis (14/44, 31.8%). In the mutivariable regression model, clinical findings didn't differ between VBPAA and non-VBPAA cases. VBPAA cases showed less severe and more regenerative anemia and more important leucocyte count, than non-VBPAA cases ($P < .005$).

The frequency of VBPAA (19.4%) appears higher than those previously reported and VBPAA cases appear less severe than non-VBPAA cases. MH is the most frequent VBP encountered, especially in oncologic cases (10/13), but its frequency is similar to that reported in healthy French dogs (15.4%). Although the findings are limited by geographic location and activity of the hospital (referral), this study suggests considering VBPs while facing anemic dogs.

Disclosures: No disclosures to report.

ISCAID-O-9

THE ROLE OF CANINE CIRCOVIRUS IN ACUTE HAEMORRHAGIC DIARRHOEA SYNDROME AND ITS IMPACT ON CANINE PARVOVIRUS INFECTION. A.L. Proksch[1], A. Anderson[1], K. Hartmann[1], C.M. Leutenegger[2], R.S. Mueller[1], S. Unterer[1]. [1]Clinic of Small Animal Medicine, Munich, Germany, [2]IDEXX laboratories, Inc., West Sacramento, California, USA

Acute haemorrhagic diarrhoea syndrome (AHDS) is a well-known disease, but its exact pathogenesis is still unclear. Recently, a canine circovirus (DogCV) was detected, which might potentially play a primary role or represent a co-factor in the development of AHDS. Thus, the aims of this study were (1) to determine the prevalence of DogCV in healthy dogs, dogs with AHDS, and dogs with canine parvovirus (CPV) infection and (2) to evaluate the pathogenic role of DogCV in these patient groups.

A total of 175 dogs (55 dogs with AHDS, 66 healthy dogs, 54 CPV-positive dogs) were included. Faecal samples were tested by two real-time TaqMan PCR assays targeting DogCV replicase and capsid genes. For comparison between DogCV-positive and DogCV-negative dogs, a standardized evaluation of clinical parameters and faecal consistency was performed daily during hospitalization.

There was no significant difference between the three groups in the prevalence of DogCV (healthy dogs: 3/66 (4.6%); dogs with AHDS: 2/55 (3.6%), dogs with CPV-infection: 7/54 (12.3%)). However, within the CPV-infected group, DogCV-positive dogs had a significantly higher mortality rate compared to DogCV-negative dogs, while time to recovery was not significantly affected.

In conclusion, DogCV can be detected in the faeces of healthy dogs and does not seem to be a primary cause for AHDS. However, presence of DogCV might influence severity and mortality rate in dogs with severe intestinal barrier destruction, which occurs in CPV infection.

Disclosures: No disclosures to report.

ISCAID-O-10

LEUCOFELIGEN® FELV/RCP VACCINE PREVENTS PERSISTENT VIREMIA IN CATS EXPOSED TO A PATHOGENIC FELV STRAIN THREE YEARS AFTER THE LAST ANNUAL VACCINE INJECTION. C. Fontaine, S. Arcidiaco, C. Lesbros, V. Martin, S. Gueguen. VIRBAC, Carros, France

Feline Leukaemia Virus (FeLV) is ubiquitous. The prognosis for cats persistently infected with FeLV is poor, most of them developing immunosuppression, anaemia and lymphoma. Due to the development of a natural resistance to FeLV infection with age, current recommendations are to vaccinate cats with a sustained risk of exposure every 2–3 years. Few vaccine efficacy data are available to support this practice. The study objective was to demonstrate the efficacy of Leucofeligen® FeLV/RCP (Virbac, Carros, France) three years after the first annual vaccine booster.

Twenty-eight specific pathogen free cats of 9–10 weeks of age (14 females, 14 males) participated in the study. 17/28 cats were vaccinated with Leucofeligen® FeLV/RCP ($\geq$ 102 µg purified p45 FeLV-envelope antigen, adjuvanted), with 2 subcutaneous injections 3 weeks apart for primary vaccination and a booster injection one year later. The other 11/28 cats did not receive any vaccine containing a FeLV valence and served as control group. Three years after the first annual booster of the vaccinated group, 25 cats were inoculated with a pathogenic FeLV strain at the dose of 5.10^5 PFU/cat by intraperitoneal route. Cats were regularly observed for appearance of any general health alteration, with body temperature and body weight follow-ups. Blood samples were taken before inoculation and each week from 3 weeks after inoculation for p45 antibody and/or p27 antigen detection by ELISA. P45 antibodies titre > 1/450 at the time of inoculation demonstrated a prolonged humoral immune response to the FeLV valence of Leucofeligen® FeLV/RCP. The presence of p27 antigen was an indicator of FeLV infection. A persistent infection was defined as the detection of p27 antigen on three consecutive occasions or on five non-consecutive occasions between week 3 and week 15 after inoculation.

13/16 cats vaccinated with Leucofeligen® FeLV/RCP and 0/9 cat of the control group presented antibodies against p45 protein at 3 years after the first annual booster. 25/25 cats were negative for p27 antigen before the experimental FeLV infection. After challenge, persistent infection was observed in 1/16 (6%) of the Leucofeligen® FeLV/RCP vaccinated cats and in 4/9 (44%) of the cats in the control group. Leucofeligen® FeLV/RCP prevented the development of a persistent infection in 86% of the vaccinated cats three years after the last vaccine injection. The risk of developing a persistent infection was seven times higher in the control group.

Leucofeligen® FeLV/RCP protects cats against FeLV persistent infection for three years.

Disclosures: All authors are employees of Virbac.

ISCAID-O-11

MARBOFLOXACIN TREATMENT IN DOGS WITH LEISHMANIASIS AND CHRONIC KIDNEY DISEASE. C. Pineda[1], M.C. Morales[1], P. Garcia[1], S. Belinchon-Lorenzo[2], L.C. Gomez-Nieto[2], E. Aguilera-Tejero[1], I. Lopez[1]. [1]Department of Medicina y Cirugia Animal, University of Cordoba, Cordoba, Spain, [2]LeishmanCeres Laboratory,. University of Extremadura, Caceres, Spain

Canine leishmaniasis is a major global parasitic and zoonotic disease caused by the protozoa *Leishmania spp*. and is potentially fatal to dogs. Clinical presentation is highly variable with a broad spectrum of signs and degrees of severity and its treatment usually represents a challenge. Due to the elevated prevalence of kidney disease in the canine population with leishmaniasis, it is important to consider an effective treatment drug with few renal side effects. Recent data have shown that marbofloxacin has leishmanicidal effects without causing changes in renal parameters of non-azotemic affected dogs. The purpose of this study was to evaluate the efficacy and the effect on renal function of marbofloxacin in dogs with leishmaniasis and concurrent chronic renal disease (CKD). Twenty eight dogs with leishmaniasis and CKD (11 animals in stage 1 and 17 in stage >1; based on IRIS recommendations) and no other coexisting diseases were enrolled in the study. Dogs were treated with oral marbofloxacin at a dose of 2 mg/kg/day for 28 days. Physical exam, blood pressure, CBC, serum chemistry profile, and urinalysis (including urine creatine:protein ratio and urinary cystatin C) were recorded at baseline (day 0) and after treatment with marbofloxacin (day 28) to determine the drug effect on renal function. Lymph node aspirations were also taken at days 0 and 28 to quantify the parasitic load by real-time PCR. Values are expressed as mean±SE. $P < 0.05$ was considered significant. In the dogs under study the treatment with marbofloxacin was well tolerated with no obvious side effects and the clinical signs related to the disease notably improved. These dogs with impaired renal function evidenced an improvement in some of the CKD biomarkers: a significant decrease in the urinary protein loss (from 3.8 ± 0.5 to 2.9 ± 0.4; $P < 0.05$) and a significant decrease in systolic blood pressure (from 180.0 ± 6.9 to 170.0 ± 7.3 mmHg; $P < 0.05$). Moreover, 72% of the dogs showed a significant reduction in parasitic load while in 28% the parasitic load remained stable. In relation to the aforementioned findings, dogs showed a significant increase in plasma albumin concentration (from 15.0 ± 1.0 to 16.6 ± 0.7 g/L; $P < 0.05$) and a significant decrease in globulin concentration (from 59.0 ± 3.4 to 54.1 ± 3.4 g/L; $P < 0.05$). No significant changes were found in the other parameters under study. In conclusion and based on these results, marbofloxacin can be chosen as an effective and safe alternative for treatment of dogs with leishmania and concurrent CKD.

Disclosures: Disclosures to report.

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ISCAID-O-12

CANIGEN® DHPPI/L VACCINE PROTECTS PUPPIES AGAINST PARVOVIROSIS EVEN IN THE PRESENCE OF MATERNALLY DERIVED ANTIBODIES. C. Fontaine, F. Senseby, T. Butaud, V. Martin, S. Gueguen. VIRBAC, Carros, France

In puppies, there is a critical period during which the quantity of maternally derived antibodies (MDA) is not sufficient to ensure a

passive protection against infectious diseases but could interfere with the development of an active immunisation with vaccines. The study aim was to evaluate the impact of the presence of MDA on the development of an active protection against parvovirosis with Canigen® DHPPi/L vaccine (Virbac, France).

Sixty conventional Beagle puppies of 8–9 weeks of age on Day 0, 32 males and 28 females, participated in the study. Based on MDA titres and body weight, puppies were allocated to either a vaccinated group (Group 1 = two vaccine injections on Day 0 and Day 21; Group 2 = three vaccine injections to finish the primary vaccination course on Day 49) or the unvaccinated group (Group 3). Puppies of Group 1 and Group 2 received Canigen® DHPPi/L vaccine formulated at minimum titre for the Canine Parvovirus type 2 (CPV-2) strain. Blood samples were taken on several occasions for serological follow-up up to Day 77. CPV-2 and Canine Parvovirus type 2c (CPV-2c) antibody titres were measured by seroneutralisation tests (SN). SN antibody titre > $10^{1.05}$ after vaccination is considered as positive and is correlated with clinical protection.

At 8 weeks of age, 32/60 puppies (53%) and 28/60 puppies (47%) had MDA against respectively CPV-2 and CPV-2c, with titres ranging from $10^{1.2}$ to $10^{2.3}$. After the first vaccine injection, seroconversion against respectively CPV-2 and CPV-2c was observed in 17/19 (89%) and in 20/24 (83%) of puppies without MDA at D0. In contrast, the seroconversion rates against respectively CPV-2 and CPV-2c in puppies with MDA at Day 0 were 52% (11/21) and 44% (7/16). Independently of the presence of MDA at D0, all vaccinated puppies (40/40) developed antibodies against both CPV variants on Day 35, after the second injection of primary vaccination. Therefore, no additional benefit on SN antibody titres was observed with the third injection of primary vaccination.

In these field conditions, a second injection of primary vaccination with Canigen® DHPPi/L, performed at 11–12 weeks of age, protects puppies against parvovirosis due to CPV-2 and CPV-2c variants. A third injection of primary vaccination against CPV-2 at 16 weeks of age may remain needed, especially in breeds with poor genetic response to CPV vaccination and in cases where puppies have high levels of MDA titres persisting beyond 12 weeks of age.

Disclosures: All authors are employees of Virbac.

ISCAID-O-13

MULTIDRUG-RESISTANT EXTENDED-SPECTRUM-β-LACTAMASE AND PLASMID-MEDIATED AMPC β-LACTAMASE-PRODUCING ENTEROBACTERIACEAE ISOLATED FROM DISEASED CATS IN SOUTHERN ITALY.

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The spread of multidrug-resistant (MDR) *Enterobacteriaceae* is a major global threat. MDR bacteria are being increasingly reported in companion animals, thus raising great concerns for animal and public health. This study aimed to evaluate the occurrence of MDR *Enterobacteriaceae* and to characterize the beta-lactam resistance mechanisms among isolates from cats showing clinical signs of various diseases in Southern Italy. A total of 101 cats affected by several clinical conditions (58.4% diarrhoea, 30.7% upper respiratory tract disease, 3.9% otitis, 2.9% conjunctivitis, 1% abscess, 2% stomatitis, 1% cystitis) were included. Data concerning living conditions and antimicrobial treatment were collected. Bacterial susceptibility testing to $n = 8$ antimicrobial classes and interpretation were performed according to EUCAST clinical breakpoints. Combination disc test was used for phenotypic identification of ESBLs producers. ESBL and pAmpC genes were identified by PCR and DNA sequencing. Phylogenetic groups of MDR *Escherichia coli* were determined according to Doumith *et al. (*2012). Among 125 *Enterobacteriaceae*, E. *coli (*52%) was the most frequently isolated, followed by *Enterobacter* spp. (16%), *Proteus* spp. (10.4%) and *Citrobacter* spp. (9.6%). The higher resistance frequencies were found against amoxicillin-clavulanic acid (64.8%) and third-generation cephalosporines (38.4%-40.8%). Although lower, resistance to aztreonam (32%), ciprofloxacin (23.2%), amikacin (31.2%), chloramphenicol (24%) and sulphamethoxazole-thrimetoprim (36.6%) were also significant. All isolates were susceptible to meropenem. Fifty percent of isolates were multidrug-resistant. Twenty-one MDR isolates were confirmed as ESBL-producers, namely: *bla*CTX-M-group1 ($n = 11$), -group2 ($n = 1$) and -group9 ($n = 1$); *bla*SHV ($n = 1$) and *bla*TEM ($n = 7$). Eight isolates were pAmpC *bla*CMY-producers, with five isolates also harbouring *bla*TEM and *bla*CTX-M. ESBLs and pAmpC-producing isolates were recovered from n = 19 cats, affected by diarrhoea, upper respiratory tract disease, abscess, otitis, stomatitis and cystitis. Of these, 58% were shelter cats, 42% were household; most ($n = 15$) were not receiving an antimicrobial treatment at the time of sample collection. ESBL/pAMPC-producing *E. coli* ($n = 11$), belonged to phylogenetic groups B2 and D, and were collected from $n = 5$ diarrheic cats ($n = 3$ living in shelter, $n = 2$ household), $n = 1$ shelter cat with upper respiratory tract disease, $n = 1$ household cat with cystitis and $n = 1$ shelter cat with cystitis. This study shows the dissemination of MDR *Enterobacteriaceae* in a variety of common defined clinical conditions among a feline population from Southern Italy. The emergence of ESBL/pAmpC-producing multidrug-resistant *Enterobacteriaceae* poses major limitations in companion animals' therapeutic options. Furthermore, it raises great concerns regarding the bi-directional transmission of MDR bacteria between pets and humans.

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ISCAID-O-14

A RANDOMIZED, ALLOPURINOL-CONTROLLED TRIAL EVALUATING THE USE OF DIETARY NUCLEOTIDES AND AHCC IN DOGS WITH CLINICAL LEISHMANIOSIS.

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The type of immune response against *Leishmania infantum* infection plays a key role in the disease progression and prognosis. Canine leishmaniosis (CanL) patients could therefore benefit from therapies aimed at modulating the immune system, such as dietary nucleotides and active hexose correlated compound (AHCC).

Although a combination of N-methylglucamine antimoniate (MGA) with allopurinol is the first-line therapy recommended for CanL, long-term allopurinol administration may increase urinary xanthine concentrations leading to urolithiasis. Hyperxanthinuria also stimulates *Leishmania* promastigotes growth *in vitro*. Moreover, allopurinol resistance has recently been described in *L. infantum* and associated with clinical relapses. The aim of this study was to evaluate the efficacy and safety of a treatment consisting of MGA and a combination of dietary nucleotides and AHCC in dogs with clinical leishmaniosis.

Sixty-nine dogs with naturally occurring clinical CanL were included in this multicentre, open-label, positively-controlled clinical trial and randomized into two groups: allopurinol (control) group (10 mg/kg allopurinol PO BID for six months) or supplement group (17 mg/kg AHCC and 32 mg/kg dietary nucleotides (Impromune®, Bioiberica SA, Barcelona, Spain) PO SID for six months). All dogs received 50 mg/kg MGA (Glucantime®, Merial Laboratorios SA, Barcelona, Spain) SC every 12 hours during the first 28 days. At 0, 30 and 180 days of treatment, dogs were clinically evaluated, and a variety of analytes were measured from blood, urine and bone marrow samples.

Initially, there were no significant differences between groups for any of the studied parameters. Final data analyses (allopurinol: n = 29; supplement: n = 24) revealed a significantly lower clinical scoring with the supplement at the end of the study ($P = 0.005$). A total of 12 patients (41%) from the allopurinol group developed xanthinuria while none did with the supplement (0%) ($P = 0.000$). No significant differences were found between groups in the distribution of study patients according to their IRIS staging of chronic

kidney disease. Both treatments resulted in a significantly reduced parasite load measured by Real-time quantitative PCR (RT-QPCR), increased CD4/CD8 ratio, and a tendency to a normalization of the protein electrophoretic pattern and acute phase response.

In conclusion, in this pilot study the combination of MGA with a supplement containing dietary nucleotides and AHCC for six months in dogs with clinical leishmaniosis, compared to the standard CanL treatment with MGA plus allopurinol, resulted in a better clinical efficacy, decreased xanthinuria, and a general improvement in clinicopathological disorders after treatment.

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SCH – Society of Comparative Hepatology

SCH-O-1
LOW SENSITIVITY AND SPECIFICITY OF ALANINE AMINOTRANSFERASE AND ALKALINE PHOSPHATASE FOR DETECTION OF HEPATOCELLULAR INJURY IN 198 LABRADOR RETRIEVERS WITHOUT CLINICAL SIGNS OF LIVER DISEASE.

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Biochemical parameters including alanine aminotransferase (ALT) and alkaline phosphatase (AP) are often used to make a presumptive diagnosis of liver disease in the dog. Especially in idiopathic and copper-associated forms or chronic hepatitis, there is a long subclinical phase in which dogs do not show clinical signs of liver disease. However, this would be the phase in which therapeutic intervention may be most effective. In dog breeds with a hereditary predisposition for the development of hepatitis, biochemical screening of subclinical dogs may be a valuable tool to identify affected dogs in an early stage. Therefore, the aim of the study was to determine the sensitivity and specificity of ALT and AP for detecting hepatocellular injury in clinically healthy Labrador retrievers. Hereto, patient files of 198 client-owned clinically healthy Labrador retrievers were reviewed. Labradors underwent a liver biopsy for screening for copper toxicosis as part of the research program into copper associated hepatitis of the Faculty of Veterinary Medicine, Utrecht University. Age, sex, liver histopathology results, ALT and AP were recorded. To determine sensitivity and specificity in these dogs, ROC analyses were used. In total, 69 dogs did not show histological abnormalities (controls) and 129 dogs showed hepatocellular injury (including 39 cases with primary hepatitis and 90 cases with reactive hepatopathy). In all 198 dogs, median ALT was 37 U/L (range 5–733) and median AP was 26 U/L (range 8–3360). Using thresholds of 70 U/L (ALT) and 89 U/L (AP) which are upper reference values in our laboratory, the sensitivity for detecting hepatocellular injury in clinically healthy dogs was 22% for ALT and 10% for AP. Specificity was 93% and 98% for ALT and AP respectively. New thresholds for ALT and AP were determined using the point closest to the top-left part of the plot with perfect sensitivity or specificity. New thresholds were 35 U/L for ALT and 26 U/L for AP. When using these values sensitivity increased to 68% (ALT) and 59% (AP) and specificity decreased to 62% (ALT) and 60% (AP). Overall, both ALT and AP have a very low sensitivity for detection of hepatocellular injury in Labradors with subclinical liver disease. Decreasing the threshold cut-off to improve the sensitivity results in a substantial decrease in specificity. Therefore, new biomarkers are needed for early detection of subclinically affected dogs, in order to avoid the progression to late stage hepatitis and liver cirrhosis.

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SCH-O-2
RELATIONSHIP OF HEPATIC COPPER CONCENTRATIONS TO HISTOPATHOLOGICAL CHANGES IN THE DOG.

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Liver disease associated with abnormal hepatocyte copper (Cu) concentrations is thought to be common in dogs. Excessive hepatic Cu results in hepatocyte damage from oxidative stress, resulting in cell death and subsequent necroinflammatory changes. The accumulation of abnormal hepatic Cu and inflammatory liver disease in the dog has been linked to genetic metabolic derangements in copper metabolism, environmental factors such as excessive dietary copper intake and/or the result of cholestatic disorders. Chelation therapy and low Cu diets are often successful in management of cases having abnormal hepatic Cu.

The goal of this study was to determine the incidence of abnormal hepatic Cu in liver biopsies submitted to our diagnostic laboratory and to then correlate the hepatic Cu concentrations with the histolopathological diagnosis. We hypothesize that hepatic Cu would be higher in dogs with necroinflammatory liver changes compared to those with non-inflammatory changes. A second aim was to determine if the concentration of hepatic Cu was related to the extent of hepatic inflammation.

We examined the records of cases having liver histopathology and hepatic Cu quantitation during the years 2010–2015. Fresh liver tissue was analyzed for Cu via flame atomic absorption spectroscopy and expressed as μg/g dry weight liver ([dwl], normal 120–400). In a subset of samples (those received in the year 2015) the Cu concentration was correlated with the histopathology. Samples were grouped as inflammatory when predominately characterized as lymphoplasmacytic or suppurative and then further classified as mild, moderate or severe inflammatory changes. Non-inflammatory samples were characterized as hepatocellular swelling, hyperplasia or lipidosis. A third "other"group was characterized either as nonspecific reactive hepatopathies, fibrosis or hepatic neoplasia. Statistical analysis included a two-sample t-test and one-way ANOVA with significance set at $P < 0.05$.

2149 samples had both Cu quantitation and histopathology. 1085 cases had hepatic Cu >400 μg/g dwl (50.5%) with a mean Cu concentration of 1233 with a range 401–12,400 μg/g dwl. Inflammatory liver disease was associated with significantly higher mean Cu (853) than non-inflammatory (355) disease ($P < 0.001$). The mean Cu in the inflammatory groups classified as mild (553), moderate (1013) or severe (1143) was significantly higher compared to the non-inflammatory (353) or 'other' group (471) ($P < 0.001$).

Our findings indicate the highest hepatic Cu concentrations are associated with inflammatory liver changes and that the severity of inflammatory changes tends to reflect increasing hepatic Cu. Because Cu associated liver disease is common, histopathology demonstrating necroinflammatory changes should have hepatic Cu quantitation.

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SCH-O-3
A PANEL OF SERUM MICRORNAS DIFFERENTIATES BETWEEN VARIOUS TYPES OF CANINE HEPATOBILIARY DISEASES.

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Hepatobiliary diseases are commonly encountered in dogs and can be divided into four main categories: parenchymal, biliary, vascular, or neoplastic disorders. In many cases clinical signs of hepatobiliary diseases are non-specific. Current biochemical indicators can establish the presence of hepatobiliary disease, but cannot specify underlying disease and a thorough and extensive diagnostic workup is needed. Recently, microRNAs (miRs) have been identified as promising new serum biomarkers for hepatobiliary disease

in humans and dogs. The aim of the present study was to investigate whether serum levels of an established group of microRNAs can be used to differentiate between various hepatobiliary diseases in dogs. Real-time polymerase chain reaction was used for quantification of 6 microRNAs (miR-21, miR-122, miR-126, miR-148a, miR-200c, and miR-222) in serum of 46 dogs with an established diagnosis of hepatobiliary disease compared to 11 healthy dogs. Hepatobiliary diseases included parenchymal (acute/chronic hepatitis), biliary (mucoceles/cholangitis and extra hepatic bile duct obstruction), vascular (congenital portosystemic shunts), and neoplastic (adenomas/carcinomas/malignant lymphomas) subgroups. Linear regression was used to investigate the effect of diagnostic subgroup on the serum levels of the natural logarithm of the different microRNAs, with healthy dogs as reference category. *P*-values were adjusted for multiple comparisons using the Benjamin-Hochberg correction. With a microRNA panel consisting of miR-21, miR-122, miR-126, miR-200c, and miR-222 it was possible to distinguish between parenchymal, biliary, and neoplastic hepatobiliary diseases. Within these groups, a differentiation between all above mentioned subgroups could be made. No differential microRNA expression was found in the adenoma and congenital portosystemic shunt groups. All other subgroups had increased levels of one or more microRNAs. MicroRNA-122 and miR-21 were both associated with hepatobiliary disease in general, while miR-126 and miR-200c were uniquely upregulated in chronic hepatitis and hepatocellular carcinomas, respectively. This study shows that serum microRNA profiling is a promising new tool that can be valuable in diagnosing and differentiating several common hepatobiliary diseases in dogs.

Disclosures: Disclosures to report.

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The authors declare no further conflict of interest.

SCH-O-4

LIPID ACCUMULATION IN CANINE PORTOSYSTEMIC SHUNTS.

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Hepatic lipidosis is a common feature in canine congenital portosystemic shunts (CPSS). However, the origin and significance of lipidosis is not fully understood. While the genetic basis of both intrahepatic portosystemic shunt (IHPSS) and extrahepatic portosystemic shunt (EHPSS) is different, the phenotype, resulting from the portal blood circumventing the liver, is identical. The aim of this study was to confirm hepatic lipidosis in both IHPSS and EHPSS and gain insight into the pathogenesis behind hepatic lipid accumulation in CPSS.

To study lipid accumulation in CPSS, Oil Red O stainings were performed on hepatic tissue of dogs with a shunt (EHPSS (n = 7) and IHPSS (n = 5) and compared to control tissue (n = 4). Lipid intensity was quantified using ImageJ. Microarray analysis was performed on liver tissue from dogs with IHPSS (n = 15) and EHPSS (n = 32) and compared to controls (n = 2). mRNA expression differences of the most affected genes were confirmed using real-time PCR (IHPSS n = 28, EHPSS n = 35 and control n = 17). Statistical differences were calculated with a Mann-Whitney U test.

In both groups, a 12-fold increase of lipid content was detected compared to the controls (EHPSS $P < 0.01$; IHPSS $P = 0.042$) using Oil Red O stainings. Remarkably gene-expression profiling indicated that in both shunt types numerous genes involved in lipid metabolism appear in the list of most up and down regulated genes compared to healthy tissue. Eleven genes of interest were selected for qPCR based on lipid-related function. Significant differences ($P < 0.01$) in mRNA expression were confirmed for seven genes. Upregulated genes in IHPSS and EHPSS were *CRP*, *FABP1*, *IGFBP1*, *ITIH4*, *SAA1*, and *PLIN*, whereas a downregulated gene was *HSD3B*.

Overall, an increased lipid concentration was confirmed for both IHPSS as well as EHPSS using Oil Red O. In addition, lipid related genes were found to be aberrantly expressed in IHPSS and EHPSS dogs. This indicates that hepatic lipidosis in CPSS could be a secondary effect of the portosystemic shunting. This study is providing the basis for future investigations into the pathogenesis behind the lipid accumulation.

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No disclosures have to be reported.

SCH-O-5

LONG-TERM ADULT FELINE LIVER ORGANOID CULTURES FOR DISEASE MODELLING OF HEPATIC LIPIDOSIS.

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Liver diseases in cats are poorly understood. Research into etiology, pathogenesis and possible therapies is hampered due to the lack of a suitable *in vitro* cell culture model for the cat. Adult stem cell cultures also known as organoids are ideally suited for disease modelling purposes. Recently, liver progenitor cells from mouse, rat, dog and human livers have been successfully cultured *in vitro*. The method permits three-dimensional, stable, and long-term expansion of adult liver stem cells. This study aimed to develop a robust culture system of genetically stable feline liver organoids that mimic *in vivo* liver progenitor cells which can be differentiated towards functional hepatocytes.

To establish feline organoid cultures, biliary duct fragments were isolated from five adult normal livers (fresh liver, frozen liver, and fine needle aspirate) and maintained in 3D culture by suspension in Matrigel droplets and R-spondin-1-based culture medium. Characterization of organoid cultures consisted of gene expression profiling with quantitative reverse transcriptase PCR, immunocytochemistry, and a proliferation assay (EdU incorporation). For induction of hepatocyte maturation, Wnt agonists were withdrawn and Notch signaling was inhibited. For disease modeling of hepatic lipidosis, liver organoids from cats, mice, dogs, and humans were incubated with either vehicle or free fatty acids (FFA) and stained with lipophilic dye LD540. Fluorescence was quantified using flow cytometry. For feline organoids the β oxidation of excess FFA was studied using a carnitine palmitoyltransferase-1 inhibitor (etomoxir) and supplementation of L-carnitine.

Organoids could be cultured successfully from all feline liver samples. Feline liver organoids grew as spherical structures that were highly proliferative and were cultured up to six months (passage 32). Organoids expressed adult stem cell marker LGR5, hepatic progenitor/biliary markers (K7, K19, and HNF1β), early hepatocyte markers (HNF4α, TBX3, ALB), and had low expression of mature hepatocyte markers (TTR, FAH, CYP3A132). Mature markers increased when organoids were cultured without Wnt agonists in combination with Notch inhibitors, indicating their potential to differentiate towards a hepatocyte-like phenotype. Feline liver organoids showed lipid accumulation when exposed to excess FFA and accumulated more lipids than human liver organoids. Lipid accumulation was enhanced when β oxidation was blocked with etomoxir and was attenuated when medium was supplemented with L-carnitine.

In conclusion, feline liver organoids can be cultured long-term from liver samples and can be differentiated to a hepatocyte-like phenotype. They present the first primary liver cell culture system for cats and offer great potential for disease modeling of feline hepatic lipidosis.

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SCH-O-6
PROGNOSTIC MARKERS FOR MORTALITY IN FELINE HEPATIC LIPIDOSIS: A RETROSPECTIVE STUDY OF 71 CATS. S. Kuzi, S. Kedar, G. Segev, I. Aroch, E. Yas. Hebrew University Veterinary Teaching Hospital, Rehovot, Israel

Feline hepatic lipidosis (HL) is a common, potentially life-threatening disease, resulting from prolonged anorexia and increased catabolism. The aim of this retrospective study was to identify clinical and laboratory parameters associated with mortality. Data were collected from the medical records of cats diagnosed with HL based on liver cytology or histopathology at the Hebrew University Veterinary Teaching Hospital (years 2004 to 2015).

The study included 71 cats (47 females and 24 males). Most cats (56; 79%) lived indoor and were fed dry commercial diets (44 cats, 62%). Most (90%) were mixed-breed cats. The median age was 7.5 years (range 1.5–16). The common presumptive primary conditions included gastro-intestinal diseases, pancreatitis and cholangiohepatitis (31 cats, 44%) and stressful events (14, 20%). HL was idiopathic in 20 cats (28%). The following were significantly ($P \leq 0.033$) associated with mortality: older age, dullness, weakness and hyper salivation, hypoproteinemia, hypoalbuminemia, increased serum creatine kinase activity, hypocholesterolemia and hepatic failure (based on presence of ≥3 abnormal liver function analytes at presentation). The primary condition was unassociated with mortality. Occurrence of hypoalbuminemia, hyperammonemia, hyperbilirubinemia, electrolyte disorders, effusions or hypotension during hospitalization was significantly ($P \leq 0.045$) associated with mortality. A decrease in serum β-hydroxybutyric acid during hospitalization was significantly ($P = 0.01$) associated with survival. This is the largest study on feline HL performed in the past 20 years. Several identified prognostic markers may be therapeutic targets, including hypoalbuminemia, possibly predisposing to effusion and hypotension, and hyperammonemia. Improvement of serum β-hydroxybutyric acid concentration is a marker of correction of the catabolic state.

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ESVC – European Society of Veterinary Cardiology

ESVC-O-1
AORTO-SEPTAL ANGLE AND SYSTOLIC MURMUR IN APPARENTLY HEALTHY CATS. A PILOT STUDY. S. Crosara[1], G. Allodi[1], M. Fabbi[1], A. Corsini[1], S. Guazzetti[2], C. Quintavalla[1]. [1]Department of Veterinary Science, University of Parma, Parma, Italy, [2]Local Health Unit, Reggio Emilia, Italy

The presence of a systolic murmur in apparently halthy cats has been previously described. The aim of this retrospectvive study was to determine whether the aorto-septal angle (AoSA), assessed by echocardiography, is correlated with the presence of a systolic murmur in cardiologically normal cats. The medical records between January 2014 and March 2016 have been reviewed. Inclusion criteria included a normal echocardiographic exam, regardless the presence of a cardiac murmur. Cats had also to be normotensive (systolic blood pressure < 160 mmHg) and euthyroid. Cats with echocardiographic evidence of dynamic right ventricular outflow obstruction were not included. Cats with normal diastolic thickness of the left ventricle but mild hypertrophy of the sub-aortic portion of the interventricular septum were also included. The AoSA was measured from the right parasternal five chambers view as previously described. For each echocardiographic parameter, the mean of three consecutive measures was used for statistics. Forty-one cats of different breed were included; 21 females and 20 males, aging 6.4 ± 5.5 (mean ± SD); 22 with a cardiac murmur, 19 without a cardiac murmur. The AoSA in cats with a cardiac murmur (131.1°± 8.6°) was significantly narrower ($P = 0.048$) than AoSA in cats without a cardiac murmur (136.3°± 7.2°). The presence of septal hypertrophy was not associated with the presence of a systolic murmur ($P = 0.41$). Cats with septal hypertrophy were older ($P = 0.0037$), however there was not correlation between AoSA and age ($P > 0.05$). In conclusion, a narrow AoSA is associated with the presence of a systolic murmur in cats and might be considered as potential cause of ejection murmur in apparently healthy cats. A longitudinal study is needed to assess if a narrow AoSA might play a role in the remodeling of the interventricular septum at the level of the left outflow tract.

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ESVC-O-2
INTER-OBSERVER VARIABILITY FOR CARDIAC ULTRASOUND MEASUREMENTS IN CATS BETWEEN 12 AND 24 MONTHS OF AGE. D.J. Connolly[1], J.R. Payne[1], A. Feugier[2], I.M.J. van Hoek[2]. [1]Royal Veterinary College, Hertfordshire, UK, [2]Royal Canin, Aimargues, France

A high degree of accuracy is required when using echocardiography to diagnose hypertrophic cardiomyopathy (HCM) in cats, as variation in measurements of 0.5 mm may affect classification of individuals as 'normal' or 'abnormal'. This study in adult cats analysed inter-observer variability between two echocardiographers with specialist veterinary cardiology training.

Twenty-four female European shorthair cats, colony-housed compliant with EU regulations, were examined at 12, 18 and 24 months of age by observer 1 (Obs-1). Cardiac ultrasound images (2D) were taken in conscious cats to measure: aortic diameter (Ao), left atrial diameter (LA), diastolic interventricular septum (IVSd), diastolic interventricular septum outflow (IVSd-LVOT), diastolic and systolic left ventricular internal dimension (LVIDd/s), diastolic left ventricular free wall (LVPWd) and left ventricular free wall outflow (LVPWd-LVOT). Cardiac ultrasound measurements were repeated by observer 2 (Obs-2) on stored images. Measurements were analysed for effect of age, observer (mean value for the 3 time points) and age-observer interaction. Additionally, based on IVSd and LVPW thickness, cats were categorized as 'normal' (≤ 6 mm or ≤ 5 mm in cats <6 kg BW) or 'abnormal' (Gundler et al. 2008). Linear mixed models (generalised when appropriate) were performed using SAS v9.3. Cat was defined as a random term. Normality of residual distribution of each model involving a quantitative output was checked. Level of significance was 5%. Post-hoc analyses were adjusted for a-risk inflation.

There was a significant effect of age on Ao ($P < 0.001$), IVSd ($P < 0.001$), IVSd-LVOT ($P < 0.001$), LIVDd ($P < 0.001$) and LVIDs ($P < 0.001$). No significant age-observer interaction was found for any parameter. A significant difference between observers was found for IVSd ($P < 0.001$), IVSd-LVOT ($P = 0.0083$), LVIDd (<0.0001), LVIDs ($P = 0.0388$), LVPW-LVOT ($P < 0.0001$) and LVPW ($P = 0.011$). Measurements were higher by Obs-1 for IVSd and IVSd-LVOT, and higher by Obs-2 for other measurements. Differences between estimated means (% of value Obs-1) ranged from 3.3% (LVPW) to 9.2% (IVSd). Differences between mean values were <0.5 mm for all parameters except for LVIDd (0.9 mm). All cats weighed <6 kg BW, and classification of cats as 'abnormal' (>5 mm) was significantly different between observers for IVSd (14/72 Obs-1, 3/72 Obs-2; $P = 0.009$) but not LVPW (0/72 Obs-1, 1/72 Obs-2).

Inter-observer variability was significant for most parameters, although independent of cats' age, and inter-observer difference only exceeded 0.5 mm for LVIDd. Caution is warranted when determining a finding of left ventricular hypertrophy based on IVSd thickness, due to significant inter-observer differences in this measurement.

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A. Feugier and I. van Hoek are employees of Royal Canin SAS, Aimargues, France.

ESVC-O-3

ANOMALIES AND ANATOMICAL VARIATIONS OF THE THORACIC GREAT VESSELS IN DOGS. P. Sebastian[1], C. Warren-Smith[1], S. Fonfara[2], K. Borgeat[3], D. Casamian[1]. [1]Langford Veterinary Services, School of Veterinary Science,University of Bristol, Bristol, UK, [2]Ontario Veterinary College, University og Guelph, Guelph, Canada, [3]Highcroft Veterinary Referrals, Bristol, UK

Well-known congenital thoracic cardiovascular anomalies in the dog are patent ductus arteriosus and persistent right aortic arch. These cardiovascular anomalies are clinically significant and their prevalence has been reported in veterinary medicine. Contrary to these, developmental anomalies of thoracic vessels that may not cause clinical signs are usually not detected or are identified as incidental findings, and their prevalence is unknown. However, these might be of importance as interference with thoracic surgery, interventional procedures, or interpretation of thoracic imaging is possible.

The aim of the study was therefore to determine the prevalence of anatomical variations of the great thoracic vessels.

The CT thoracic studies of 878 dogs carried out between 2011 to 2014 at Langford Veterinary Services (University of Bristol) were reviewed. Poor quality CTs or those of young dogs with clinical evidence of congenital cardiac disease or regurgitation were excluded. A total of 802 studies met the inclusion criteria. A panel of three boarded cardiologists and one boarded diagnostic imager reviewed the abnormalities.

Overall 8 dogs (1%) showed an anatomic anomaly. The most common anomaly was an aberrant retroesophageal right subclavian artery (n = 7, 0.8%). One dog showed a dilated azygos vein associated with coarctation of the caudal vena cava. None of the dogs had a persistent left cranial vena cava.

Anatomical variations observed included three types of branching of the common carotid arteries: both arteries arising at the same point (type I present in 68.5% of dogs, n = 506/739), the arteries arising separated (type II, identified in 28.7% of dogs, n = 212/739) or from a common trunk ("Bicarotid Trunk", type III, in 2.8% of dogs, n = 21/739). In 92.1% of cases (n = 739) the azygos vein drained into the cranial vena cava, in 1.9% (n = 15) into the right atrium and in 6% (n = 48) the drainage site was equivocal.

Incidental anatomical anomalies of the thoracic great vessels appear to be rare in dogs. Only 1% (n = 8) of dogs undergoing thoracic CTs showed an anomaly. Of these, an aberrant retroesophageal right subclavian artery was the most common abnormality. A persistent left cranial vena cava appears to be very uncommon, as it was not detected in any of the 802 dogs of the present population. Three different branching patterns of the common carotid artery were identified and type I (both carotids arising from the same point of the brachyocephalic trunk) was the most frequent.

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ESVC-O-4

EFFECTS OF SEDATION WITH DEXMEDETOMIDINE AND BUPRENORPHINE ON ECHOCARDIOGRAPHIC VARIABLES, BLOOD PRESSURE AND HEART RATE IN HEALTHY CATS. E. Johard[1], A. Tidholm[1], I. Ljungvall[2], J. Häggström[2], K. Höglund[3]. [1]Anicura Albano Animal Hospital, Enebyberg, Sweden, [2]Department of Clinical Sciences, Faculty of Veterinary Medicine, SLU, Uppsala, Sweden, [3]Department of Anatomy, Physiology and Biochemistry, Faculty of Veterinary Medicine, SLU, Uppsala, Sweden

Different sedative agents are commonly used in veterinary medicine. Due to their hemodynamic effects, they may alter echocardiographic measurements in cats when screening for heart disease, such as hypertrophic cardiomyopathy (HCM). The objective of this study was to evaluate effects of the sedation combination dexmedetomidine and buprenorphine on echocardiographic variables, blood pressure and heart rate (HR) in healthy cats.

50 healthy client-owned cats were prospectively included in the study. Cats were sedated with dexmedetomidine and buprenorphine. Doses were adjusted to body weight. Standard echocardiographic and Doppler examinations, blood pressure and HR measurements were performed prior to sedation and repeated ten minutes after sedation. Results were compared using non-parametric methods.

Left ventricular internal diameter in end-diastole (LVIDd) and systole (LVIDs), right ventricular internal diameter in end-diastole (RVIDd), left atrium (LA), pulmonic deceleration time, systolic (SBP), diastolic (DBP) and mean arterial (MAP) blood pressure increased after sedation ($P \leq 0.022$). Aortic (V_{max} Ao) and pulmonic artery (Vmax A pulm) maximum velocity, fractional shortening (FS), acceleration/deceleration time (AT/DT) and HR decreased after sedation ($P < 0.0001$). Interventricular septum in end-diastole (IVSd) and systole (IVSs), left ventricular posterior wall in end-diastole (LVPWd) and systole (LVPWs), aortic diameter (Ao), left atrial/aortic diameter (La/Ao) and pulmonic acceleration time did not differ pre- and post-sedation. Sedative dosage had no significant effect on echocardiographic variables, blood pressure or HR.

In conclusion blood pressure increased and HR decreased after sedation. The echocardiographic variables most important in HCM-screening, i.e. wall thickness and LA/Ao, were not affected by the combination of dexmedetomidine and buprenorphine.

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ESVC-O-5

CARDIOVASCULAR EFFECTS OF MEDETOMIDINE ALONE OR IN COMBINATION WITH PROPOFOL IN STAGE B2 MIXOMATOUS MITRAL VALVE DISEASE. V.M. Saponaro[1], A. Ave[2], J.L. Wargny[1]. [1]Clinique Vétérinaire de la Gare, Taverny, France, [2]UNIVET, Cannes, France

Medetomidine is expected to depress cardiac performance in dogs by increasing vagal tone via baroreceptor stimulation with consequent bradycardia and drop in cardiac output and inotropy. In asymptomatic dogs suffering from mixomatous mitral valve disease (MMVD) a previous study showed a reduction of mitral regurgitation appearance on color-flow Doppler echocardiography, but the counterpart was a possible loss in contractility. The hypothesis of the present study was that by combining propofol (useful when endotracheal intubation is warranted), which provides vasodilation and inhibits baroreflex, vagal-related undesired events would be prevented or reduced.

Dogs weighing less than 15 kg, needing sedation and endotracheal intubation for short non-invasive procedures and showing a systolic apical heart murmur, were recruited if MMVD was confirmed and LA/Ao was 1.4 < 1.6. The sedative protocol consisted in an IV injection of 30 μg/kg medetomidine (for M group), followed by a single IV bolus of 1 mg/kg propofol (for MP group). Sedation was then reversed by IM injection of atipamezole. Of 24 dogs screened, 16 were enrolled and randomly assigned equally to M or MP group. Clinical parameters, echocardiographic variables, thoracic radiographs and oscillometric blood pressure measurements were collected in blinded fashion at baseline (T0), 30 minutes after medetomidine administration (T1) and three hours after atipamezole injection (T2).

At T1 regurgitant jet area (ARJ/LAA) significantly decreased in both groups while shortening fraction and body weight-indexed LVIDs decreased and increased respectively only in M group ($P < 0.05$). Systolic blood pressure showed values at the upper physiologic limit at T0 in both groups and a significative decrease at T1 only in MP group. No significant change was recorded for LA/Ao at any time point in both groups, the value remaining < 1.6, nor for body weight-indexed LVIDd. The other echocardiographic variables did not show a particular trend. Thoracic radiographs were evocative of heart enlargement without pulmonary venous congestion or pulmonary oedema both at T0 and T2. Respiratory rate did not change between T0 and T2. Heart rate showed a similar significative decrease at T1 in both groups. The degree of sedation was optimal during the clinical procedure in all cases.

Sedation with 30 μg/kg medetomidine combined with propofol at the dose of 1 mg/kg, useful for endotracheal intubation, is safe in dogs suffering from MMVD in stage B2 (LA/Ao = 1.4 < 1.6) and affects inotropy less than medetomidine used alone.

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ESVC-O-6

INTER-OBSERVER AGREEMENT WHEN MEASURING ULTRASONOGRAPHIC INFERIOR VENA CAVA DIAMETER AND BASIC ECHOCARDIOGRAPHIC PARAMETERS BY NON CARDIOLOGIST VETERINARIANS FOLLOWING A 6-HOUR TRAINING COURSE. E. Darnis[1], A.C. Merveille[1], L. Desquilbet[2], S. Boysen[3], K. Gommeren[1]. [1]Liège University, Liège stilman, Belgium, [2]ENVA, Maisons-alfort, France, [3]University Calgary, Calgary, Canada

Clinical parameters, including blood pressure, do not reliably predict intravascular volume status. In human medicine, assessment of the inferior vena cava diameter (IVCD) and focused echocardiographic parameters (La/Ao, LA minor, LVIDd, LVIDs, FS) have been used to rapidly evaluate volume status and systolic function in critically ill patients. Recently, focused training courses in echocardiography for human criticallists and internists have been described.

This prospective, observational study aimed to quantify inter-observer (IEO agreements between a cardiologist and 2 non-cardiologists who underwent a training course in echocardiography for the ultrasonographic IVCD and focused echocardiographic parameters in healthy beagle dogs.

Two veterinary internists (one resident and one specialist), novice in echocardiography, underwent a 6-hour echocardiography training course. One month later, 15 healthy beagle dogs were examined 3 times by the two internists and one cardiologist. IVCD was assessed via a subxiphoid window (IVC-SX) and a dorsolateral window (IVC-DL), caudal only to the last rib.

Bland-Altman analysis was used to assess IEO agreement between two series of clinical measurements; coefficients of variation (CV) were calculated to quantify IEO variability.

The widest 95% limits of agreement (LOA) for LA minor, LVIDd, LVIDs, LA/Ao, and FS were ±5 mm, ±9 mm, ±5 mm, ±0.68, and ±19%, and CV were 6%, 13%, 12%, 8%, and 17%, respectively. For IVCD-SX, the 95% LOA for $IVCD_{min}$ and $IVCD_{max}$ were ± 0.75 cm and ± 0.62 cm with CV of 37% and 21%, respectively. For IVCD-LD, the 95% LOA were ± 0.37 cm with a CV of 11%.

Based on inter-observer reproducibility, minimal training in EC seems sufficient for measurement of standard cardiac parameters. Evaluation of IVC-LD was considered good, based on narrow 95% IOA. However, IVCD-SX was considered unacceptable. This may be due to variation in measurements of the IVCD at the IVC-SX, and the effect of the respiratory cycle on the minimal and maximal measurements. Standardization of the IVC-SX technique and investigation of the impact of the respiratory phase on IVCD in dogs are needed.

A 6-hour training course in echocardiography seems sufficient to train non cardiologist veterinarians to measure IVCD-LD and basic echocardiographic parameters in healthy beagle dogs. Further studies are needed to determine whether IEO is acceptable with other breeds of different body conformation. Values of these measurements to estimate the volume status in clinical setting remain to be determined. IVCD-SX measurements require further standardization to allow for quantitative analysis.

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ESVC-O-7

FOCUSED CARDIAC ULTRASOUND IN THE EMERGENCY ROOM IMPROVES THE DIFFERENTIATION OF RESPIRATORY AND CARDIAC CAUSES OF DYSPNEA IN DOGS. M.J. Hezzell, C. Ostroski, M.A. Oyama, B. Harries, K. Drobatz, E.L. Reineke. University of Pennsylvania, PA, USA

Dyspnea caused by primary respiratory disease or congestive heart failure is a common emergency in dogs. Early, accurate diagnosis is essential for optimal therapy. However, physical examination (PE) alone may be insufficient to differentiate causes of dyspnea and patient instability frequently necessitates delay of radiography and echocardiography. In human patients, emergency clinician-performed focused cardiac ultrasound (FCU) helps differentiate causes of dyspnea quickly and safely. We hypothesized that FCU performed by emergency and critical care (ECC) clinicians would improve diagnostic accuracy in dyspneic dogs compared to medical history and PE alone.

ECC faculty and residents underwent a 3-hour structured FCU training program. Goals included recognizing basic cardiac structure and function and quantitatively measuring left atrial and aortic root diameter (LA/Ao) from right parasternal views. Dogs presenting with dyspnea to the University of Pennsylvania Veterinary Hospital were prospectively recruited. Exclusion criteria included intravenous fluid therapy within 72 hours of presentation, known trauma, and severe systemic disease precluding participation. Medical history, PE, and FCU were obtained at presentation. The ECC clinician, blinded to any radiographic or echocardiographic data, recorded a diagnosis of respiratory (R) or cardiac (C) before and after FCU. Thoracic radiography was performed within 3 hours and echocardiography was performed by a cardiologist or cardiology resident within 24 hours.

ECC clinician diagnostic accuracy was calculated against a gold-standard diagnosis (agreement of a board-certified cardiologist and criticalist with access to all diagnostic test results). Comparisons between groups were made using Mann-Whitney tests. Agreement between LA/Ao on FCU and echocardiography was investigated using univariate linear regression. Significance was set at $P < 0.05$.

Thirty-eight dogs were recruited. In 3 dogs, gold-standard diagnosis could not be determined. The remaining 35 dogs were used for analysis: 13 in group R, 22 in group C. LA/Ao on echocardiography ($P < 0.0001$) and FCU ($P = 0.0004$), and vertebral heart size ($P < 0.0001$) were significantly higher in group C vs. group R. LA/Ao on FCU and echocardiography were significantly associated (B = 0.75, $P = 0.0002$, R^2=0.354). Prior to FCU, 27/35 dogs (77.1%, 95% CI: 60%, 90%) were correctly diagnosed by the ECC clinician. Two cardiac and 6 respiratory cases were mis-assigned. Following FCU examination, 30/35 dogs (85.7%, 95% CI:70%, 95%) were correctly diagnosed. One cardiac and 4 respiratory cases were mis-assigned. No dogs with a correct diagnosis were reassigned incorrectly following FCU.

In conclusion, performance of FCU by ECC clinicians following training improved diagnostic accuracy compared with medical history and PE alone in dyspneic dogs.

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ESVC-O-8

HOLTER EVALUATION IN CATS WITH SYMPTOMATIC HEART DISEASE AND WITH THORACIC TRAUMA. U. Bartoszuk, M. Baron Toaldo, N. Pereira, N. Summerfield, J. Novo Matos, T. Glaus. University of Zurich, Switzerland, Zurich, Switzerland

Multiple studies have shown the importance of arrhythmias secondary to cardiac as well as extracardiac diseases, such as splenic masses and trauma in dogs. Arrhythmias are commonly implicated as plausible cause of sudden death. Although sudden death is commonly recognized in cats, little is known about the importance of arrhythmias associated with primary and secondary myocardial injury. Therefore the aim of this study was to determine frequency and complexity of arrhythmias in cats with symptomatic hypertrophic, dilated or restrictive cardiomyopathy, with transient congestive heart failure referred to as myocarditis and after thoracic trauma.

Holter examinations were analyzed for number of ventricular (VPCs) and supraventricular premature beats (APCs), arrhythmia complexity (ventricular tachycardia (VTach), R-on-T, supraventricular tachycardia (SVT)) and additional arrhythmias.

Nine cats with thoracic trauma, 15 cats with hypertrophic cardiomyopathy (HCM), 5 with myocarditis, 4 with restrictive cardiomyopathy (RCM) and 2 with dilated cardiomyopathy (DCM) were enrolled. Median heart rate was higher in cats with HCM. Median numbers of VPCs and APCs after thoracic trauma were 24 [range 0–117] and 0, in HCM 6363 [1–35160] and 2933 [0–28568], in myocarditis 69 [1–154] and 1 [0–6], in RCM 33639 [0–134036] and 0, in DCM 3 and 1132 VPCs and 0 and 2575 APCs. VTach was found in 4 HCM (longest 74 beats), 2 myocarditis (longest 7 beats), 2 RCM (longest 22 beats) and 1 DCM (longest 8 beats) cats. Intermittent complete AV-blocks were found in 1 RCM cat. Atrial fibrillation (AFib) was found in 2 HCM (1

intermittent and 1 sustained) and 1 RCM (intermittent) cats. SVT was found in 2 HCM (longest 1409 beats), 1 myocarditis (longest 10 beats), and 1 DCM (longest 180 beats).

The frequency of arrhythmias was significantly higher in cats with cardiomyopathies compared to cats with myocarditis and thoracic trauma. Serum Troponin I concentration was higher in cats with myocarditis.

The quantity and complexity of arrhythmias were markedly higher in this study than in similar previous studies. Interestingly, chronic myocardial remodeling with less measurable myocardial cell death is more arrhythmogenic than acute myocardial damage. As compared to dogs trauma, even to the chest, and (suspected) myocarditis do not appear to cause clinically important arrhythmias. In contrast, arrhythmias may be quite severe in cats with primary heart disease which conceivably may cause sudden death in some.

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ESVC-O-9
POINCARÉ PLOTS AS A MEASURE OF HEART RATE VARIABILITY IN NORMAL DOGS.

R. Blake, G. Culshaw, D. Shaw, Y. Martinez-Pereira. University of Edinburgh, Roslin, UK

Poincaré scatterplots are created by plotting each R-R interval against the subsequent R-R interval. It remains a largely unexploited means of heart rate variability (HRV) analysis in dogs.

The primary aims of this study were to describe Poincaré plot patterns in normal dogs, to establish reference ranges for its quantitative descriptors, SD1 (represents short-term HRV), SD2 (represents long-term HRV) and SD1/SD2 (represents sympathovagal balance) and to compare these descriptors with more conventional measures of HRV. A secondary aim was to explore the effect of activity levels on the Poincaré plots.

Twenty-four hour ambulatory ECG recordings were obtained from 25 healthy dogs and analysed using Novacor HolterSoft Ultima Version 2.5.5. Time and frequency-domain measurements of HRV, Poincaré plots and their descriptors were generated. Reference ranges were calculated using Reference Value Advisor. Additional Poincaré plots were developed from 6 hours of night-time data (sleeping) and 6 hours of day-time data (activity).

The 24 hour Poincaré plots demonstrated a 'Y' pattern, which differs from the comet shape described in normal humans. Reference ranges were 614.113–2567.501 ms for SD1, 1968.839–3253.123 ms for SD2 and 0.109–0.844 for SD1/SD2.

SD1, SD2 and SD1/SD2 showed statistically significant correlations with mean heart rate, SDNN, SDNNIDX and RMSSD. Positive correlations were also found for SD1 and SD2 with SDANN; SD1 and SD1/SD2 with HF msec^2 and PNN50%, and SD2 with LF msec^2 ($P < 0.05$, $r > 0.39$).

Comparison between Poincaré plots derived from day and night-time data confirmed that the arms of the 'Y' shape are derived mostly from periods of rest and that periods of activity populate the stalk of the 'Y' shape. Values derived from day-time data (mean SD1 1227.95 ms, SD2 1975.0 ms, SD1/SD2 0.61) were significantly lower than values derived from night-time data (mean SD1 1971.1 ms, SD2 2457.2 ms, SD1/SD2 0.80), indicating an overall reduction in HRV during the day. This was supported by statistically significant decreases in SDNN (mean night 458.2 ms, day 343.5 ms), PNN50% (mean night 78.57, day 60.56), SDNNIDX (mean night 413.88 ms, day 271.92 ms) and RMSSD (mean night 548 ms, day 351.3 ms).

In conclusion, 24 hour Poincaré plots show a distinct 'Y' pattern in healthy dogs. While standard descriptors SD1, SD2 and SD1/SD2 correlate with more conventional measures of HRV, their clinical usefulness is limited by the wide reference ranges. The amount of activity/rest within the recording has a marked effect on the Poincaré plot pattern and its associated quantitative descriptors.

Disclosures: No disclosures to report.

ESVC-O-10
FELINE HYPERTROPHIC CARDIOMYOPATHY DOES NOT ALTER SERUM LEVELS OF SYMMETRIC DIMETHYLARGININE.

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Symmetric dimethylarginine (SDMA) is a promising new marker of feline renal function with the potential to detect kidney disease at an early stage. Dimethylarginines interfere with nitric oxide formation by inhibiting nitric oxide synthase, which leads to increased levels of SDMA in some human cardiovascular diseases including hypertrophic cardiomyopathy (HCM).The aim of this study was to assess serum SDMA in cats with HCM compared to healthy cats and cats with kidney disease.

Serum SDMA concentration was measured in 83 feline serum samples (IDEXX SDMA[TRADEMARK]) stored from previous research. Cats above one year of age were classified as having HCM with no signs of azotemic kidney disease (49), having kidney disease with no signs of cardiac disease (10) or as being clinically healthy (24) based on the following parameters: physical examination, echocardiography, ECG, blood pressure measurements, hematology, biochemistry, thyroxin (cats > 4 years of age) and (for healthy cats and cats with kidney disease) urinanalysis.

Two-way ANOVA with age and disease group as factors and Tukey-HSD post hoc analysis were performed on the log-transformed SDMA, presented as (median [range]).

Cats with HCM (9.00 [3.00–24.00] μg/dl) and healthy cats (10.50 [5.00–15.00] μg/dl) had significantly lower SDMA concentrations ($P < 0.0001$) compared to cats with kidney disease (18.00 [14.00–64.00] μg/dl). There was no significant difference between cats with HCM and healthy cats ($P = 0.91$). Our results indicate that HCM does not cause increased concentrations of SDMA in cats and SDMA may therefore be a valid marker of GFR in these patients.

Disclosures: Idexx laboratories have provided financial support for the serum SDMA analysis described in the submitted abstract.

ESVC-O-11
MITRAL ANNULAR PLANE SYSTOLIC EXCURSION (MAPSE) AND TRICUSPID ANNULAR PLANE SYSTOLIC EXCURSION (TAPSE) IN CATS WITH HYPERTROPHIC CARDIOMYOPATHY.

I. Spalla, K. Borgeat, A. Pope, V. Luis Fuentes, D.J. Connolly. Royal Veterinary College, Brookmans park, UK

Hypertrophic cardiomyopathy (HCM) is common in cats and has a variable prognosis ranging from no clinical signs to cardiac death. Congestive heart failure (CHF) may be manifested as pleural effusion (PlEff) and/or pulmonary edema (PEd). Reduced left ventricular (LV) systolic function is associated with increased risk of CHF in cats with HCM. In humans, M-mode derived measures of longitudinal displacement of the mitral and tricuspid annular planes (MAPSE and TAPSE respectively) are considered important determinants of systolic function, and are reduced in human patients with HCM.

Aims of the study were to evaluate MAPSE and TAPSE in healthy (control) cats and cats with HCM. We hypothesized that 1) Cats with HCM have lower MAPSE and TAPSE values than controls; 2) Cats with PlEff ± PEd have lower MAPSE and TAPSE values than cats with PEd alone, and 3) Lower MAPSE and TAPSE values are associated with reduced survival.

Electronic patient records of a veterinary teaching hospital were retrospectively reviewed for cats evaluated by echocardiography. Cats with inadequate echocardiographic images or those with other diseases resulting in LVH were excluded. Cats were included in the HCM group if LV wall thickness was ≥6 mm. Healthy cats undergoing echocardiography with LV wall thickness ≤5.5 mm were included as controls. Anatomic M-mode from the left apical four-chamber view was used to record MAPSE from the free wall (MAPSE-FW) and septum (MAPSE-IVS) and TAPSE.

The study included 64 cats with HCM (45 asymptomatic and 21 CHF) and 27 control cats. Compared to controls, HCM cats had lower MAPSE-IVS (4.2 mm, IQR:2.9–5.0 vs. 5.15 mm, IQR:4.55–5.63, $P < 0.001$), MAPSE-FW (4.38 mm, IQR: 2.99–4.91 vs. 5.8 mm, IQR:5.34–6.17, $P < 0.001$) and TAPSE (6.5 mm, IQR 4.7–7.6 vs. 8.6 mm, IQR:7.4–10.15, $P < 0.001$). Within the HCM group,

cats with CHF had lower MAPSE-IVS (2.6 mm, IQR:2.48–3.2 vs. 4.65 mm, IQR:4.08–5.2, $P < 0.001$), MAPSE-FW (2.8 mm, IQR:2.37–3.23 vs. 4.68 mm, IQR:4.14–5.10, $P < 0.001$) and TAPSE (4.6 mm, IQR:4.1–5.4 vs. 7.2 mm, IQR:6.3–8.15, $P < 0.001$) compared to asymptomatic cats. MAPSE-FW was lower in cats with PlEff ± PEd (2.56 mm, IQR:2.31–2.85) than PEd alone (3.15 mm, IQR:3.05–3.68, $P = 0.008$). Logrank analysis showed shorter survival in cats with lower MAPSE-IVS ($P = 0.014$), MAPSE-FW ($P = 0.005$) and TAPSE ($P = 0.01$). In conclusion, longitudinal LV systolic function as assessed by MAPSE and TAPSE was lower in cats with HCM and was lowest in patients with overt CHF. Lower MAPSE and TAPSE were also associated with shorter survival time. This suggests that systolic longitudinal dysfunction is present in cats with HCM and has prognostic significance.

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ESVC-O-12

INTER-BREED VARIATION IN CIRCULATING CONCENTRATIONS OF SEROTONIN (5HT) IN HEALTHY DOGS.

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In different species, increased circulating serotonin (5HT) concentrations have been linked to development of valvular lesions, similar to those seen in myxomatous mitral valve disease (MMVD). Canine reference values for circulating 5HT are lacking, but previous studies have suggested breed differences in healthy dogs, with higher concentrations in Cavalier King Charles spaniels (CKCS), a breed highly affected by MMVD. The study aim was to investigate inter-breed variation in serum 5HT in healthy dogs.

483 healthy, privately-owned dogs, aged 1–7 years, of 9 breeds were examined at 5 European centers. Absence of cardiovascular or other clinically relevant organ-related or systemic disease was ensured by thorough clinical investigations including echocardiography. Serum was frozen, stored at −20°C and later analyzed in batches by a validated 5HT ELISA.

Median 5HT concentration was 252.5 (interquartile range 145.5–390.6) ng/mL. Overall differences were found between breeds as well as centers of examination, and female dogs had higher 5HT concentrations (all $P < 0.0001$). Age was not associated with 5HT concentration. Bonferroni-corrected pair-wise comparisons between all breeds were significant in 42% of comparisons. Within centers, overall breed differences were found at 3/5 centers ($P \leq 0.028$) and pair-wise Bonferroni-corrected analysis within those centers showed breed differences in 42% of comparisons. Including center, breed and sex in multilinear regression analysis, the final model had an adjusted *R2* of 0.26 with breed and center remaining significant (both $P < 0.0001$). Newfoundlands, Belgian shepherds and CKCS had highest concentrations, with values approximately 2.5 times higher than Dachshunds, Finnish Lapphunds and German shepherds, which had the lowest concentrations.

In conclusion, inter-breed variation in serum 5HT concentration was found in healthy dogs between 1 and 7 years of age. These differences are likely influenced by genetic factors and should be taken into account when designing clinical trials.

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ESVC-O-13

ANALYSIS OF PRECORDIAL LEAD SYSTEM IN DOGS WITH DIFFERENT THORACIC CONFORMATIONS.

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Precordial lead system consists in a group of unipolar leads placed on the thoracic surface, which record the electrical activity of the heart on the horizontal plane. In human medicine, the sequence of ventricular depolarization results in a characteristic QRS complex pattern in each precordial lead: rS with a R:S ratio < 1 in the right precordial lead (V1) and qR in the left precordial leads (V5-V6). The purpose of this prospective study was to evaluate the QRS complex morphology in precordial leads using a previously described precordial lead system in dogs with different morphotypes. Sixty healthy dogs were enrolled and underwent physical examination, thoracic radiographs, 12-lead electrocardiogram using a system previously described and standard echocardiography. The dogs were allocated in three groups according the thoracic index (dorso-ventral thorax diameter x 100/latero-lateral thorax diameter): 90–100 brachycephalic, 50–60 dolicocephalic and 60–90 mesocephalic. The Shapiro-Wilcoxon W-test was used to test normality. Mean value ± standard deviation as well median and range was calculated. Non-parametric analysis of variance was performed on data to evaluate difference on QRS complex appearance among three thorax shape, by Kruskas Wallis test. To evaluate repeatability between three measurements the intraclass correlation coefficient was executed. All data analysis was performed by commercial available statistical software (SAS v9.2). Q wave was absent in V1, V2, V3 and V4 in all groups, present in V5 in dolicocephalic group and in V6 in all the groups. R wave amplitude in all precordial leads was statistically different between the three groups ($P = 0.0000$). Brachycephalic group showed lowest R wave amplitude, while the dolicocephalic group presented the highest R wave amplitude. S wave in V3 ($P = 0.041$) and V6 ($P = 0.046$) was statistically different between the three groups, showing the highest amplitude in the dolicocephalic group, and the lowest amplitude in mesocephalic group. R:S ratio in all precordial leads except V6 was statistically different between the three groups. In lead V1, brachycephalic dogs presented a ratio R:S < 1 while dolicocephalic and mesocephalic dog R:S > 1 ($P = 0.0005$). Based on this data, the previously proposed precordial lead system provides a correct evaluation of the ventricular depolarization of the right ventricle in lead V1 just in brachiocephalic dogs due to the different orientation of the cardiac dipole in the thorax. Further studies are needed to evaluate an alternative positioning of lead V1 in the latter two groups of dogs.

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ESVC-O-14

T WAVE INVERSION IN PRECORDIAL ECG LEADS AS A MARKER OF ARRHYTHMOGENIC RIGHT VENTRICULAR CARDIOMYOPATHY IN BOXER DOGS.

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Arrhythmogenic right ventricular cardiomyopathy (ARVC) is a primary myocardial disease of the Boxer dog, diagnosed by most cardiologists on the basis of a 24-hour Holter ECG. Identifying ARVC in general practice can be challenging, because of limited access to Holter ECG. In humans, early identification of the same disease is possible through the detection or repolarisation abnormalities on precordial chest leads: particularly T-wave inversion and possibly J-point abnormalities. We hypothesized that these same ECG abnormalities would be able to identify ARVC in a population of Boxer dogs.

12-lead ECGs were prospectively recorded from adult Boxer dogs presenting to the Cardiology services of five veterinary referral centres and one general practice in the UK. Dogs with aortic stenosis were excluded. ARVC (n = 21) was diagnosed based upon the presence of >50 VPCs/24 h on Holter. Control dogs (n = 34) had no evidence of ventricular arrhythmia, no significant heart murmur, and no clinical signs or history of cardiovascular disease. T waves were classified as positive or negative in each pre-cordial chest lead (V1-V6), and J waves were recorded as present or absent, with identification of J-point slurring or notching as described for humans. There was no significant difference in age, weight or sex between groups.

J-point abnormalities were identified in up to 48% of dogs (greatest in lead V4, but variable between different precordial leads). There was no significant difference in the frequency with which J-point abnormalities were identified in dogs with ARVC vs. controls ($P > 0.272$). The frequency of T-wave inversion varied according to chest lead: in lead V1 it was rare (ARVC 0%, controls 3%) but in lead V6 it was common (ARVC 81%, controls 68%). ARVC dogs had a significantly greater prevalence of T-wave inversion in lead V4 (29%, vs. controls 6%, $P = 0.046$) and lead V5 (52%, vs. controls 15%, $P = 0.005$).

ROC analysis was performed. T-wave inversion in lead V5 had a sensitivity of 52.4% and a specificity of 85.3% for the detection of ARVC (AUC 0.688, $P = 0.02$). In this population of dogs where the prevalence of ARVC was 38%, the positive predictive value was 69%, with a negative predictive value of 74%.

In conclusion, T-wave inversion in leads V4 and V5 was more prevalent in Boxer dogs with ARVC than control dogs in this pilot study.

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ESVC-O-15

A PILOT STUDY OF BRIDGING INTEGRATOR-1 IN BOXER DOGS WITH ARRHYTHMOGENIC RIGHT VENTRICULAR CARDIOMYOPATHY. M.J. Hezzell[1], R. Shaw[2], K. Meurs[3], M.A. Oyama[1]. [1]University of Pennsylvania, Philadelphia, USA, [2]Cedars-Sinai Medical Center, Los angeles, USA, [3]North Carolina State University, Raleigh, USA

Bridging integrator-1 (BIN1) is a membrane anchoring protein that organizes the cardiac dyad, facilitating calcium-induced calcium release from the sarcoplasmic reticulum and excitation-contraction coupling. In human patients, plasma concentrations of BIN-1 are reduced in patients with arrhythmogenic right ventricular cardiomyopathy (ARVC) and are negatively correlated with severity of ventricular tachycardia. Boxer dogs are predisposed to ARVC and we hypothesized that plasma BIN1 would be lower in affected dogs and negatively correlated with ventricular arrhythmias.

Boxer dogs over 5 years of age with and without ARVC (groups ARVC and boxer control [BC], respectively), dogs with stage B2 (preclinical) myxomatous mitral valve disease (MMVD) and healthy control dogs (HC) were recruited. All dogs underwent physical examination, echocardiography and blood sampling for measurement of plasma BIN1. Groups ARVC, BC and MMVD underwent measurement of plasma N-terminal pro-B-type natriuretic peptide (NT-proBNP) and cardiac troponin I (cTnI). Boxers underwent 24 hour ECG monitoring and genotyping for the *striatin* mutation. Comparisons between groups were made using Kruskal-Wallis or Mann-Whitney tests. Univariate regression models were constructed to investigate relationships between plasma BIN1 concentrations and clinical variables. Binary logistic regression models were constructed to investigate clinical predictors of ARVC positive status. Significance was set at $P < 0.05$.

Twenty-three dogs without evidence of congestive heart failure were recruited (5 BC, 8 ARVC, 4 MMVD and 6 HC). Plasma BIN1 concentrations were not significantly different between BC (median=1.01 ng/mL; range: 0.39, 3.03), ARVC (1.02 ng/mL; 0.69, 1.22), MMVD (2.23 ng/mL; 0.70, 3.50) and HC (0.62 ng/mL; 0.49, 1.86) groups ($P = 0.598$). NT-proBNP ($P = 0.22$) and cTnI (0.94) concentrations were not significantly different between groups. ARVC dogs had significantly greater number of ventricular premature complexes per hour (VPCs/hr) ($P = 0.028$) than BC, however, there was no correlation between BIN1 and VPCs/hr (B = -0.003; $P = 0.59$), longest run of ventricular tachycardia ($P = 0.76$), maximum rate of ventricular tachycardia ($P = 0.85$), striatin mutation ($P = 1.0$), left ventricular end-diastolic dimension ($P = 0.26$) or fractional shortening ($P = 0.33$). Binary logistic regression analysis detected no significant clinical predictors of ARVC vs. BC status. In conclusion, plasma BIN1 concentration is not decreased in canine ARVC patients who do not have concurrent heart failure. Larger cohorts, and longitudinal studies may determine if BIN1 can mark the transition from functioning heart to failing heart.

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ESVC-O-16

TRANSIENT MYOCARDIAL THICKENING IN CATS ASSOCIATED WITH HEART FAILURE. J. Novo Matos[1], N. Pereira[2], T. Glaus[2], L. Wilkie[1], K. Borgeat[3], J. Loureiro[4], J. Silva[4], V. Law[1], D.J. Connolly[1], A. Kranjc[2], V. Luis Fuentes[1]. [1]Royal Veterinary College, Hatfield hertfordshire, UK, [2]Vetsuisse Faculty, University of Zurich, Zurich, Switzerland, [3]Highcroft Veterinary Referrals, Bristol, UK, [4]North Downs Specialist Referrals, Surrey, UK

Cats with hypertrophic cardiomyopathy (HCM) and heart failure (CHF) are reported to have a poor prognosis. Nevertheless there are anecdotal observations of cats with left ventricular hypertrophy (LVH) and CHF that show normalization of left ventricular wall thickness (LVWT) and left atrial size on echocardiography within weeks to months. Transient increase in LVWT mimicking HCM has been described in acute myocarditis in humans.

We aimed to identify and describe clinical characteristics in cats with transient myocardial thickening and CHF (TMT+CHF). We hypothesized that TMT+CHF occurs mainly in young cats with a history of an antecedent event (e.g. neutering).

Clinical records at a single center were searched for TMT+CHF cases and a control group of cats matched for clinical signs with persistent LVH and CHF (HCM+CHF); and also at multiple centers for TMT+CHF cases. TMT+CHF was defined as initial LVWT ≥6 mm accompanied by signs of CHF with subsequent decrease in wall thickness to <5.5 mm. Data are reported as median [range] or mean (95%CI).

Case-control study: 6 TMT+CHF and 6 HCM+CHF cats were identified. TMT+CHF were younger (1.7 [0.4–4.0] years) than HCM+CHF cats (10.2 [8.2–12.6] years, $P = 0.004$). At presentation LVWT was similar in TMT+CHF (6.7 [6.1–8.2] mm) and HCM+CHF groups (7.7 [6.0–9.8] mm, $P = 0.297$), but TMT+CHF cats had thinner LVWT at final echo (5.0 mm [3.7–5.3] vs 7.2 mm [5.5–8.3], $P = 0.004$). Left atrium/aorta (LA/Ao) was larger in the HCM+CHF group at presentation (LA/Ao 2.9 [1.98–3.23] vs 2 [1.52–2.3], $P = 0.024$) and increased in size over time, (to 3.1 [2.37–3.83] vs a decrease to 1.4 [1.26–1.56] in TMT+CHF cats, $P = 0.006$). 83.3% of TMT+CHF cats had antecedent events vs 50% in the HCM+CHF group ($P = 0.545$). CHF relapsed in all HCM+CHF cats but in no TMT+CHF cats.

Multicenter study: 17 TMT+CHF cases were enrolled. 70.6% had antecedent events. LVWT decreased over 3.4 (95%CI 1.9–7.4) months from 6.7 mm [6.0–9.7] to 4.8 mm [2.8–5.3], ($P < 0.0001$) and LA/Ao also decreased (from 1.8 [1.52–2.30] to 1.4 [1.3–1.7], $P = 0.001$). cTnI was elevated at presentation and normalised once myocardial thickening resolved (cTnI 4 ng/ml [0.43–63.8] vs 0.01 ng/ml [0.0–0.34]; $P = 0.018$). Therapy was discontinued in 15/17 TMT+CHF cats at 4.7 (CI 1.9–7.4) months after presentation and all cats remained asymptomatic.

TMT+CHF affects younger cats and antecedent events are common, however no clinical or echocardiographic characteristics at presentation differentiated the two groups. TMT is a cause of CHF in cats but has a better prognosis than HCM+CHF.

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ESVC-O-17

HISTORY AND CLINICAL FINDINGS IN 87 CATS PRESENTING WITH DYSPNOEA IN GENERAL PRACTICE: A PROSPECTIVE INVESTIGATION. D. Dickson[1], C. Little[2], J. Harris[1], M. Rishniw[3]. [1]HeartVets, Bridgend, UK, [2]Barton Vets, Canterbury, UK, [3]VIN, Ithaca, USA

Studies of feline dyspnoea from referral populations suggest that select historical and clinical examination findings can discriminate between aetiologies. Whether similar findings help discriminate cases of feline dyspnea in general practice is unknown.

We prospectively enrolled first-time dyspnoeic cats presenting to first-opinion practice between 1/6/2011 and 16/03/2016. We

collected signalment, historical and clinical data at presentation using standardized forms.

First-opinion clinicians investigated each case; supervising clinicians (DD, CL, JH) reviewed the final diagnosis and categorised cases as cardiac, respiratory, neoplastic, traumatic or miscellaneous, based upon objective and accepted clinical, radiographic, echocardiographic or post-mortem criteria. Records lacking critical data were excluded. Relationships between historical/clinical variables and dyspnoea aetiology were examined. Receiver operating characteristic (ROC) and standard diagnostic test performance analyses were used to find optimal cut-offs for select historical/clinical variables that could differentiate cardiac and non-cardiac dyspnoea.

A total of 102 cats were enrolled and a definitive diagnosis was reached in 87 cases. Fifty-eight were cardiac (66.7%); 13 respiratory (14.9%); 10 neoplasia (11.5%) and 6 traumatic (6.9%). Fifteen (25.9%) of cats with cardiac dyspnoea had a recent history of cough. Fifteen cats had heart murmurs, 13 of these were in the cardiac group and two had neoplasia. Thirteen cats had gallop sounds and all were in the cardiac group. Eleven had arrhythmias; 10 were cardiac and one traumatic.

Individual variables that helped identify congestive heart failure (CHF) as the aetiology of dyspnea included presence of a gallop sound, rectal temperature <37.5°C, heart rate of ≥190 bpm, and respiratory rate ≥72. These findings had low sensitivities but high specificities, with predicted post-test probabilities >85%. History of a cough failed to exclude CHF as an aetiology.

Our findings provide first-opinion clinicians with simple means of stratifying dyspnoeic feline patients. Dyspnoeic cats with hypothermia, tachycardia, gallop sounds or profound tachypnea are likely to have CHF underlying their dyspnea. Additional diagnostics are required for cats without these findings to help differentiate aetiologies. Cats with a history of coughing cannot be automatically assumed to be "non-cardiac".

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ESVC-O-18

CLUSTER ANALYSIS OF PATHOLOGICAL FEATURES TO RECLASSIFY FELINE CARDIOMYOPATHIES.

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Feline cardiomyopathies are currently classified according to the human system, despite poor characterization of feline phenotypes (including the effect of age), difficulties ascribing a category in many cats, unknown etiology in most cases, and a lack of diagnostic consensus.

We aimed to apply cluster analysis techniques to determine whether gross and histopathological findings in cats with and without myocardial disease could be used to construct an alternative cardiomyopathy classification.

Hearts from cats submitted for necropsy from March 2013 to December 2015 were examined prospectively by a single, trained observer using a standardized set of criteria for macroscopic and microscopic evaluation and assigned a diagnosis based on conventional classification. Cluster analysis was performed using a two-step cluster method.

Hearts were analysed from 179 sequential feline necropsies, with cluster analysis carried out in a subset of 107 cats with complete data. Cats had a median age of 6.0 [0.1–18.9] years, 64.8% were male and 35.8% were pedigree; 43% were believed to have died as a result of heart disease. Cluster analysis resulted in two clusters. Cats in cluster 1 had more extensive replacement ($P < 0.001$), interstitial ($P < 0.001$), perivascular ($P = 0.003$) and subendocardial fibrosis ($P < 0.001$) and were more likely to have intramural arteriosclerosis ($P < 0.001$), left atrial enlargement ($P < 0.001$) and inflammatory cell infiltration ($P < 0.001$) than cats in cluster 2. Additionally, cats in cluster 1 had a greater score for myofiber disarray ($P < 0.001$), greater myocyte hypertrophy ($P < 0.001$) and thicker right ventricular walls ($P = 0.004$). Heart weight was significantly greater for cats in cluster 1 ($P < 0.001$), and cats in cluster 1 were more likely to die of their cardiac disease ($P < 0.001$). Classifications based on conventional pathology for cats in cluster 1 were: hypertrophic cardiomyopathy (HCM; n = 28, 73.7%), end-stage HCM (n = 6, 8.8%), endomyocardial form of restrictive cardiomyopathy (eRCM; n = 1, 2.6%) and unclassified cardiomyopathy (UCM; n = 6, 8.8%). Cats in cluster 2 were classified as: normal (n = 25, 36.2%), HCM (n = 28, 40.6%), eRCM (n = 2, 2.9%), dilated cardiomyopathy (n = 1, 1.5%), arrhythmogenic right ventricular cardiomyopathy (n = 1, 1.5%), inflammatory (epicarditis/myocarditis/endocarditis; n = 5, 7.3%) and UCM (n = 2, 2.9%).

Cluster analysis failed to identify distinct phenotypes that would correspond with the currently described forms of feline cardiomyopathy. Instead, clusters appeared to reflect disease severity. This suggests either the currently described feline cardiomyopathies are a spectrum of a single disease or that gross pathology, combined with semi-quantitative histopathology using light microscopy, is insufficient to allow discrimination.

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ESVC-O-19

'SOFT', 'NOT SOFT' OR 'PALPABLE': MORE DETAILED MURMUR CLASSIFICATION OF PULMONIC AND SUBAORTIC STENOSIS PROVIDES NO ADDITIONAL USEFUL INFORMATION.

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Most cardiologists grade murmur intensity on an ordinal 6-level scale, modified from a system proposed by Levine in 1933. A previous study of small-breed dogs with mitral valve disease demonstrated that clinically useful information is obtained when classifying murmurs on a 2-level scale, with a 4-level scale providing additional probabilistic information (probability of congestive heart failure or pulmonary hypertension). Whether classifying murmurs in dogs with pulmonic stenosis (PS) or subaortic stenosis (SAS) on a 6-level scale provides useful clinical information, or if a more simple classification scheme suffices, is unknown. Therefore, we examined the ability of murmur intensity to predict the severity of PS or SAS in dogs.

155 dogs with PS and 132 dogs with SAS were identified from medical records. Dogs ≤8 years old were included. Dogs with SAS that were <1 year old were excluded. Dogs with complex cardiac defects, those having undergone an interventional procedure, or receiving cardiac medications were excluded. Murmur grade (6-level scale) noted by the attending cardiologist, and the Doppler-derived pressure gradients (PG) across the stenotic valve were recorded. Murmurs were re-classified using a descriptive 4-level scale ("soft", "moderate", "loud", "palpable").

No dogs with soft murmurs (grade I or II) had PG >50 mmHg, regardless of disease. Only 2/59 dogs with moderate (grade III) murmurs had pressure gradients >100 mmHg; only 6/59 had PG >79 mmHg. However, 52/73 dogs with loud murmurs, and 85/98 dogs with palpable murmurs had pressure gradients >80 mmHg. Severity of stenosis increased with increasing murmur intensity, however, murmurs rated "not soft"(>grade II) were not informative on a case-by-case basis. "Soft"murmurs were 100% specific, but only 60% sensitive for identifying PG <50 mmHg.

Dogs with PS and SAS that have "soft"(grade II) murmurs have mild disease. Dogs with palpable murmurs mostly have severe disease, but require additional diagnostics. Therefore, a simple 3-level scale of "soft", "not soft", and "palpable"suffices for physical evaluation of dogs with PS and SAS as no additional information is obtained from more complex classification.

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ESVC-O-20

CAN NT-PROBNP PLASMA LEVELS AND PHONOCARDIOGRAPHY FACILITATE DIFFERENTIATION OF INNOCENT CARDIAC MURMURS FROM CONGENITAL CARDIAC ANOMALIES IN ASYMPTOMATIC PUPPIES?. V. Szatmári, S. Marinus, V. Szatmári. Utrecht University, Faculty of Veterinary Medicine, Utrecht, the Netherlands

Differentiating innocent cardiac murmurs from pathological ones can be challenging in first opinion veterinary practices. The aim of this study was to investigate whether phonocardiograms and plasma NT-proBNP levels can help in this differentiation.

We hypothesized that plasma NT-proBNP levels of puppies with innocent cardiac murmurs are not different from those without a murmur, whereas NT-proBNP levels of puppies with a severe congenital cardiac anomaly are increased. Also, phonocardiographic characteristics of innocent cardiac murmurs were expected to be different from those of pathologic murmurs.

Between September 2014 and September 2015, 133 asymptomatic cairn terrier puppies were auscultated. Their breeders participated in a voluntary screening program for congenital portosystemic shunt. Blood was collected for individual measurement of blood ammonia levels. From the surplus plasma samples NT-proBNP was measured. The median age of these puppies was 52 (range 45–124) days. Of the 133 puppies 41 had an innocent murmur (31%). In the same period 30 asymptomatic young dogs were referred to the cardiology service for evaluating a murmur (median age 164 days, range 29–396 days). All dogs with a murmur underwent an echocardiogram on the same day performed by the same cardiologist who auscultated the dogs. In the referred dogs a wide range of congenital anomalies was found. Besides, a phonocardiogram was recorded with an electronic stethoscope at the point of maximal intensity of the murmur. The phonocardiograms were viewed and analyzed on a computer screen. For quantitative description of the phonocardiograms, murmur–to-systole duration ratios were calculated.

The median NT-proBNP level of puppies without a murmur did not differ from that of the puppies with an innocent murmur: 300 (range 102–1224) versus 326 (range 102–1340) pmol/L, ($P = 0.405$). The median NT–proBNP concentration of the group with congenital cardiac anomaly was 1097 (range 102–8970) pmol/L. Anomalies causing left-sided overload resulted in higher levels than right-sided stenotic disorders. Dogs with more severe cardiac disorders had higher NT-proBNP levels.

Innocent cardiac murmurs had a median murmur-to-systole ratio of 65% (range 38–81%), which was significantly shorter than the median murmur-to-systole ratio of the congenital cardiac anomalies: 95% (range 66–100%) ($P = 0.000$).

Because dogs with severe congenital cardiac anomalies (especially pulmonic stenosis) may have low NT-proBNP values, NT-proBNP measurement is not suitable as a routine screening test for detecting congenital cardiac anomalies. However, NT-proBNP levels exceeding 850 pmol/L and murmurs longer than 80% of the systole on a phonocardiogram are most likely caused by a congenital cardiac anomaly.

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ESVC-O-21

VALUE OF STANDARD ECHOCARDIOGRAPHIC VARIABLES IN PREDICTING PULMONARY TRANSIT TIME AND MYOCARDIAL PERFUSION IN DOGS WITH OR WITHOUT MYXOMATOUS MITRAL VALVE DISEASE. T. Falk. tf veterinär AB, Helsingborg, Sweden

Myocardial perfusion and pulmonary transit time can be assessed using contrast echocardiography. The study aim was to investigate if standard echocardiographic variables can predict contrast echocardiographically derived pulmonary transit time (PTT) and myocardial perfusion (MP) in dogs with or without myxomatous mitral valve disease (MMVD).

28 dogs of different breeds were included, 18 with mild-moderate MMVD and 10 with no or minimal MMVD. Dogs underwent clinical examination, standard echocardiographic examination and contrast echocardiography utilizing a second-generation contrast medium to assess MP and PTT. Each clinical and echocardiographic variable was regressed against MP and PTT evaluating both linear and quadratic fits. Variables showing $P < 0.02$ were entered in a multiple linear regression model, performed in a stepwise backward manner using $P < 0.05$ as threshold.

For PTT, out of 10 variables entered in the multiple regression model, increased Fractional shortening (FS) ($P < 0.001$), Ejection fraction (EF) ($P = 0.009$), BW normalized left ventricular (LV) volume in systole (LVVSn) ($P = 0.017$) and LV diameter in diastole (LVIDDn) ($P = 0.024$) were associated with increased PTT, while increased BW normalized LV free wall in systole (LVFWn) was associated with decreased PTT ($P = 0.028$), with an adjusted R^2 of 0.69. For MP, out of 10 variables entered in the multiple regression model, increased FS ($P < 0.001$), LVVSn ($P = 0.012$) and E-wave deceleration-time ($P = 0.020$), were associated with longer MP-time.

In conclusion, increased LV systolic function and volume corresponds to a more advanced stage of MMVD, which to some extent, may predict an increase in PTT and a decrease in MP.

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Other authors employed by respective Univeristy.

ESVC-O-22

COMPARISON OF REAL-TIME 3-DIMENSIONAL AND 2D-BIPLANAR ECHOCARDIOGRAPHIC ASSESSMENT OF LEFT ATRIAL VOLUMES IN DOGS WITH MYXOMATOUS MITRAL VALVE DISEASE USING THE SAME ACQUISITION. A Tidholm[1], A Höglund[1], J. Häggström[2], I. Ljungvall[2]. [1]Albano Animal Hospital, Danderyd, Sweden, [2]Dept of Clinical Sciences, Faculty of Veterinary Medicine, Uppsala, Sweden

Left atrial (LA) size is important in decision-making and prognostication in dogs with myxomatous mitral valve disease (MMVD). Previously, our group has shown that allometric scaling of 2-dimensional (2D)-based single dimension echocardiographic measurements of LA showed good correlation with real-time 3-dimensional (RT3D) echocardiographic measurements of LA volume, whereas indexed 2D-based methods did not. However, biplane methods might more accurately reflect LA volume especially in enlarged hearts. The aim of the study was to compare LA volumes obtained by RT3D echocardiography with those obtained by Simpson's modified method of discs (SMOD) and the area-length method using the same RT3D acquisition.

Ninety-six privately owned dogs of 33 breeds diagnosed with MMVD were examined using 2D and RT3D echocardiography. According to the ACVIM classification, 22 dogs were classified with congestive heart failure (CHF) (2 in class C1 and 20 in class C2) and 74 dogs without CHF (64 dogs in class B1 and 10 dogs in class B2). Age ranged from 4 to 14 years (median 10 years), and body weight ranged from 2 to 37 kg (median 9 kg). Fifty-eight (60%) males and 38 (40%) females were included, and heart rate ranged from 80 to 222 beats/min (median 135 b/min).

The RTD3D LA volumes were obtained by off-line analysis where 5 reference points were manually placed, and the endocardial border was then traced using an automated detection process to create a cast of the LA cavity. In the same acquisition, with exact same timing, the LA volumes were calculated using SMOD and the area-length method in 2 orthogonal views. Bland-Altman plots were used to compare measured LA volumes with calculated LA volumes obtained from the two different biplanar methods. Both measured and calculated volumes were corrected for body weight.

None of the calculated LA volumes based on either of the two biplane methods showed good agreement with the RTD3D LA volumes obtained in the same acquistion. In comparison to RTD3D LA volumes, SMOD underestimated LA volumes and the difference between methods increased with increasing LA volume. The area-length method overestimated LA volumes and the difference between methods increased with increasing LA volume.

In conclusion, in comparison to RTD3D, SMOD might underestimate and the area-length method might overestimate LA volumes in dogs with MMVD.

Disclosures: No disclosures to report.

ESVC-O-23

THREE-DIMENSIONAL ECHOCARDIOGRAPHIC COMPARISON OF MITRAL VALVE MORPHOLOGY IN CAVALIER KING CHARLES SPANIELS TO MITRAL VALVE MORPHOLOGY IN DOGS OF OTHER BREEDS. G. Menciotti[1], J. Häggström[2], I. Ljungvall[2], M. Aherne[1], S. Wesselowski[1], J. Abbott[1], M. Borgarelli[1]. [1]Virginia-Maryland College of Veterinary Medicine, Blacksburg, USA, [2]Swedish University of Agricultural Science, Uppsala, Sweden

Cavalier King Charles Spaniels (CKCS) have a high prevalence of myxomatous mitral valve disease (MMVD) and early onset of the disease. Mitral valve (MV) morphology is a key factor in distributing forces over the MV apparatus, and abnormal loads could have a role in the pathogenesis of MMVD. We therefore sought to evaluate the morphology of the MV of healthy CKCS and compare it to the MV morphology of other canine breeds using real-time three-dimensional echocardiography (3DE). We hypothesized that, compared to other breeds, the MV of healthy CKCS was morphologically different. To be enrolled, dogs had to be healthy based on physical and echocardiographic examinations. A total of 63 dogs were enrolled in the study: 22 CKCS and 41 dogs from 18 other breeds. The median (IQR) body weight (BW) was 14 kg (8.8–20 kg). Three-dimensional echocardiographic datasets were analyzed off-line with a dedicated software package and 16 morphologic variables were measured. Variables with a known association to body size were indexed using previously reported scaling factors. Differences between CKCS and all the other breeds were analyzed using unpaired Student's T-test or Mann-Whitney U-test as appropriate for data distribution. Compared to healthy dogs, CKCS had significantly smaller BW ($P < 0.0001$), normalized anterolateral-posteromedial annulus diameter ($P = 0.0320$), annulus height ($P = 0.0255$), tenting height ($P < 0.0001$), tenting area ($P < 0.0001$), normalized tenting volume ($P = 0.0001$), posterior leaflet length ($P = 0.0012$), normalized posterior leaflet area ($P = 0.0258$), and greater annulus sphericity index ($P = 0.0417$). In conclusion, the MV of healthy CKCS was more circular and had less tenting, compared to other breeds.

Disclosures: Disclosures to report.

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ESVC-O-24

MITRAL REGURGITATION SEVERITY AND LEFT VENTRICULAR SYSTOLIC DIMENSION PREDICT SURVIVAL IN YOUNG CAVALIER KING CHARLES SPANIELS. M.J. Reimann[1], J.E. Møller[2], J. Häggström[3], T. Martinussen[4], S.S.C. Zatrazemi[1], L. Svanholm[1], L.B.M. Nielsen[1], H.D. Pedersen[5], L.H. Olsen[1]. [1]Department of Veterinary Disease Biology, University of Copenhagen, Frederiksberg, Denmark., [2]Department of Cardiology, Odense University Hospital, Odense, Denmark., [3]Department of Clinical Sciences, Swedish University of Agricultural Sciences, Uppsala, Sweden., [4]Department of Public Health, University of Copenhagen, København K, Denmark., [5]BioAdvice A/S, Ølstykke, Denmark.

Development and progression of myxomatous mitral valve disease (MMVD) in dogs are difficult to predict. Identification at a young age of dogs at high risk of developing congestive heart failure in the future is desirable.

The aim of the study was to investigate the predictive value of selected clinical and echocardiographic characteristics associated with MMVD obtained at a young age for prediction of long-term cardiac and all-cause mortality in Cavalier King Charles Spaniels (CKCS).

The study included 1125 privately-owned CKCS examined at the age of 1-3 years between January 1996 and June 2012. Long-term outcome was assessed by telephone interview with owners. The value of variables for predicting mortality (cardiac and all-cause) was investigated by Cox Proportional Hazard and Kaplan-Meier analyses.

Presence of mild to severe mitral regurgitation (MR) (hazard ratio (HR)=3.03, 95% confidence interval (95%CI)=1.48–6.23, $P = 0.003$) or intermittent MR (HR=2.23, 95%CI=1.48–6.23, $P = 0.04$) on echocardiography was significantly associated with increased hazard of cardiac death. An interaction between MR and sex was significant for all–cause mortality ($P = 0.04$) showing that males with mild to severe MR had a higher all–cause mortality compared to males with no MR (HR=2.38, 95%CI=1.27–4.49, $P = 0.007$), whereas no difference was found between female MR groups. The risk of cardiac (HR=1.37, 95%CI=1.14–1.63, $P = 0.0008$) and all–cause (HR=1.13, 95%CI=1.02–1.24, $P = 0.02$) mortality increased with increasing left ventricular end-systolic internal dimension normalized for body weight ($LVIDS_N$).
In conclusion, mild to severe MR, intermittent MR and decreased $LVIDS_N$ in dogs<3 years of age were associated with cardiac death later in life in CKCS.

Disclosures: No disclosures to report.

ESVC-O-25

EVALUATING URINARY 5-HYDROXYINDOLEACETIC ACID (5-HIAA) AS A BIOMARKER OF MYXOMATOUS MITRAL VALVE DISEASE IN CAVALIER KING CHARLES SPANIELS. L.B. Christiansen[1], S.E. Cremer[1], A. Helander[2], T. Madsen[1], M.J. Reimann[1], J.E. Møller[3], K. Höglund[4], I. Ljungvall[4], J. Häggström[4], L.H. Olsen[1]. [1]University of Copenhagen, Frederiksberg c, Denmark, [2]Karolinska Institutet, Stockholm, Sweden, [3]Odense University Hospital, Odense, Denmark, [4]Swedish University of Agricultural Sciences, Uppsala, Sweden

Myxomatous mitral valve disease (MMVD) is the most common heart disease in dogs with a high prevalence among Cavalier King Charles Spaniels (CKCS). Valvular changes may cause mitral regurgitation (MR) and over time, some dogs can progress into congestive heart failure. Increased circulating concentrations of serotonin are suggested to be involved in the pathogenesis of MMVD in CKCS.

5-Hydroxyindoleacetic acid (5-HIAA) is a serotonin metabolite excreted in urine. Urine 5-HIAA is commonly used in human medicine as a biomarker of serotonin-secreting tumors. The aim of the present study was to investigate if urinary 5-HIAA is associated with MMVD severity in CKCS. We hypothesized that the urine 5-HIAA concentration was increased in CKCS with MMVD and that urine 5-HIAA concentration would correlate with the serotonin concentration in serum or plasma.

Serum, plasma and urine samples were collected from 80 dogs above 4 years of age divided into four groups: control dogs (Beagles) with no evidence of heart disease (CON, n = 17), CKCS with no or minimal MR due to MMVD (nMR, n = 18), CKCS with mild MR due to MMVD (mMR, n = 22) and CKCS with moderate to severe MR due to MMVD (sMR, n = 23). Urinary 5-HIAA was analyzed by high-performance liquid chromatography (HPLC) and creatinine (to correct for variations in urine dilution) by the Jaffe method. Serotonin concentrations in serum and platelet poor plasma were determined by a validated enzyme-linked immunosorbent assay.

The results from preliminary analyses in a subset of dogs from three of the four groups (CON, nMR and sMR) with a mean age of 8.5 years (range: 4.1–13.3) are presented as the median (25–75% interquartile range). Analyses of the remaining samples are ongoing.

No significant difference in urinary 5-HIAA to creatinine ratio (5-HIAA/CREA, μmol/mmol) was found between the CON dogs (n = 6; 2.37(1.52-2.58)), nMR dogs (n = 6; 2.77 (2.23–3.20)) and sMR dogs (n = 6; 2.94 (1.65–3.32)) (overall $P = 0.48$). Female dogs (n = 11) showed significantly higher 5-HIAA/CREA than male dogs (n = 7; 3.05 (2.47–3.32) versus 1.65 (1.50–2.49), $P = 0.011$).

The preliminary data did not reveal any association of 5-HIAA/CREA with age ($P = 0.844$; R^2=0.003), serum serotonin concentration ($P = 0.396$; R^2=0.045) or plasma serotonin concentration ($P = 0.3801$; R^2=0.048).

In conclusion, the preliminary data indicate that urinary 5-HIAA concentrations are dependent on the sex, but not the age of the dog. Further analyses are necessary to draw final conclusions

regarding the possible associations between urinary 5-HIAA concentrations and MMVD severity in dogs.

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No disclosures regarding this study.

ESVC-O-26
DIAGNOSTIC VALUE OF PULMONARY VEIN TO PULMONARY ARTERY RATIO IN DOGS WITH PULMONARY HYPERTENSION OF PRE-CAPILLARY ORIGIN. E. Roels, A.C. Merveille, P.L. Malaize, C. Clercx, K. Mc Entee. University of Liège, Liège, Belgium

The pulmonary vein-to-pulmonary artery ratio (PV/PA) has been shown to be decreased in West Highland white terriers affected with pulmonary fibrosis in comparison with age- and breed-matched controls, suggesting its potential use in the non-invasive diagnosis of pulmonary hypertension (PH). The aim of the present work was to determine the value of PV/PA for the prediction of tricuspid regurgitation pressure gradient (TRPG) compared with other echocardiographic indices in dogs with pre-capillary PH of different origins. Echocardiographic images obtained from dogs with a tricuspid regurgitant jet were retrospectively reviewed. PV/PA, acceleration time to ejection time ratio of the pulmonary flow (AT:ET), main pulmonary artery to aorta ratio (MPA/Ao) and right pulmonary artery distensibility index (RPADi) were evaluated. Dogs were grouped into control (Group1, n = 19, TRPG<30 mmHg), and mildly (Group2, n = 10, TRPG 30-50 mmHg), moderately (Group3, n = 4, TRPG 50-75 mmHg), and severely (Group4, n = 11, TRPG>75 mmHg) affected with PH. Ten dogs were clinically heathy, and the remaining 34 dogs were suffering from angiostrongylosis (n = 13), brachycephalic syndrome (n = 6), bronchomalacia (n = 6), heart-worm disease (n = 2), chronic pulmonary thromboembolism (n = 2), PH of unknown origin (n = 2), eosinophilic bronnchopneumopathy (n = 1), pulmonary fibrosis (n = 1), and diffuse pulmonary carcinoma (n = 1). PV/PA (median, [IQ range]) in both two-dimensional (2D) and M-modes (MM) were significantly reduced in Group3 (PV/PA_MM = 0.590 [0.532–0.658]; PV/PA_2D = 0.543 [0.471–0.718]) and Group4 (PV/PA_MM = 0.341 [0.245–0.477]; PV/PA_2D = 0.324 [0.215–0.485]) in comparison with Group1 (PV/PA_MM = 0.974 [0.937–1.083]; PV/PA_2D = 0.958 [0.926–1.002]; $P \leq 0.007$), and in Group4 in comparison with Group2 (PV/PA_MM = 0.835 [0.701–0.957]; PV/PA_2D = 0.831 [0.798–0.983]; $P \leq 0.005$). Results of the Spearman correlation analyses revealed the strongest correlation for PV/PA_2D (r = –0.767, $P < 0.0001$) to TRPG followed by PV/PA_MM (r = –0.766, $P < 0.0001$), MPA/Ao (r = 0.720, $P < 0.0001$), RPADi (r = –0.567, $P = 0.001$) and AT:ET (r = –0.537, $P = 0.003$). PV/PA_2D possessed the most accurate cut–off (0.776, AUC 0.974, Se 100%, Sp 88%) to predict a TRPG ≥ 50 mmHg followed by PV/PA_MM (0.756, AUC 0.963, Se 100%, Sp 88%), RPADi (24%, AUC 0.953, Se 91%, Sp 91%), AT:ET (0.390, AUC 0.902, Se 85%, Sp 86%), and MPA/Ao (0.926, AUC 0.865, Se 69%, Sp 92%). In conclusion, PV/PA measured in 2D or MM is an accurate predictor of TRPG and may be particularly useful if TR is absent or difficult to measure in dogs affected with pre-capillary PH.

Disclosures: No disclosures to report.

ESVC-O-27
ECHOCARDIOGRAPHIC EVALUATION OF THE RIGHT ATRIAL AREA INDEX IN DOGS WITH PULMONARY HYPERTENSION. T. Vezzosi[1], M. Iacona[1], F. Marchesotti[2], R. Tognetti[1], L. Venco[3], O. Domenech[2]. [1]University of Pisa, San piero a grado (pi), Italy, [2]Istituto Veterinario di Novara, Granozzo con monticello (no), Italy, [3]Veterinary Hospital Città di Pavia, Pavia, Italy

Pulmonary hypertension (PH) can lead to right ventricular remodeling and failure. Right ventricular dysfunction and tricuspid regurgitation can lead to right atrial enlargement. In dogs, echocardiographic evaluation of right atrial enlargement is thus far only based on subjective assessment. The aim was to evaluate reliability of the right atrial area index (RAAI) to characterize right atrial size and PH severity in dogs.

The study was prospective, multicenter and observational. We included 103 client owned dogs: 45 dogs with PH and 58 healthy dogs as control group. PH was classified according to tricuspid regurgitation pressure gradient (TRPG) in mild (TRPG: 36-50 mmHg; n = 15 dogs), moderate (TRPG: 51-75 mmHg; n = 9 dogs) and severe (TRPG >75 mmHg; n = 21 dogs). Nine dogs with PH had right-sided congestive heart failure (CHF). Echocardiographic view of the right atrium was obtained from the left apical 4-chamber view optimized for the right heart and the right atrial area was measured by planimetry at the end of ventricular systole. RAAI was calculated as right atrial area divided by body surface area.

Right atrial area showed a strong positive linear correlation with body surface area in healthy dogs (r = 0.89; $P < 0.0001$). RAAI was significantly higher ($P < 0.05$) in dogs with moderate PH (11.9 ± 7.3 cm^2/m^2) and severe PH (12.0 ± 4.5 cm^2/m^2) than in those with mild PH (6.9 ± 1.5 cm^2/m^2) or control group (7.1 ± 1.6 cm^2/m^2). No difference in RAAI was found between dogs of the two latter groups, or between dogs with moderate and severe PH. A weak positive correlation was found between RAAI and TRPG (r = 0.37; $P < 0.05$) and the TRPG was not different between dogs with right-sided CHF (81 ± 29 mmHg) or without right-sided CHF (76 ± 31 mmHg). Conversely, RAAI was significantly higher ($P < 0.0001$) in dogs with right-sided CHF (17.0 ± 4.5 cm^2/m^2) in comparison to those without right-sided CHF (8.6 ± 3.6 cm^2/m^2). The most accurate cut-off value in the prediction of right-sided CHF was >12.3 cm^2/m^2 (sensitivity: 89%; specificity: 89%). Intra- and inter-observer measurement variability was clinically acceptable (average coefficient of variation <10%).

The study showed that RAAI increases in dogs with moderate-to-severe PH and is particularly high in dogs with right-sided CHF. RAAI is expected to provide beneficial information during the assessment of PH severity in dogs and, possibly, when PH leads to remarkable hemodynamic consequences but the tricuspid regurgitation is absent or difficult to measure. Studies are needed to verify if RAAI is a prognostic factor in dogs with PH.

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ESVC-O-28
TAURINE DEFICIENCY IN ENGLISH COCKER SPANIELS DIAGNOSED WITH DILATED CARDIOMYOPATHY. M. Basili, B. Pedro, H. Hodgkiss-Geere, X. Navarro-Cubas, N. Graef, J. Dukes-Mcewan. Small Animal Teaching Hospital, University of Liverpool, Leahurst, Neston, UK

Dilated cardiomyopathy (DCM) is an acquired disease with high prevalence in large breed dogs but also in Cocker Spaniels. It has been reported that American Cocker Spaniels have taurine deficiency and this is associated with reduced systolic function and dilated cardiomyopathy phenotype. Supplementation with taurine is known to improve echocardiographicparameters and clinical signs in the affected dogs. Cocker Spaniels affected by DCM appear to have a better outcome than other large breed dogs with DCM. No studies have been performed investigating taurine deficiency in English Cocker Spaniels (ECS). In addition, the natural progression of the disease in ECS affected by DCM has not been fully assessed. Our database was retrospectively searched for ECS diagnosed with dilated cardiomyopathy. Between 2003 and 2016, fifty-nine ECS were assessed by the cardiology department of the Small Animal Teaching Hospital of the University of Liverpool. Eighteen of these dogs were diagnosed with DCM: 3 pre-clinical and 15 clinical DCM. Seven were females and 11 were males. Their age at the time of initial admission was 7.2 years (range 1.5-11) and their weight was 15.1 kg (9.5-20.8). Heparinised plasma Taurine levels were measured in 16/18 dogs and were low in 13/16 (mean 16.07 µmol/L, range 1-39; normal reference 50-180). When low, taurine supplementation was started, in addition to conventional cardiac medications. Of these 18 dogs, 3 were lost to follow-up. Of the 15 remaining dogs, 7 were still alive at the time of this study and 8 were dead. Of the 3 dogs with preclinical DCM, one was still alive, the other two were dead but remained preclinical at the time of death. The mean survival time (MST) for the overall

populations of dogs with clinical DCM was 1237.5 days (95% CI 510.8-1694.2). The MST for the subgroup of ECS with low taurine levels started on taurine supplementation was 1644.9 days (740.4-2549.4) while the MST for the three dogs with normal taurine levels was 381.7 days (3.8-759.5) ($P = 0.010$).

Like American Cocker Spaniels, also ECS diagnosed with DCM phenotype are commonly affected by taurine deficiency. Considering their MST, the prognosis for ECS with DCM may be better than other breeds affected by DCM. In addition, the MST of taurine deficiency ECS may be better than ECS with normal taurine levels. Larger samples and prospective studies are needed.

Disclosures: No disclosures to report.

ESVC-O-29

HEART RATE DECELERATION CAPACITY OBTAINED FROM 24-HOUR AMBULATORY ECG IN HEALTHY DOBERMAN PINSCHERS AND THOSE WITH DILATED CARDIOMYOPATHY. J.D. Harris[1], C.J.L. Little[2], J. Dennis[3], M.W. Patteson[1]. [1]HeartVets, Dursley, UK, [2]Barton Veterinary Hospital and Surgery, Canterbury, UK, [3]University of Exeter Medical School, Exeter, UK

There is an established link between autonomic nervous system (ANS) dysfunction and human cardiovascular disease. Altered heart rate variability (HRV) is associated with human disease severity and outcome, however canine HRV studies have largely failed to show a similar relationship. Electronic measurement of cardiac vagal tone (cardiac index of parasympathetic activity, CIPA) has prognostic value in dogs, however measurement is impractical in a clinical setting. Deceleration capacity (DC), a a novel measure of vagal tone, quantifies deceleration-related heart rate modulation from 24-hour ECG recordings and is a powerful predictor of human cardiac mortality. The prognostic value of DC measurement in canine heart disease is unknown. We sought to assess DC in a population of normal Doberman pinschers and those affected with dilated cardiomyopathy (DCM).

Clinical records and Holter data were collected retrospectively from 64 client-owned Doberman pinschers, comprising 20 healthy animals (NORMAL), 30 with preclinical DCM (DCM) and 14 with DCM and congestive heart failure (DCM-CHF). Accepted echocardiographic measurement criteria were used for the diagnosis of DCM. The NORMAL group were healthy dogs presented for DCM screening. The DCM group included dogs identified previously for a large, multicentre, prospective clinical trial (PROTECT trial) as well as clinical cases presented for screening, with the same inclusion criteria. Quantitative Holter analysis was performed and data exported for measurement of DC.

We compared log-transformed DC by clinical group using age-adjusted linear regression. Differences in log-DC for DCM and DCM-CHF groups are presented as average marginal effects, relative to the NORMAL group whose values were standardised to zero. We examined association of reduced DC with primary endpoint (PEndP) of CHF or sudden cardiac death, in the DCM group only. Two subgroups were defined by </>=median. Log-DC and time to PEndP was compared using the Kaplan-Meier method and age adjusted Cox proportional hazard models. Compared to the NORMAL group, log-DC was reduced in the DCM-CHF group ($P = 0.001$) with the same direction of effect observed in the DCM group ($P = 0.13$). Within the DCM group, median time to PEndP was shorter for dogs with log-DC =median (623 days), relative risk 3.21 (95%CI 1.28-8.08).

DC can be measured from canine 24-hour ECGs and supports a gradual reduction in vagal tone from early in the course of DCM. Wider prospective studies to evaluate this technique may lead to additional prognostic information for individual dogs.

Disclosures: Disclosures to report.

Two authors (JH, MP) offer commercial veterinary Holter monitor rental and analysis as part of their existing cardiology referral service.

A proportion of the preclinical DCM cases were previously recruited for a wide-scale prospective study funded by Boehringer Ingelheim. Permission was granted for the data to be included in the present study but no further funding was provided.

3 authors (JH, CL, MP) have received hororaria from pharmaceutical companies to provide CPD to veterinarians but no funding was directly given for this study.

Support for the study (use of Pathfinder Digital software) was provided by Spacelabs, UK but there was no funding provision.

ESVC-O-30

COMPARISON OF ECHOCARDIOGRAPHIC PARAMETERS IN DOGS WITH ARRHYTHMIA-INDUCED CARDIOMYOPATHY AND FAMILIAR DILATED CARDIOMYOPATHY. M. Perego, S. Battaia, R.A. Santilli. Clinica Veterinaria Malpensa, Samarate, Italy

Arrhythmia-induced cardiomyopathy (AICM) is defined as systolic and/or diastolic ventricular dysfunction resulting from a prolonged elevated heart rhythm, which is reversible upon control of the heart rate. Familiar dilated cardiomyopathy (DCM) is a primary cardiac disease with genetic predisposition causing mainly left ventricular systolic failure. To the best to the authors knowledge there are no data regarding echocardiographic difference between these two disorders in the dog. The aim of this study was, therefore, to retrospectively evaluate echocardiographic parameters in dogs with AICM secondary to sustained accessory pathways-mediated tachycardia (APMT) and in dogs with familiar DCM. According to the breed and the presence of APMT two groups of dogs were made, and for each group reported monodimensional and B-dimensional echocardiographic measurements indexed to body surface area were taken by one author (MP). Group A included 21 dogs of different breeds with a mean age ($\pm$ SD) of 2.8 ± 2.1 years, a mean body weight of 28.0 ± 6.7 kg, and M:F 2.5:1 with AICM induced by APMT diagnosed with endocardial mapping prior to the ablation of the accessory pathway, group B, 12 Doberman Pinschers with mean age of 7.3 ± 2.3 years, a mean body weight of 34.8 ± 7.0 kg, a M:F 1.4:1 with familiar DCM. In group A echocardiographic parameters obtained during sinus rhythm and during APMT were compared to assess the effects of acute changes in heart rate. Echocardiographic measurements obtained in both groups during sinus rhythm were then compared to determine possible screening factors to differentiate these two entities. Normal distribution of values was assessed by the Shapiro-Wilk W-test. Normally distributed data were tested using Student's t-test and non-normally distributed data using Wilcoxon's sum rank test. In group A, shortening fraction (FS) and 2-D ejection fraction (EF) were significantly higher during sinus rhythm than during tachycardia (P respectively 0.001 and 0.004). Shortening fraction and 2D EF were significantly higher in group A than in group B (P respectively 0.002 and 0.007) while end-diastolic volume index, end-systolic volume index and E-point-septal separation were significantly lower than in group B (P respectively 0.03, 0.001, 0.01). The echocardiographic difference between AICM dogs and DCM dogs found may reflect different pathophysiologic mechanisms or different rate of evolution of these myocardial diseases. Further studies are needed to determine cut-off values allowing the differentiation between AICM and familiar DCM.

Disclosures: No disclosures to report.

ESVC-O-31

ECHOCARDIOGRAPHIC INDICES OF AGE AND GENDER-DEPENDENT CARDIAC REMODELING OVER THE ADULT LIFESPAN IN IRISH WOLFHOUNDS. A.Y. Brungs[1], C. Poulsen Nautrup[2], A.C. Vollmar[1]. [1]Tierärztliche Praxis für Kleintiere Dr. Vollmar, Bonn, Germany, [2]Ludwig Maximilian University/ Department of Veterinary Anatomy, Munich, Germany

The heart undergoes a continuous life-long remodeling process. In humans cardiac remodeling over the adult life course from <19 to 60-80 years of age has been characterized echocardiographically by a distinct pattern of decreasing LV end-diastolic and end-systolic dimensions/volumes while LV systolic function increased with advancing age (Gebhard C, et al, Echocardiography 2013). These

alterations were more pronounced in women than in men. Longitudinal data characterizing cardiac remodeling in dogs are limited.

The objective of this study was to characterize echocardiographically indices of cardiac remodeling over the adult life course in Irish wolfhounds (IW).

Between 5/1990-3/2016, 1588 IW (732 m; 856f) were examined by physical examination, echocardiography and electrocardiography (AV). Inclusion criteria for this study were dogs with no indication of cardiac disease until old age or death, which had 4 examinations performed between 1-2.5 yrs, 3-4 yrs, 4.5-6 yrs and 7-10.5 years of age. 56 males (BW 53.2-87 kg), 90 females (BW 45-72 kg) were eligible. As first comparison of mean values between age groups Student′s t-test was used. A P-value <0.05 was considered statistically significant.

Over the adult life course males had statistical significant increases in LVIDs, LVIDd, right atrial and left atrial dimensions and statistical significant decreases of FS%. From youngest to oldest age of examination means±SD were: LVIDs, 32.7 ± 3.0 vs 36.5 ± 2.9 mm; LVIDd, 49.6 ± 4.7 vs 53.4 ± 3.8 mm; RA 36.8 ± 3.4 vs 42.6 ± 3.4 mm; LA 49.1 ± 3.5 vs 55.0 ± 3.8 mm, and FS% (34.5 ± 3.7 to 30.9 ± 3.09) with P- values <0.001 for all comparisons. In females, from youngest to oldest age of examination, increases of mean LVIDs (32.9 ± 3.0 to 34.2 ± 3.2 mm; $P = 0.001$); LVIDd (49.6 ± 3.5 to 50.4 ± 3.4, $P = 0.041$); RA (38.1 ± 3.7 mm to 40.0 ± 5.2 mm, $P = 0.004$); LA (48.8 ± 3.6 to 52.4 ± 4.3 mm, $P < 0.001$) were attenuated, as were decreases of FS% (33.4 ± 3.7 to 31.5 ± 4.4, $P = 0.02$).

In conclusion, in IW, echocardiographic indices of cardiac remodeling over the adult life course demonstrated that LV dimensions increased, while fractional shortening (FS) decreased with advancing age. Female gender attenuated this remodeling process.

Disclosures: No disclosures to report.

ESVNU – European Society of Veterinary Nephrology and Urology

ESVNU-O-1

CHRONIC KIDNEY DISEASE IN CATS PRESENTING TO PRIMARY-CARE PRACTICE IN THE UK. M. Conroy, D.C. Brodbelt, Y. Chang, D.G. O'Neill, J. Elliott. Royal Veterinary College, Hatfield, UK

Chronic kidney disease (CKD) is commonly diagnosed in cats in the UK. Previous studies have estimated a prevalence of 1.7–3.6% in the cat population in the UK. Little is known about how CKD is diagnosed and treated in the primary-care setting in the UK. The aims of the present study were to estimate the prevalence and incidence of CKD in the UK and to describe diagnostic procedures and treatments employed.

Cats that presented to 90 veterinary clinics between January 2012 and December 2013 were included in the study. Using the VetCompass database, potential cases were identified by searching the electronic patient record for key terms associated with CKD diagnosis. A random sample of 20% of the potential cases were reviewed in detail to identify cats diagnosed with CKD. Data were extracted from the database for demographics, diagnosis, treatment and comorbidities. Prevalence and incidence were estimated adjusting for the sampling approach.

Of 104977 cats presented, 6691 potential cases were identified. From the potential cases reviewed in detail, 345 new and 199 pre-existing cases were confirmed. Estimated prevalence was 2.6% (95% CI 2.4–2.8%) and estimated incidence of new cases was 1.6% (95% CI 1.5–1.8%) over the study period. Median age at diagnosis was 15 years(IQR 12.5–16.9 yr). Most cats (61.1%) were presented because of owner reported clinical signs. The majority of cats (51%) had 2 or more signs at diagnosis with weight loss (44.1%) and polydipsia (32.5%) most commonly reported. Combined biochemistry and urinalysis was the most common method of diagnosis (61.9%). One fifth (20.9%) of cats had a UPC performed. Just under one third (30.4%) of vets recorded IRIS staging with just over half (50.2%) of the staged cats having IRIS CKD stage 2 at diagnosis. One third (33.6%) of cats had at least one blood pressure measurement, with 47.4% of these cats being diagnosed with hypertension. A commercial 'renal diet' (65.8%) and Benazepril (32.8%) were the most common treatments prescribed.

One in 40 cats presenting to primary-care practices in the UK were diagnosed with CKD. UPC and blood pressure are performed in a minority of cats, despite the recognised importance of proteinuria and hypertension influencing prognosis and treatment of cats diagnosed with CKD. Improved knowledge of how veterinarians are diagnosing CKD in primary-care practice will allow targeted continuing education of practitioners. This study also highlights the need for better owner education regarding CKD.

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ESVNU-O-2

INVESTIGATION OF A CELL CULTURE MODEL FOR THE STUDY OF FIBROSIS IN THE FELINE KIDNEY. J.S. Lawson, H.M. Syme, C.P. Wheeler-Jones, J. Elliott. Royal Veterinary College, London, UK

Chronic kidney disease (CKD) is common in ageing cats, and is histologically characterised by chronic tubulointerstitial inflammation and fibrosis. The cytokine transforming growth factor beta 1 (TGF-β1) has been associated with severity of renal fibrosis in cats but the cellular mechanisms underlying the fibrotic process remain incompletely understood. The aims of this study were to characterise the Crandell-Rees Feline Kidney (CRFK) cell line for use as an in vitro model of TGF-β1-sensitive feline kidney cells.

The morphology of CRFK was characterised by light microscopy. Expression of the intermediate filament proteins cytokeratin, vimentin and desmin was assessed by immunofluorescence in CRFK cells and compared with the immunohistochemical distribution in formalin fixed feline kidney tissue, which was obtained at post-mortem with owner informed consent. Confluent monolayers of CRFK were exposed to either 0, 0.1, 0.2, 0.5, 1 or 10 ng/ml recombinant TGF-β1 for 24 hrs, then lysed and the expression of collagen type 1α1 (col1α1), connective tissue growth factor (CTGF) and TGF-β1 mRNA quantified by RT-qPCR. Experiments were carried out in triplicate. Gene expression data were normalised to the housekeeping gene RPS7, analysed by ANOVA with post-hoc Dunnett's test and expressed as mean fold change in comparison to control.

CRFK formed monolayers of spindle-shaped cells which strongly expressed vimentin but not cytokeratin or desmin. Vimentin expression in fixed feline kidney tissue was localised to the glomerulus and scattered cells within the interstitium, whereas cytokeratin was confined to the tubular epithelium. No desmin expression was detected. Treatment of CRFK cells with TGF-β1 induced morphological changes, the cells becoming elongated and irregular at the highest concentrations. Exposure to 1 ng/ml TGF-β1 increased col1α1 expression 5.9 fold ($P = 0.0004$) and CTGF 3.5 fold ($P = 0.0198$) in comparison to control. Exposure to 10 ng/ml of TGF-β1, increased expression of col1α1 8.9-fold ($P < 0.0001$), CTGF 7.9-fold ($P < 0.0001$) and TGF-β1 3-fold ($P < 0.0001$) in comparison to control.

The results of this study demonstrate that CRFK resemble cells of renal interstitial or glomerular origin, with cell morphology suggestive of a fibroblastic phenotype. Further characterisation is warranted. We also demonstrate that TGF-β1 upregulates gene

expression of collagen I and CTGF, as well as auto-inducing further TGF-β1 expression in CRFK cells, supporting a role for this cytokine in feline renal fibrosis. The TGF-β1 signalling pathway may therefore represent a target for treatments aimed at preventing the progression of renal disease in cats.

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ESVNU-O-3

TRANSGLUTAMINASE 2 FOLLOWING RENAL WARM ISCHAEMIA IN THE RAT: IMPLICATION FOR FELINE CHRONIC KIDNEY DISEASE. A.C. Sanchez-Lara, J. Haylor. The university of sheffield, Sheffield, UK

Feline chronic kidney disease (CKD) is associated with activation of the renal transglutaminase 2 (TG2) pathway (Sanchez-Lara et al 2015). To establish whether TG2 and the development of CKD maybe causally linked, an interventional approach was employed in a rat model of renal warm ischaemia (RWI) to examine the effect of TG inhibition (TGI) on renal fibrosis. Hypoxia has been suggested as an important trigger and perpetuating factor for the development of CKD in the cat where, as in the rat following RWI, tubulointerstitial fibrosis develops in the absence of significant glomerular involvement.

Male Sprague Dawley rats (250-300 g) were subjected to renal-hilar-clamping for 60 minutes followed by right nephrectomy with/without intrarenal TGI for 28 days (RWI, n = 5/RWI+TGI, n = 6). Sham-operated rats were subjected to right nephrectomy alone (NX, n = 5). Subcutaneous minipumps were loaded with either NaCl 0.9% or 50 mmol/L TGI (DOO3, Zedira, Germany) to deliver 10 μg/kg/h intrarenally. Extracellular matrix protein, in the tubulointerstitium and intraglomerular mesangial area (IGMA) was determined by Masson's trichrome staining (MTS) and collagens (I/III/IV) by immunofluorescence, and quantified by multiphase image analysis. Extracellular TG enzyme activity (eTGact), extracellular TG2 protein (eTG2) and total kidney transglutaminase 2 (tTG2) were determined *in situ*. The presence of TG2 protein was confirmed by western blotting. Results were compared using one-way-ANOVA followed by Bonferonni's multiple comparisons test.

By day 28, the RWI group showed a significant increase in serum creatinine (2.7 fold), MTS (20-fold), collagens I (1.8-fold), III (4.3-fold), IV (5.5-fold), eTGact (2-fold) and eTG2 (1.9 fold) compared to the NX group. Following RWI, TGI significantly reduced the increase in serum creatinine (by 70%) MTS (by 80%), collagens I (by 100%), III (by 57%), IV (by 90%), eTGact (by 89%) and eTG2 (by 91%). Significant linear correlations were obtained between eTG2 and tubulointerstitial fibrosis, MTS and collagens I/III/IV. However, following RWI, no increase in glomerular collagens, eTGact or eTG2 was observed.

RWI in the rat mimics the major histopathologic and functional features of feline CKD. TGI reduced the development of tubulointerstitial fibrosis following RWI and improved the decrease in renal function, providing evidence for a causal link between the two. However, neither the TG pathway nor collagen deposition were activated in glomeruli, allowing a protective glomerular mechanism toward RWI to be postulated.

Sanchez-Lara A, Elliott J, Syme H, Brown C, Haylor J (2015). Feline chronic kidney disease is associated with upregulation of transglutaminase 2; a collagen cross-linking enzyme. Veterinary Pathology, 52:513-523.

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ESVNU-O-4

FIBROBLAST GROWTH FACTOR 23 AND HYPERTENSION IN FELINE CHRONIC KIDNEY DISEASE. D.H.N. van den Broek, R.E. Jepson, Y.M. Chang, J. Elliott. Royal Veterinary College, London, UK

Cats with chronic kidney disease (CKD) are at increased risk of developing systemic hypertension. Fibroblast growth factor 23 (FGF-23) is frequently elevated in feline CKD, and recent studies suggest that FGF-23 is involved in volume regulation and vascular calcification. This retrospective observational cohort study examined the association between plasma FGF-23 concentration and hypertension in cats with CKD.

Clinicopathologic information from cats at diagnosis of azotaemic CKD was sourced from the records of two first opinion practices. Clinical data are presented as median [25^{th}, 75^{th} percentile]. Comparisons were made between hypertensive (HT) and normotensive (NT) cats at diagnosis of CKD using independent samples *t*-tests or Mann-Whitney U tests. Cats treated with medications known to influence systolic blood pressure (SBP) were excluded. The normotensive group was subsequently used to identify predictors of incident hypertension using Cox regression analysis (hazard ratio (HR) and 95% confidence intervals (CI) reported). Cats with follow-up of <90 days after diagnosis of CKD, or that developed hypertension within that period were excluded from this analysis. SBP and packed cell volume (PCV), were considered as continuous variables, whilst FGF-23 (terciles) and body weight (median) were entered as categorical variables.

This study included 134 cats with CKD (IRIS stage 2 n = 95, IRIS stage 3 n = 39) of which 18 were HT and 116 NT at baseline. HT cats had significantly higher FGF-23 concentrations (HT:1906 [537, 5605]pg/mL; NT:633 [344, 1507]pg/mL, $P = 0.016$), and significantly lower chloride concentrations (HT:116.2 [114.2, 117.5]mmol/L; NT:118.2 [116.7, 120.1]mmol/L, $P = 0.011$). Creatinine ($P = 0.925$) and phosphate ($P = 0.608$) concentrations did not differ between groups. Ninety NT cats were available for Cox regression analysis, of which 22 developed hypertension. In the final multivariable model (n = 88), increasing SBP ($P < 0.001$), and decreasing PCV ($P = 0.009$) and body weight (<4.0 kg, $P = 0.018$) were significant risk factors for hypertension in feline CKD. In addition, FGF-23 ($P = 0.018$) was a significant independent risk factor for development of hypertension in the multivariable model (<400 pg/mL, HR:0.41, CI:0.15-1.17, $P = 0.096$; and 400-1200 pg/mL, HR:0.14, CI:0.04-0.57, $P = 0.006$, compared with >1200 pg/mL).

In conclusion, CKD cats with hypertension had higher FGF-23 concentrations than their normotensive counterparts. Moreover, in azotaemic cats that were normotensive, FGF-23 concentration appeared associated with the risk of incident hypertension in a model adjusted for baseline systolic blood pressure, PCV and body weight. The mechanism by which FGF-23 influences blood pressure in cats remains to be elucidated.

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ESVNU-O-5
DETECTION OF MORBILLIVIRUS AND OTHER PARAMYXOVIRUSES IN URINE SAMPLES FROM GERIATRIC CATS WITH AND WITHOUT EVIDENCE OF AZOTAEMIC CHRONIC KIDNEY DISEASE (CKD) IN THE UNITED KINGDOM (UK). K.E. McCallum, S. Stubbs, L.S. Tiley, T.L. Williams. University of Cambridge, Cambridge, UK

Feline morbillivirus (FmoPV) was originally discovered in Hong Kong in 2012 and suggested to be associated with tubulo-interstitial nephritis. It has since been detected in the urine of cats in Japan, USA and Germany. The aim of this study was to identify paramyxoviruses (including morbillivirus) in urine samples of geriatric cats with and without azotaemic CKD, to establish if a relationship between FmoPV and azotaemic CKD exists. In addition, urinary markers of tubular damage and dysfunction were evaluated in non-azotaemic cats with and without FmoPV or other paramyxoviruses.

Blood and urine samples were obtained from cats at three UK first opinion practices as part of a geriatric screening programme. Cats were assigned to either the azotaemic CKD group (defined as a serum creatinine concentration >153 μmol/L and concurrent urine specific gravity <1.035) or the non-azotaemic group. Viral RNA was extracted from urine and RT-PCR performed on these samples with pan-*Paramyxoviridae* primers. DNA was extracted from positive samples for genome sequencing and virus identification. Urine protein:creatinine ratio (UPC), urine albumin:creatinine ratio (UAC) and urine cystatin C:creatinine (UCC) ratio were calculated using previously validated immunoturbidimetric assays. Comparisons between groups were made using Fisher's exact test or Mann Whitney U test, and statistical significance was defined as $P < 0.05$.

Three paramyxoviruses were identified which were most closely related to feline paramyxovirus MSi-2014 (accession number KP159805) with 92–99% homology. Five distinct morbilliviruses were identified which were most closely related to other FmoPV (accession numbers KR014147, JQ411014 and JQ411015 with 96-97%, 96-99% and 96-99% homology respectively). FmoPV detection was not significantly different between azotaemic CKD and non-azotaemic groups (1/16 vs 4/24 respectively; $P = 0.63$). Other paramyxovirus detection was not significantly different between azotaemic CKD and non-azotaemic groups (0/16 vs 3/24 respectively; $P = 0.26$). In non-azotaemic cats, there was no significant association between detection of paramyxovirus and UPC ($P = 0.4$), UCC ($P = 0.87$) or UAC ($P = 0.68$). Similarly, detection of FmoPV was not associated with UPC ($P = 0.12$), UCC ($P = 0.74$) or UAC ($P = 0.35$).

FmoPV and other paramyxoviruses can be detected in the urine of geriatric cats in the UK with and without azotaemic CKD, however the incidence of virus detection was not significantly different between azotaemic and non-azotaemic cats. No association between detection of these viruses and increased excretion of urinary markers of tubular damage or dysfunction was identified. Further studies to evaluate if paramyxovirus infection is associated with the subsequent development of azotaemic CKD or other morbidities is nevertheless warranted.

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ESVNU-O-6
DIAGNOSTIC WORK-UP DOES NOT AFFECT APPROPRIATE ANTIBIOTIC PRESCRIPTION IN DOGS WITH SUSPECTED URINARY TRACT INFECTION - AN OBSERVATIONAL STUDY IN DANISH SMALL ANIMAL PRACTICES. T.M. Soerensen[1], C.R. Bjornvad[1], K.M. Hoelmkjaer[1], L. Guardabassi[2], L. Bjerrum[1], L.R. Jessen[1]. [1]University of Copenhagen, Frederiksberg, Denmark, [2]Ross University School of Veterinary Medicine, St. Kitts and Nevis

Urinary tract infection (UTI) is a common cause of antibiotic prescription in dogs. Clinical signs are unspecific for infection, and appropriate diagnostic work-up is a prerequisite for a correct diagnosis.

The aim of the study was to assess the impact of diagnostic work-up on decision to treat (DTT) with antibiotics in dogs with suspected UTI in small animal practice.

The study was designed as a prospective cohort study of small animal practices in Denmark. Dogs with clinical signs of UTI were enrolled and the diagnostic work-up, the diagnosis and prescribed treatment were registered. A urine sample was submitted to a reference laboratory for gold standard bacterial culture (BC). Antibiotic prescription was only considered correct DTT in case of significant bacteriuria on reference BC.

Fifty-six clinics enrolled 154 dogs. Diagnostic pathways were A) Dipstick+Microscopy+BC (n = 66); B) Dipstick+BC (n = 13); C) Dipstick+Microscopy (n = 62) and D) Dipstick (n = 13). Overall, 88% were diagnosed with UTI by the veterinarian, though only 48% had significant bacteriuria on reference BC. Correct DTT was made in 56% in total with over-prescription in 41% and under-prescription in 3% of the dogs. Diagnostic pathways led to correct DTT in 65%(A), 31%(B), 55%(C) and 46%(D) of cases. Pathways with and without BC led to a correct DTT in 59% and 53%, respectively. No significant difference in correct DTT could be found between the diagnostic pathways.

The results reveal a high proportion of antibiotic over-prescription in dogs with suspected UTI, regardless of the diagnostic pathways pursued.

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ESVNU-O-7
BACTERIAL CULTURE DOES NOT IMPROVE ANTIBIOTIC CHOICE IN DOGS WITH SUSPECTED URINARY TRACT INFECTION - AN OBSERVATIONAL STUDY IN DANISH SMALL ANIMAL PRACTICES. T.M. Soerensen[1], C.R. Bjornvad[1], K.M. Hoelmkjaer[1], L. Guardabassi[2], L. Bjerrum[1], L.R. Jessen[1]. [1]University of Copenhagen, Frederiksberg, Denmark, [2]Ross University School of Veterinary Medicine, St. Kitts and Nevis

Rational use of antibiotics is important to decrease development of resistant microorganisms. Urinary tract infection (UTI) is a common cause of antibiotic prescription in dogs and treatment is often empirical and not based on bacterial culture.

The aim of the study was to investigate the impact of diagnostic work-up on appropriate choice of treatment (COT) and assess whether bacterial culture (BC) improved COT for canine UTI in small animal (SA) practice.

The study was designed as a prospective cohort study of small animal (SA) practices in Denmark. Dogs with clinical signs of UTI were enrolled. The diagnostic work-up, the diagnosis and prescribed treatment were registered, and a urine sample was submitted to a reference laboratory for gold standard BC. Appropriate COT was defined as prescribing antibiotics with in-vitro susceptibility in combination with choosing first-line agents over second-line agents.

Fifty-six clinics enrolled 154 dogs. Based on reference BC, 74 dogs had UTI and appropriate COT was instituted in 38% of these cases. Inappropriate second-line agents were prescribed in 54%, and first-line agents with in-vitro resistance were prescribed in 8%. Diagnostic work-up included BC in 50% of cases. Appropriate COT was instituted in 38% of cases regardless if BC where included in the diagnostic work-up or not. No significant difference could be demonstrated between the groups.

In conclusion, there was a high proportion of over-prescription of second-line agents and performance of BC did not significantly improve antibiotic choice in dogs with UTI. BC response time may be a limiting factor in a practice setting.

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ESVNU-O-8
THE DIAGNOSTIC UTILITY OF URINARY ALKALINE PHOSPHATASE AND γ-GLUTAMYL TRANSPEPTIDASE IN EARLY RECOGNITION OF ACUTE KIDNEY INJURY IN DOGS. R. Nivy, Y. Avital, I. Aroch, G. Segev. 1Koret School of Veterinary Medicine, Hebrew University of Jerusalem, Israel, Rehovot, Israel

Measurement of urinary alkaline phosphatase (uALP) and urinary γ-glutamyl transpeptidase (uGGT) activities is readily available and inexpensive. Most studies of uGGT and uALP are limited to small number of dogs with AKI of a single etiology or to experimentally-induced AKI. We aimed to investigate their clinical utility for diagnosing naturally occurring AKI in a large, heterogeneous group of dogs. The study included client-owned dogs with AKI (34 dogs), chronic kidney disease (CKD, 13), urinary tract infection (UTI, 15) and healthy controls (51). uALP and uGGT activities were normalized to urinary creatinine concentration (uALP/uCrea and uGGT/uCrea, respectively). uALP/uCrea and uGGT/uCrea significantly correlated ($r = 0.67$, $P < 0.001$). Both differed significantly ($P < 0.001$) among study groups, and between the AKI group and either the UTI or CKD groups ($P < 0.05$), but not the control group. Areas under the receiver operator characteristics curves for uALP/uCrea and uGGT/uCrea as predictors of AKI were 0.68 and 0.61, respectively. Optimal cut-off points for uALP/uCrea and uGGT/uCrea showed poor sensitivity/specificity (58%/70% and 58%/68%, respectively). Higher cut-off points with 90% specificity were associated with decreased sensitivity (38%, 41%, respectively).In conclusion, uGGT/uCrea and uALP/uCrea demonstrated poor discriminatory power for diagnosing AKI in dogs, contrary to previous reports of naturally-occurring and experimentally-induced AKI, and therefore cannot be recommended as screening tests for AKI. uALP/uCrea is a superior marker of AKI to uGGT/uCrea. Since both measures are readily available and inexpensive, they may serve as ancillary biomarkers for early detection of AKI, if appropriate cut-off points, with high specificities, are used.

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ESVNU-O-9
MOLECULAR HETEROGENEITY OF FELINE CYSTINURIA CAUSED BY DIFFERENT MUTATIONS IN THE SLC3A1 AND SLC7A9 GENE. U. Giger[1], K. Mizukami[1], R. Karthik[1], C. Osborne[2]. [1]University of Pennsylvania, Philadelphia, USA, [2]University of Minnesota, St. Paul, USA

Cystinuria is a classical inborn error of metabolism characterized by a selective proximal renal tubular defect affecting cystine, ornithine, lysine, and arginine (COLA) reabsorption, leading to cystine crystals and urolithiasis. Cystinuria is caused by defects in one of two genes, *SLC3A1* and *SLC7A9*, which encode the rBAT and $b^{o,+}$AT subunits of the $b^{o,+}$ basic amino acid transporter system. We document here the first *SLC3A1* and *SLC7A9* mutations causing cystinuria in cats.

Crystallograpic and amino acid tests were used to assess cystinuria. Exons and flanking regions of the *SLC3A1* and *SLC7A9* genes were sequenced from genomic DNA. Compared to the Felis catus-6.2 reference genome sequence, DNA sequences from these affected cats revealed 4 unique homozygous missense mutations: one in exon 8 (p.Arg448Trp) in *SLC3A1* from a non-purpose-bred short-haired cat, and the others in the *SLC7A9* gene: one in exon 5 (p.Asp236Asn) from a non-purpose-bred medium-haired cat, one in exon 7 (p.Val294Glu) in 2 Maine Coon and Sphinx cats, and one in exon 10 (p.Thr392Met) from a non-purpose-bred long-haired cat. Genotyping assays identified another cystinuric domestic medium-haired cat that was homozygous for the mutation originally identified in the purebred cats. These missense mutations result in deleterious amino acid substitutions of highly conserved residues in the $b^{o,+}$AT protein. The remaining 2 sequenced domestic short-haired cats had a heterozygous single nucleotide polymorphism (SNP) at a splice donor site and a homozygous SNP at a branchpoint of *SLC7A9*, respectively.

This study identifies the first *SLC3A1* and *SLC7A9* mutations causing feline cystinuria and reveals that, as in humans and dogs, this disease is genetically heterogeneous in cats.

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ESVNU-O-10
URINALYSIS RESULTS AS A PREDICTOR OF SUBCLINICAL BACTERIURIA IN DOGS. H. Teh, T. Johnstone. The University of Melbourne, Melboune, Australia

Subclinical bacteriuria (SBU) is the presence of bacteria in the urinary tract of dogs that do not show signs of urinary tract infection. It is a common finding in dogs with predisposing conditions. The pathogenic potential of associated bacteria is not clearly understood, suggesting that these dogs require at least monitoring. This retrospective case-crossover study sought to describe SBU in dogs that were followed longitudinally. Dogs that had cultures and concurrent urinalysis of cystocentesis-derived urine performed on more than one occasion were identified from the records of U-Vet Animal Hospital Werribee. Urine samples of dogs that were treated with antibiotics were excluded. Based on urine culture results and recorded clinical signs, dogs were classified as having clinical urinary tract infection, SBU or no growth of bacteria. Age, breed, sex, neuter status, concurrent conditions, microorganism cultured and urinalysis parameters were recorded. In each dog, urinalysis of SBU episodes and no-growth episodes were compared using conditional logistic regression with the aim to assess the value of individual urinalysis parameters in predicting SBU in each dog. A total of 44 dogs were included with a total of 151 paired urinalysis and culture results. A median of 3 paired results (range 2–13) were reviewed in each dog. Many dogs had predisposing conditions; most common were changes in urine composition caused by endocrine disease or drugs (n = 18; 41%) or renal disease (n = 9; 20%). In 9 dogs (20%), no underlying condition was recorded. Dogs were of various breeds, predominantly female spayed (n = 29; 65%) and senior (median age 9 years, range 0.3–17). The most commonly cultured organisms in SBU were *Escherichia coli* (n = 22; 52%) and *Enterococcus spp* (n = 6; 14%). Five dogs had SBU with multi-drug resistant bacteria. Whilst urinalysis parameters were often abnormal in the individual dogs, only pyuria (identified by microscopic sediment examination) was reliable in differentiating SBU from no-growth episodes (OR 34; 95% CI 4.5–266). This suggests that urinalysis parameters other than pyuria commonly reflect a concurrent disease process rather than SBU. Furthermore, it confirms that urine sediment analysis is crucial in monitoring dogs affected by conditions that predispose to SBU or UTI, particularly if urine culture is not planned.

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ESVNU-O-11
PYELONEPHRITIS IN CATS WITH URETERAL OBSTRUCTION: A RETROSPECTIVE STUDY OF 45 CASES. C. Maurey Guenec, D. Dullin, A. Decambron, G. Benchekroun, M. Campos, M. Manassero. ENVA, Maisons alfort, France

In cats, ureterolithiasis is an emergent medical condition and could predispose to upper urinary tract infection. Although culture of urine sampled directly from the renal pelvis is the gold standard to confirm pyelonephritis, culture of urine obtained by cystocentesis is most commonly performed. But in case of ureteral obstruction culture of urine collected by cystocentesis could be negative because of interruption of urine flow in the affected ureter. The objectives of this study were to determine the incidence of pyelonephritis in feline ureteral obstruction, to investigate if clinical signs and laboratory findings could help diagnose pyelonephritis and to compare results of urine culture obtained by pyelocentesis and cystocentesis in the same individuals. Cats in which pyelocentesis was performed during surgical management of ureteral obstruction were retrospectively included. Pyelonephritis was diagnosed if a positive urine culture was obtained in the sample collected by pyelocentesis. Signalment, clinicopathologic data and abdominal ultrasonography findings were compared between

cats with pyelonephritis (group P+) and cats with negative urine culture obtained by pyelocentesis (group P-). Forty-five cats were included. Culture of urine collected by pyelocentesis was positive in 8 of 45 (18%) cats. The isolates were E. coli (n = 3), Raoultella Terrigina (n = 3), Enterobacter cloacae (n = 1) and Enterococcus faecalis (n = 1). The cats in the P+ group were significantly older than in the P-group. The average monocyte count was significantly higher in the P+ group. No significant differences were observed concerning clinical data, other laboratory findings or results of abdominal ultrasonography between the two groups. Three of 8 cats of the P+ group and 9 of 37 cats of the P- group had received antibiotic therapy prior to the urine culture. In thirty-three cats (7 from P+ group, 26 from P- group) urinary culture was also performed in samples collected by cystocentesis. In 4 of 7 (57%) cases from the P+ group, the urine obtained by cystocentesis was sterile and in 3 of 7 (43%) cases culture results were similar between the samples collected by pyelocentesis and cystocentesis. Two of 26 (8%) cats from the P-group had a positive urine culture obtained by cystocentesis. In this study, the incidence of pyelonephritis in cats with ureteral obstruction was 18%. Common clinical and laboratory indicators of renal infection were absent in cases of confirmed pyelonephritis. The discrepancy between results of urine cultures obtained by cystocentesis or pyelocentesis emphasizes the difficulty of diagnosing pyelonephritis in the context of ureteral obstruction.

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ESVNU-O-12
THE MEDICAL PERSPECTIVE ABOUT THE USE OF SUBCUTANEOUS URETERAL BYPASS VERSUS URETERAL STENT IN FELINE URETEROLITHIASIS MANAGEMENT: A RETROSPECTIVE COMPARATIVE STUDY. C. Deroy, R. Oliveira Leal, D. Rossetti, G. Ragetly, C. Bismuth, R. Vallefuoco, J. Hernandez, C. Poncet. Centre Hospitalier Vétérinaire Fregis, Arcueil, France

Feline ureterolithiasis is one of the most common causes of acute azotaemia in cats. The placement of ureteral stents or Subcutaneous Ureteral Bypass (SUB) devices has been recently developed in order to overcome the limitations of traditional medical and surgical therapies.

The objective of this study was to compare clinical outcome and complication rates of cats with ureteral calculi managed with ureteral stents or SUBs.

A retrospective comparative study was performed. Medical records of cats diagnosed with feline ureteral obstruction undergoing placement of stents or SUB devices between 2011 and 2015 were reviewed. Information about signalement, clinical signs, biochemical data, surgical procedure, length of hospitalization, complications and a minimal 6-month follow-up was obtained.

A total of 50 cats diagnosed with ureterolithiasis were enrolled. A stent was placed in twenty-seven cats (stent group) and 23 cats received a SUB device (SUB group). Regarding pre-operative azotemia, no difference was observed between groups. There was no significant difference on perioperative mortality rate between groups (18% for ureteral stent *versus* 13% for SUB, $P = 0.71$). A significant decrease of serum creatinine and urea concentrations was observed in both groups in the first 48 h after surgical intervention ($P < 0.0001$).

Considering immediate post-operative complications, the number of additional surgical procedures was significantly higher in stent group ($P = 0.012$) including: stent occlusion (7/27), uroabdomen (3/27) and refractory signs of cystitis (2/27). In SUB group, device occlusion (1/23) and lower urinary tract obstruction (1/23) justified additional surgical procedures in two cats.

Stent placement was associated with increased lower urinary tract signs including hematuria (45% for stent group *versus* 15% for SUB group, $P = 0.047$) and pollakiuria/stranguria (54% for stent group *versus* 20% for SUB group, $P = 0.029$). Comparing to SUB group (in which most cats were alive at the end of the study, impairing survival time assessment), stent group had a shorter median survival time (14 months) ($P = 0.043$).

In spite of the fact that stent placement led to a rapid improvement of azotaemia, this procedure was associated with higher mortality, post-operative complications and recurrent lower urinary signs. A possible explanation for these findings relies on the physical irritation induced by the distal stent curl in the urinary bladder. SUB placement induced a rapid decrease on azotaemia with fewer complications, a shorter operating time, and less recurrent lower urinary tract signs.

SUB devices are a safe alternative to stent placement for resolution of feline ureterolithiasis, improving outcome and reducing lower urinary tract signs.

Disclosures: No disclosures to report.

Part of this work was accepted for presentation at the ECVS congress 2016 (surgical public).

ESVE – European Society of Veterinary Endocrinology

ESVE-O-1
GLUCOSE CONCENTRATIONS FOLLOWING INSULIN-INDUCED HYPOGLYCEMIA IN HEALTHY CATS AND IN CATS WITH DIABETES MELLITUS. E. Zini, E. Salesov, P. Dupont, T. Lutz, C. Reusch. University of Zuric, Zurich, Switzerland

Rebound hyperglycemia has been defined as fasting hyperglycemia attributable to counter-regulatory hormone response to nocturnal hypoglycemia (Somogyi effect). Recent studies in humans raised doubts on the existence of this phenomenon or postulated that it is extremely rare. In veterinary medicine, rebound hyperglycemia is often defined independent of its time of occurrence. Data in cats are scarce and its clinical significance is largely unknown.

Aims were to evaluate if glucose concentrations increase above normal due to counter-regulation in healthy cats with insulin-induced hypoglycemia, to define frequency of rebound hyperglycemia in diabetic cats and to investigate differences between cats with and without rebound hyperglycemia.

Six healthy cats were treated with insulin (PZI and degludec; 0.1–0.3 IU/kg). Glucose concentrations were measured twice before injections and every 2 hours for 24 hours. The percentage of cats with post-hypoglycemic glucose concentrations above baseline, based on calculation of 90% range of differences (Marshall et al., 2008), was computed. Medical records of diabetic cats under insulin therapy with >1 blood glucose curve were evaluated; cats revealing biochemical hypoglycemia were included. Data of cats with and without rebound hyperglycemia were compared at the time when hypoglycemia was detected. Hypoglycemia and rebound hyperglycemia were defined as glucose <4 mmol/l followed by an increase >15 mmol/l within 12 hours.

In healthy cats, both insulin preparations and all doses led to hypoglycemia but did not induce rebound hyperglycemia. However, in 4 of 29 curves (13.8%) post-hypoglycemia glucose concentrations exceeded baseline (PZI=3, degludec=1); the highest glucose concentrations were 5.7 and 5.8 mmol/l, both with PZI. Among 133 diabetic cats with hypoglycemia, 33 (25%) had rebound hyperglycemia (group 1); 100 (75%) had no rebound hyperglycemia (group 2); groups did not differ for age, body weight and sex. In group 1, the daily insulin dose was higher [median: 1.00 IU/kg (range: 0.21–2.14) vs. 0.48 IU/kg (0.07–2.91); $P < 0.0001$]; good metabolic control was less frequent (6.7% vs. 69.1%; $P < 0.0001$); and serum fructosamine concentration was higher [535 µmol/l (347–726) vs. 409 µmol/l (262–747); $P < 0.0001$]. Glucose nadir, time-to-nadir and insulin type (glargine, porcine zinc) were not different.

In conclusion, in healthy cats insulin-induced hypoglycemia does not cause rebound hyperglycemia although post-hypoglycemia glucose exceeds baseline in some cats. In diabetic cats rebound hyperglycemia occurs in 25% of cases with hypoglycemia, is associated with higher insulin doses, worse metabolic control and higher fructosamine. The reason why rebound hyperglycemia is only seen in certain cats is currently unclear.

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Claudia Reusch is consultant for Boehringer Ingelheim, and has been a consultant for Novartis Animal Health in the past. She has received financial support for her endocrine research from various companies such as Nestle Purina, Hills, Provet, Antlia SA, Glycemicon and from the clinical studies fund of the ECVIM-CA and from the Society of Comparative Endocrinology.

ESVE-O-2
COMPARISON OF LENTE INSULIN AND NPH INSULIN THERAPY FOR THE TREATMENT OF NEWLY DIAGNOSED DIABETIC DOGS. F.F. Fracassi[1], G. Linari[1], F. del Baldo[1], A. di Cunzolo[2], N. Leoni[3], P. Palagiano[4], G. Giordano[5], S. Corradini[1]. [1]Department of Veterinary Medical Sciences, Ozzano dell'Emilia, Italy, [2]Clinica Veterinaria Vetlan, Battipaglia, Italy, [3]Clinica Veterinaria San Siro, Milano, Italy, [4]Clinica Veterinaria Meda, Meda, Italy, [5]Laboratorio La Vallonea, Lecce, Italy

Treatment of canine diabetes mellitus (DM) always requires exogenous insulin therapy. Two types of commonly used insulin are lente insulin and Neutral Protamin Hegerdon (NPH) insulin. The aim of this prospective, randomized clinical trial was to compare the effects of lente and NPH insulin in dogs with DM. Client-owned dogs with newly diagnosed DM were enrolled. Dogs with relevant concurrent diseases and with prior administration of diabetogenic drugs were excluded. Dogs were randomized into two groups such as lente insulin (Caninsulin®) and NPH insulin (Humulin I®). In each group dogs were treated with insulin SC, BID and fed BID with the same commercial diet low in simple carbohydrates and high in fiber. Follow-up evaluations were done at 1, 2, 4, 6, 8, 12 weeks. At each re-evaluation a physical exam, blood glucose curve (BGC) and serum fructosamine concentrations were performed. The glycemic control was classified as good on the basis of absence of PU/PD, body weight stability, normal attitude/activity and >50% of the values in the BGC within 90 and 270 mg/dL. Eight dogs were treated with lente and 12 with NPH insulin. At the time of diagnosis (T0) both groups were homogenous considering age, body weight, gender, serum glucose concentrations and serum fructosamine concentrations. At the last re-evaluation (T12) mean(±SD) glucose concentrations of BGCs and median(range) serum fructosamine concentrations evaluated in the lente group were 279 mg/dL (±53), 474 µg/dL (336–749) and in the NPH group were 219 mg/dL (±114), 419 µg/dL (292–597), respectively; such differences were not significant between groups. Median(range) lente insulin dose per injection at T0 [0.35 U/kg (0.3–0.6)] was significantly lower ($P = 0.007$) compared with T12 (0.6 U/kg;0.4–0.9); median dose of NPH was not significantly different between T0 (0.3 U/kg; 0.1–0.4) and T12 (0.5 U/kg;0.2–0.7). Median fructosamine concentrations at T12 were significantly lower ($P = 0.01$) compared to T0 in the NPH group but not in the lente group ($P = 0.4$). At T12 good glycemic control was found in 25% (2/8) and in 75% (9/12) of dogs treated with lente and NPH insulin, respectively; however the difference was not significant ($P = 0.06$). Hypoglycemic events (nadir <90 mg/dL) were identified in 4 patients (4% of the BGCs in the lente group and 7% in the NPH group) and such difference was not significant. According to our preliminary results the use of both insulin preparates is effective in the treatment of dogs with DM, however the success rate with NPH insulin seems to be greater than that with lente insulin.

Disclosures: In the past FF has received financial support for continuing education courses organized by MSD which produces Caninsulin. The diet for the study was provided for free by Royal Canin. GG is the owner of the laboratory (Laboratorio la Vallonea) that performed all the laboratory analysis without costs for the owners.

ESVE-O-3
HEALTHY OVERWEIGHT AND DIABETIC CATS HAVE INCREASED LEVELS OF FELINE PANCREATIC LIPASE IMMUNOREACTIVITY. I.N. Kieler, B.J. Krabbe, C.R. Bjornvad. University of Copenhagen, Frederiksberg, Denmark

Obesity is a risk factor of canine and human pancreatitis. Obese older cats have an increased risk of developing diabetes, and pancreatitis is a common comorbidity of diabetic cats. Obesity in cats has however not previously been associated with pancreatitis. The aim of this study was to investigate if there is a difference in the serum levels of pancreatic lipase immunoreactivity (fPLI), trypsin-like immunoreactivity (fTLI) and cobalamin between clinically healthy lean and overweight compared to diabetic cats >6 years of age.

Diabetic cats were recruited from the patient population of the University Hospital for Companion Animals, while the clinically healthy cats were primarily recruited through advertisements. Fifty-two indoor-confined cats were included (12 diabetic, 22 overweight and 18 lean) underwent a physical examination, and hemogram, biochemistry, quantitative fPLI, fTLI and cobalamin measurements were performed. ANOVA was used to analyze if diabetes, body condition or age was associated with the log-transformed levels of fPLI, fTLI and cobalamin. Pearson's Chi^2 test was used to compare the proportions of diabetic, overweight and lean cats with fPLI and fTLI indicative of pancreatitis (fPLI >5.4 µg/L and fTLI >400 ng/mL). Results are given as median [range].

Compared to clinically healthy lean cats, diabetic cats had higher levels of fPLI (1.45 [0.8–4.75] versus 4.75 [0.8- 26.6] µg/L, $P < 0.01$) and the proportion of diabetic cats with a level of fPLI and fTLI indicative of pancreatitis was also larger ($P \leq 0.01$). Compared to lean cats, overweight cats had lower cobalamin ($P = 0.02$) and tended to have higher levels of fPLI ((1.45 [0.8–4.75] versus 2.10 [0.7- 13.2] µg/L, $P = 0.05$). A larger proportion of obese cats had fPLI indicating pancreatitis ($P = 0.03$). No difference was found when comparing fPLI levels of diabetic and obese cats ($P = 0.18$). Compared to cats 6–10 years of age, clinically healthy cats >10 years of age had higher levels of fPLI ($P = 0.04$), lower cobalamin ($P = 0.002$) and a larger proportion of cats ($P = 0.03$) had fTLI>400 ng/mL, indicating pancreatitis.

Diabetic and overweight cats have higher levels of fPLI compared with lean cats. Whether this correlates with increased prevalence of subclinical pancreatitis remains to be determined. Cats more than 10 years of age have increased levels of fPLI and lower cobalamin and this association may exist for fTLI, as well.

Disclosures: No disclosures to report.

ESVE-O-4
MOLECULAR ANALYSES OF PITUITARY SOMATOSTATIN AND DOPAMINE RECEPTORS IN FELINE HYPERSOMATOTROPISM. C.J. Scudder[1], S. Mirzcuk[1], K.M. Richardson[1], R. Gostelow[1], Y. Forcada[1], I. Mcgonnell[1], D.C. Church[1], P. Kenny[1], M. Korbonits[2], R.C. Fowkes[1], S.J. Niessen[1]. [1]Royal Veterinary College, North Mymms, UK, [2]Barts and the London School of Medicine, London, UK

Feline hypersomatotropism (HS) (which results in acromegaly) is typically caused by a growth-hormone (GH) secreting pituitary adenoma and is thought to be a common cause of feline diabetes mellitus. Medical pituitary inhibition has been challenging in some humans and cats with this condition. This could be related to variable expression of somatostatin (SSTR) and dopamine (DR) receptor expression. There are five different SSTR subtypes (*SSTR1-5*) and five different subtypes of DRs, with *D2R* being the predominant DR subtype in the human pituitary. Pasireotide, a somatostatin analogue with high binding affinity to *SSTR1*, *SSTR2* and *SSTR5*, is effective at controlling GH secretion in feline acromegalics but somatostatin analogues with high binding affinity to *SSTR2* (octreotide and lanreotide) are not. The aim of this study was to document the receptor expression in feline somatotrophinomas and to compare this to the healthy feline pituitary.

We utilised a novel customised multiplex RT-qPCR assay to investigate the expression profile of the somatostatin and dopamine receptors in GH-secreting pituitary adenomas. Pituitary adenoma RNA was extracted from 20 GH-secreting adenomas and eight control cats followed by multiplex RT-qPCR analyses for multiple genes, including somatostatin receptors (*SSTR1-5*), dopamine receptor (*D2R*), growth hormone receptor, growth hormone secretagogue receptor and the housekeeper RPL18.

The normalised gene expression of *SSTR1-5* in acromegalic cats was *SSTR1 = SSTR5 > SSTR2 vs SSTR5 = SSTR1 = SSTR2* in control cats. *SSTR3* and *SSTR4* were undetectable. Expression of *SSTR1, 2* and *5* were upregulated in acromegalics vs controls (*SSTR1*: $P = 0.006$, *SSTR2*: $P = 0.005$, *SSTR5*: $P < 0.001$) and the magnitude of upregulation varied between the somatostatin receptors (*SSTR1* increased x9 [95% CI 4–12], *SSTR2* increased x6.5 [95% CI 2.5–8.5] and *SSTR5* increased x4 [95% CI 2–4]. *D2R* gene expression was not significantly different between tumorous or normal pituitary tissue; within the

hypersomatotropism group D2R exhibited a moderate negative correlation with pituitary volume (r = -0.62, $P < 0.01$, Rsquare 0.39).

Feline GH-secreting adenomas expressed SSTRs are similar to human GH-secreting adenomas, having higher *SSTR1*, *2* and *5* expression than *SSTR3* and *4*. However, the higher expression of *SSTR1* and *SSTR5* vs *SSTR2* than in most humans may explain the greater biochemical response to pasireotide than octreotide. Decreased *D2R* expression in larger tumours may be a mechanism allowing unchecked adenoma growth. The receptor expression profiles of feline GH-secreting adenomas will help the search for improved medical management options of feline hypersomatotropism.

Disclosures: This data was presented as a poster abstract at ENDO2016, Boston, USA.

ESVE-O-5

MARKERS OF PANCREATIC INFLAMMATION AND LIPID PROFILE IN DOGS WITH DIABETES MELLITUS.

C. Arenas, M. Herrtage, T. Williams, L. Davison. University of Cambridge, Cambridge, UK

The relationship between canine diabetes mellitus (DM), hyperlipidaemia and pancreatitis has long been recognised; however the question of cause or consequence in this relationship remains unclear. This study aimed to identify correlations between serum lipid concentrations and biomarkers for pancreatitis (1,2-o-dilauryl-rac-glycero glutaric acid-(6′-methylresorufin) ester [DGGR] lipase) and for inflammation (C-reactive protein [CRP]) in diabetic dogs, which could support a causal relationship between hyperlipidaemia and pancreatitis in DM.

Twenty four diabetic dogs (DM) and 28 control dogs (CON) were included in this retrospective study. Control dogs had no evidence of inflammatory or pancreatic disease. Seven dogs with histologically confirmed chronic pancreatitis (CP) without DM were also included.

Due to change in the reference interval (RI) during the study, lipase measurements are represented as a proportion of the upper limit of the RI. In the DM, CON and CP groups, median [range] lipase was 0.98 [0.16–38.86], 0.47 [0.15–1.59] and 0.32 [0.22–2.27] respectively. Median [range] CRP (RI <2.2–8.2 mg/L) was <2.2 [<2.2–55.60], <2.2 [<2.2–13.20] and 10.65 [2.40–24.20] respectively. The differences between DM and CON group were statistically significant (p£0.017) for lipase and CRP, but no significant differences were identified between the DM and CP groups. Between the CP and CON groups, only CRP was significantly different ($P < 0.001$).

Median [range] triglycerides (RI 0.4–1.3 mmol/L) were 2.6 [0.50–33.80], 0.7 [0.20–9.10] and 0.9 [0.58–5] in the DM, CON and CP groups respectively. Median [range] cholesterol (RI 3.3–6.5 mmol/L) was 10.47 in the DM group [5.32–21.13] and 6.36 [3.33–13.40] in the CON group. Cholesterol concentrations were not available for all CP dogs. Triglycerides and cholesterol were significantly higher in dogs with DM ($P < 0.001$) compared to CON dogs. There was a weak positive correlation between lipase and CRP (r_s=0.443; $P = 0.021$) in the DM group, not found in the CP group or the CON group. However neither CRP nor lipase showed a significant correlation with cholesterol or triglycerides in the DM group. In the CON group there was a weak positive correlation between lipase and TG (r_s=0.435; $P = 0.021$).

The results of this study add to the evidence that DM is an inflammatory disease, commonly associated with acute pancreatic inflammation. This study also illustrates the poor sensitivity of DGGR lipase, but potential clinical utility of CRP, for recognition of CP. In this study, although the lipid profile of dogs with DM was abnormal, lipid concentrations were not correlated with inflammatory or pancreatic biomarkers in these patients.

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ESVE-O-6

THYROID CYSTS IN CATS: A RETROSPECTIVE STUDY OF 37 CASES.

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Thyroid cysts are uncommonly observed in hyperthyroid cats. Although treatment of feline hyperthyroidism is well characterized, the long-term prognosis and ideal therapy for cats with thyroid cysts is unclear. Therefore, we examined clinical findings and treatment responses of a series of cats with thyroid cysts.

Medical records of cats confirmed to have thyroid cysts by technetium scan, ultrasound, or necropsy from 2005–2016 were reviewed. Signalment, clinical features, imaging procedures, diagnostic tests, treatment protocols, and outcomes were recorded.

Thirty-seven cats were identified; 35/37 cats were hyperthyroid. Median time from initial diagnosis of hyperthyroidism to cyst diagnosis was 18 (1–96) months. Clinical signs included palpable neck mass (24/37), weight loss (14/37), dysphagia (7/37), poor appetite (5/37), and dyspnea (4/37). Median aspirated cyst fluid volume in 19/37 cats was 23 (1–300) mL. Advanced imaging in 36/37 cats and necropsy in 1 cat confirmed small (<2 cm^3), medium-large (2–8 cm^3), and huge (>8 cm^3) thyroid cysts in 9/37 (24%), 7/37 (19%), and 21/37 (57%) cats, respectively. Cats with huge thyroid cysts were more likely to display dysphagia or dyspnea.

Prior methimazole and radioiodine (^{131}I) treatment was recorded in 27/35 and 1/35 hyperthyroid cats, respectively; 26/35 hyperthyroid cats with cysts underwent subsequent ^{131}I treatment (13 receiving ≤400 mBq and 13 receiving >600 mBq). Hyperthyroidism resolved in 21/23 cats with follow-up data; thyroid cyst resolved in 3/8 cats receiving ≤400 mBq and 8/10 cats receiving >600 mBq ^{131}I. Three cats underwent post-^{131}I thyroid cystectomy for removal of residual thyroid cysts without complication. Four cats underwent initial thyroid cystectomy without ^{131}I therapy; of these, 3 were euthanized postoperatively for refractory hypocalcemia. Histopathologic findings on the 7 cats undergoing thyroidectomy revealed thyroid carcinoma (3) and adenomatous hyperplasia (4).

Thyroid cysts may be encountered in hyperthyroid, and rarely euthyroid, cats. Clinical signs related to the compressive effect of the cyst include dysphagia and dyspnea. Advanced imaging helps characterize the cyst. Small cysts might not require specific intervention but huge cysts can be difficult to cure. High ablative doses of ^{131}I appear to resolve the cyst more effectively than smaller doses. Thyroid cystectomy as primary treatment appears contraindicated (due to high risk of hypoparathyroidism), but use of surgical thyroid cystectomy following ^{131}I therapy can be considered in cats warranting further intervention when hyperthyroidism resolves but large cysts persist.

Disclosures: No disclosures to report.

ESVE-O-7

DOES HYPERCALCITONINISM CONTRIBUTE TO HYPOCALCAEMIA IN HYPERTHYROID CATS?.

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Hyperthyroid cats have lower blood ionised calcium concentrations (iCa), and greater plasma parathyroid hormone (PTH) and calcitriol concentrations when compared to healthy older cats. The increased PTH (and calcitriol) concentrations are appropriate compensatory responses to hypocalcaemia, which could contribute to renal injury in hyperthyroidism. Calcitonin inhibits osteoclastic bone resorption, decreases renal calcium reabsorption and decreases intestinal calcium absorption, therefore elevated plasma calcitonin concentrations could explain the observed relative hypocalcaemia in hyperthyroid cats. Previous studies have suggested that serum calcitonin concentrations are often undetectable in healthy adult and hypercalcaemic cats, whereas serum calcitonin concentrations are elevated in human Graves' disease patients. This study aimed to evaluate plasma calcitonin

concentrations in hyperthyroid cats and identify if an association with iCa exists.

Newly diagnosed hyperthyroid cats from two London-based first opinion practices were recruited into the study. iCa (measured by iSTAT) and plasma calcitonin concentrations (measured by previously validated immunoradiometric assay) were measured at the time of diagnosis and at the time of establishment of euthyroidism. The limit of blank (LOB) of the assay was 1.2 pg/mL. The Mann-Whitney U test was used to compare plasma calcitonin concentrations between hypocalcaemic (iCa <1.18 mmol/L) and normocalcaemic hyperthyroid cats, and the Wilcoxon signed rank test was used to evaluate the change in plasma calcitonin concentrations following treatment. Spearman's rank correlation was used to evaluate the correlation between baseline plasma calcitonin concentrations and iCa and plasma total thyroxine concentration (TT4). Statistical significance was defined as $P < 0.05$.

Thirty seven hyperthyroid cats were recruited into the study. Five cats were classified as hypocalcaemic and thirty two cats were classified as normocalcaemic. Baseline plasma calcitonin concentrations were detectable in four cats; one hypocalcaemic cat (1.4 pg/mL) and three normocalcaemic cats (1.3, 1.5, 2.4 pg/mL) and below the LOB in the remaining cats. Plasma calcitonin concentrations were not significantly different between hypocalcaemic and normocalcaemic cats ($P = 0.510$). Following treatment, plasma calcitonin concentrations did not change significantly and remained below the LOB in 9/14 cats (n = 14; $P = 0.116$). There was no correlation between baseline plasma calcitonin concentration and iCa (r_s= -0.01; $P = 0.954$) or TT4 (r_s= 0.114; $P = 0.5$).

Plasma calcitonin concentrations were undetectable in most hyperthyroid cats and were not associated with iCa, which suggests that hypercalcitoninism is not a mechanism for the development of hypocalcaemia in these patients. The cause of hypocalcaemia in hyperthyroid cats remains enigmatic.

Disclosures: No disclosures to report.

ESVE-O-8

HYPERTHYROID CATS DEVELOP TRANSIENT OR PERSISTENT SUBCLINICAL HYPOTHYROIDISM AFTER SUCCESSFUL RADIOIODINE TREATMENT.

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After radioiodine (^{131}I) treatment, hyperthyroid human patients often exhibit overt or subclinical hypothyroidism, defined biochemically as high serum TSH with low or normal thyroid hormone concentrations, respectively (Endocr Pract 2012;18:988; Thyroid 2012;22:1200). This can be transient, with recovery of thyroid function after a few months, or, most commonly, permanent. Onset of permanent hypothyroidism can be delayed for many months or even years after ^{131}I treatment.

Whether cats develop similar patterns of ^{131}I-induced hypothyroidism is unknown, but hypothyroidism has generally been considered uncommon, transient, or clinically irrelevant. Therefore, we investigated the prevalence of ^{131}I-induced hypothyroidism in cats to determine its onset, duration (transient or persistent), and clinical relevance.

569 hyperthyroid cats, successfully treated with low-dose ^{131}I (median dose, 78 mBq), underwent assessments of serum T4 and TSH concentrations at 1, 3, 6, 12, and ≥18 months post-treatment. Cats that developed high TSH concentrations were classified as having either overt or subclinical hypothyroidism (based on finding of low or normal T4 value, respectively).

At 1 month, 15% of cats were hypothyroid; of these, 27% were overtly hypothyroid. Subsequently, 11%, 9%, 5%, and 9% of remaining cats became hypothyroid at 3, 6, 12, and ≥18 months (resulting in a total of 23% of all cats); 95% of these had subclinical hypothyroidism. Very few cats manifested obvious clinical signs associated with hypothyroidism; however, the prevalence of new or worsening azotemia was significantly higher in hypothyroid cats than in euthyroid cats. Levothyroxine supplementation (30 cats) significantly decreased both serum TSH and creatinine concentrations.

Of cats with untreated hypothyroidism, 30% subsequently normalized their high TSH (and low T4) concentrations within 3–21 months (median, 6 months); 25% of these cats with transient hypothyroidism took ≥12 months to normalize. High TSH concentrations persisted in the remaining 70% of cats for periods of 6–33 months (median, 9 months).

Our results show that about 25% of ^{131}I-treated cats develop subclinical hypothyroidism, even after low ^{131}I doses; however, only a small proportion develop overt hypothyroidism. Cats can develop hypothyroidism at any time, even ≥18 months post-treatment. Approximately 30% will recover normal thyroid function within a few months, but hypothyroidism persists for months in most cats. New or progressive azotemia appears to be the most important clinical feature associated with feline hypothyroidism. Whether hypothyroid cats (especially subclinical) without azotemia should be treated with L-T_4 is unclear, especially when serum T4 concentrations remain well within the reference interval.

Disclosures: No disclosures to report.

ESVE-O-9

THE REPEATABILITY OF VARIOUS CORTISOL MEASUREMENTS IN CLINICALLY STABLE DOGS WITH HYPERADRENOCORTICISM BEING TREATED WITH TRILOSTANE.

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Monitoring cortisol concentrations is an established method of assessing trilostane treatment. However the repeatability of these measurements has never been examined.

Dogs with hyperadrenocorticism that were receiving trilostane were recruited to a multi-centre open label prospective study. Cortisol concentrations were measured at 3 different times: pre-trilostane, 3 hours post-trilostane and 1 hour post-ACTH stimulation. These measurements were repeated at intervals of 4 to 8 weeks for up to 4 repeats. The dose of trilostane was adjusted at the discretion of the attending veterinarian. When dogs had received the same dose of trilostane for a minimum of 3 weeks before, and between, 2 consecutive tests then co-efficients of variation (CV%) were calculated from the results.

Mann-Whitney U tests were used to examine for significant differences between the individual groups of cortisol values and between groups of CV%. Univariate and multiple step-wise linear regression analyses were used to assess any association between a range of factors and the cortisol and CV% results. The 4 centres used the same chemiluminescent assay and had a median CV% of 7.8% (range 4.6 to 14.7%) in their cortisol measurements submitted to the ESVE-EQA scheme.

A total of 35 dogs were recruited and 123 monitoring tests performed. From this population there were 21 dogs that had 45 pairs of results with the same total daily dose of trilostane however 11 pairs from one centre did not have post-ACTH cortisol. There was no significant difference between the absolute cortisol concentrations measured pre-trilostane (median = 114.0 nmol/l) or post-ACTH stimulation (median = 110.0 nmol/l), however the post-trilostane cortisol (median = 53.5 nmol/l) was significantly lower than both. There were significant associations between pre-trilostane cortisol and one centre, pre-trilostane cortisol and female entire dogs, and also post-ACTH cortisol and the number of revisits.

There was no significant difference between the CV% of the post-trilostane (median = 28.3%) and post-ACTH stimulation cortisol (median = 33.8%), however the CV% of pre-trilostane cortisol (median = 12.0%) was significantly lower than both. There were significant associations between post-ACTH cortisol CV% and dose, post-ACTH cortisol CV% and HAC type, and also post-trilostane cortisol CV% and centre.

It was concluded that pre-trilostane cortisol is significantly more repeatable than either post-trilostane or post-ACTH stimulation cortisol in dogs that are kept on the same dose for 4 to 8 weeks. Further studies are underway to assess the reliability of this measure as a predictor of clinical response.

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ESVE-O-10

STEROIDOGENIC FACTOR-1 INVERSE AGONISTS AS A TREATMENT MODALITY OF CANINE HYPERCORTISOLISM: IN VITRO INVESTIGATION. K. Sanders, J.A. Mol, A. Slob, H.S. Kooistra, S. Galac. Faculty of Veterinary Medicine, Utrecht University, Utrecht, the Netherlands

Canine hypercortisolism is usually treated medically with either mitotane or trilostane. They are both effective in suppressing cortisol secretion and a good treatment option in case of pituitary-dependent hypercortisolism, but in case of a cortisol-secreting adrenocortical tumor (AT), a suppressive effect on the AT growth is desirable as well. This can be achieved with high dosages of mitotane, however this approach is associated with side effects and there is a concern about mitotane toxicity in households with pregnant women and/or children. Steroidogenic factor-1 (SF-1), an orphan nuclear hormone receptor, is a key regulator of both adrenal steroidogenesis and proliferation. Modulation of SF-1 activity could possibly be an interesting therapeutic target in canine hypercortisolism.

The aim of this study was to investigate the effects of SF-1 inverse agonists on steroidogenesis and proliferation in canine primary adrenocortical cell suspensions. Three types of SF-1 inverse agonists were tested: IsoQ A (SID7969543 (#IsoqA)), #compound 31 (F1808-0154, (#31)) and #compound 32 (F1808-0165, (#32)). Eight adrenocortical cell suspensions from healthy dogs and three from patients with an AT were incubated with four concentrations per compound (10^{-8}, 10^{-7}, 10^{-6} and 10^{-5} M). In normal adrenocortical cell suspensions, synthetic ACTH was added to mimic hypercortisolism. Effects of SF-1 inverse agonists were determined by cortisol measurements in the culture media, and mRNA relative expression of steroidogenic enzymes, SF-1 and melanocortin type 2 receptor (MC2R), with RT-qPCR analysis. Proliferative effect was assessed by EdU assay.

In ACTH-stimulated and non-stimulated normal adrenocortical cells, the highest concentration of #31 significantly ($P < 0.0001$ and $P = 0.01$, respectively) inhibited cortisol concentrations to 39% and 46% of DMSO vehicle control, respectively. Compound #32 and IsoqA had no significant effect on cortisol production. In non-stimulated adrenocortical suspensions, #31 significantly reduced mRNA expression of CYP17 ($P = 0.007$) and CYP11B ($P = 0.006$), the most important enzymes in cortisol synthesis. In the three AT suspensions, #31 was the most effective in reducing cortisol production. Mean cortisol concentrations for the highest concentration of #31 ranged from 20–40% compared to the DMSO vehicle control. The EdU assay demonstrated no clear effect of SF-1 inverse agonists in adrenocortical cell suspensions of healthy dogs and a minimal effect in AT cell suspensions.

In conclusion, *in vitro* studies demonstrate that SF-1 inverse agonist #31 is an effective inhibitor of cortisol production. Its effect on proliferative capacity of AT cells warrants further evaluation in future studies about this new medical treatment option for hypercortisolism.

Disclosures: Disclosures to report.

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ESVE-O-11

LONG TERM FOLLOW UP OF DOGS DIAGNOSED WITH PITUTARY DEPENDENT HYPERADRENOCORTICISM TREATED BY GAMMA KNIFE RADIOSURGERY. A. Vicente Montaña[1], R. Martínez[2], N.E. Martínez[2], G. Rey[2], J. Escribano Vera[2], D. Pérez Alenza[1]. [1]Complutense University, Madrid, Spain, [2]Hospital Ruber Internacional, Madrid, Spain

Dogs with pituitary hyperadrenocorticism (HAC) are usually treated with trilostane to reduce hypercortisolism. However, surgical removal or radiotherapy of the pituitary tumor might be useful, especially in animals with large tumors. Radiosurgery performed in a Gamma knife equipment designed to apply a single dose distributed from 192 converging beams, in stereotaxic conditions, has been proposed as a definitive treatment in dogs with pituitary HAC.

This study, approved by the Ethics Committee of Animal Experimentation of the University Complutense Madrid, included 12 dogs diagnosed with HAC. Dogs were of different breeds, 7 females and 5 males, with an age ranged from 8 to 12 years (mean ± SD 10.38 ± 1.39 years). Under stereotaxic conditions and anesthetized, animals were studied in a high magnetic field (3T) MRI, and underwent to radiosurgery at the Ruber International Hospital (Madrid). Dogs were followed-up after radiosurgery and clinical, laboratorial and control of HAC was evaluated in every visit. Time and cause of death were registered.

Results of MRI showed the presence of pituitary microadenoma in 7 dogs and masses greater than 10 mm (diagnosed as macroadenomas) in 5 animals. Treatment (mean ± SD) doses administered was 30.0 ± 3.2 Gy; with a range of 25.0 to 35.0 Gy.

Good control of HAC was achieved in dogs with microadenoma between 3 to 6 months after treatment without trilostane (n = 6). In dogs with macroadenoma, a reduction in neurological signs was observed within the first week after treatment, but trilostane was required to control HAC, with lower dosages than before radiosurgery.

Short time and midterm secondary effects were not observed. One dog developed hypothyroidism 2 years after radiotherapy. One dog diagnosed with macroadenoma died due to diencephalic radionecrosis at 348 days. A tumor recurrence was observed at 515 days (n = 1).

Mean survival time in dogs diagnosed with microadenoma was 1123 ± 873.14 days, with a range of 40 to 2798 days. Mean survival time in dogs diagnosed with macroadenoma was 375 ± 232.14 days, (ranging from 181 to 751 days). Survival times in dogs with microadenomas are longer than the observed in other studies in dogs with HAC using mitotane (mean 985 ± 57 days) or trilostane (mean 1051 ± 78 days). In dogs with macroadenoma, survival times are similar to reported with fractionated radiotherapy.

Gamma Knife radiosurgery is a noninvasive and effective procedure to treat dogs with pituitary HAC, and is especially useful in dogs with macroadenoma.

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ESVE-O-12

EVALUATION OF THE EFFICACY AND SAFETY OF A NEW FORMULATION OF DESOXYCORTONE PIVALATE (DOCP) FOR TREATING PRIMARY HYPOADRENOCORTICISM (PH) IN DOGS EITHER NEWLY DIAGNOSED WITH PH, OR PREVIOUSLY TREATED WITH FLUDROCORTISONE. B. Mason, H. Farr, S. Longhofer. Dechra Ltd, Overland Park, USA

Fludrocortisone and DOCP are both mineralocorticoid replacement therapies for dogs with PH. A change from fludrocortisone to DOCP is often prompted by adverse events or inadequate control of PH.

A comparison of clinical signs and Na^+, K^+ concentrations or the Na^+/K^+ ratio was made between Zycortal-treated dogs previously treated with fludrocortisone, versus new cases not treated with fludrocortisone, from a multi-centre randomised clinical trial investigating the efficacy and safety of a new prolonged-release suspension of DOCP (Zycortal, Dechra Ltd) in the treatment of PH.

Cases (n = 107) were retrospectively grouped based on pre-study treatment history: cases treated long-term with fludrocortisone (≥ 30 days): (LT; n = 12); cases treated short-term with fludrocortisone (≤ 7 days) (ST; n = 19); newly diagnosed cases never treated with fludrocortisone (NF; n = 76). Dogs were administered Zycortal at an initial dose of 2.2 mg/kg subcutaneously, with subsequent doses administered approximately every 30 days for up to 5 months. Treatment success on Days 90 and 180 occurred when the veterinarian assessed the case as improved, or unchanged (if not new cases of PH) compared to baseline (veterinarian-assessed improvement), and Na^+ and K^+ concentrations or the Na^+/K^+ ratio were within the reference range. Dogs were concurrently treated with prednisolone or prednisone.

The majority of dogs were purebred, young to middle aged (mean 4.7 years), with males and females equally represented. Treatment success was similar ($P = 0.8023$) at Day 90 with 81.8, 82.4 and 87.3% for the LT, ST and NF Groups, respectively and at Day 180 with 100, 91.7 and 84.2% ($P = 0.8301$) for these respective Groups. Veterinarian-assessed improvement was > 99% for all groups on Days 90 and 180. The LT dogs had normal Na^+ (73%) and K^+ (55%) concentrations on Day 0; by Days 90 and 180, 91 and 100% of LT dogs had normal concentrations of both Na^+ and K^+. On Day 0, < 20% of ST and NF dogs had normal Na^+ and K^+ concentrations; however, by Days 90 and 180, > 87% of these dogs had normal Na^+ and K^+ concentrations.

Adverse events reported most frequently in all groups were polyuria/polydipsia and vomiting.

Zycortal was equally effective in managing clinical signs and electrolyte concentrations in newly diagnosed cases of PH compared to cases previously treated with fludrocortisone, showing beneficial effects on electrolyte normalisation. Dogs previously receiving fludrocortisone were successfully transitioned to Zycortal.

Disclosures: All authors are employees of Dechra Ltd, the manufacturer of Zycortal. The study was funded by Dechra.

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ESCG-O-1
METHYLMALONIC ACID CONCENTRATIONS IN DOGS WITH HYPOCOBALAMINEMIA TREATED WITH ORAL VERSUS PARENTERAL COBALAMIN SUPPLEMENTATION.

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Cobalamin (cbl) deficiency is a prevalent sequel to chronic enteropathies (CE) in dogs and the current supplementation protocols call for repeated parenteral injections. This group has recently published a retrospective study in dogs with CE and hypocobalaminemia, in which oral cbl supplementation appeared effective. However, intracellular markers of cbl status, such as methylmalonic acid (MMA) concentrations, were not evaluated. The purpose of this study was to compare MMA concentrations after oral (PO) versus parenteral (PE) cbl supplementation in dogs with signs of CE and hypocobalaminemia.

Dogs with signs of CE and serum cbl below 210 pmol/l (reference interval: 180–708 pmol/l) were included. Supplementation was prescribed using a block-randomized pre-designed schedule as either daily oral cbl tablets, using the treatment protocol from the retrospective study (http://onlinelibrary.wiley.com/doi/10.1111/jvim.13797/full), or parenteral cbl according to a current protocol (http://vetmed.tamu.edu/gilab/research/cobalamin-information#-dosing). The study was approved by the local ethichs committee and started in March 2014. Serum MMA concentrations were analyzed using a stable isotope dilution GC-MS method (reference interval 415–1193 mmol/l).

36 dogs aged 1.8–12 years (median 6) of 21 different breeds were included; 19 in the PO group and 17 in the PE. As previously reported, serum cbl concentrations improved significantly in all dogs. Comparisons between the groups were performed using Mann Whitney test and comparisons within the groups using Wilcoxon matched-pairs signed rank test. At inclusion, there was no statistical difference in MMA concentrations between the groups ($P = 0.944$). The initial median (range) MMA concentration was 923 mmol/l (566–2468) in the PO group and 934 mmol/l (508–1900) in the PE group. After 4 weeks of supplementation, median MMA concentrations had decreased significantly to 672 mmol/l (386–1465) in the PO group and 724 mmol/l (377–932) in the PE group ($P < 0.0001$ in both groups). There was no statistical difference between the PO and PE group after 4 weeks ($P = 0.99$). Furthermore, there was no statistical difference between MMA concentrations after 4 and 12 weeks of treatment, either in the PO group (n = 16; $P = 0.71$) or in the PE group (n = 13; $P = 0.89$). After 12 weeks of treatment, median MMA serum concentration in the PO group was 735 mmol/l (450–1221) and 671 mmol/l (349–1145) in the PE group, with no statistical difference between the groups ($P = 0.77$).

Our results suggest that oral cbl supplementation appears as effective as parenteral in improving the cellular cobalamin status.

Disclosures: No disclosures to report.

ESCG-O-2
LONG-TERM IMPLICATIONS OF CANINE PARVOVIRUS INFECTION.

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Canine parvovirus (CPV) is the most important viral cause of canine enteritis leading to severe damage of the intestinal barrier. No studies regarding long-term implications of CPV infection have been published to date. The aim of this study was to evaluate whether dogs that have survived from CPV infection will have an increased risk for developing chronic gastroenteritis, atopic dermatitis, or cardiac disease later in their lifes.

Dogs that had been treated at the Clinic of Small Animal Medicine, Ludwig-Maximilians-Universitaet Munich, for CPV infection for which a follow-up of at least 12 months was available, were included in the study. Their owners had to complete a questionnaire on the presence of chronic gastrointestinal and cutaneous signs, cardiac disease, and other potential disorders. An identical questionnaire was sent out to owners of a breed- and age-matched control group during the same time period. Fisher's exact test was used for statistical analysis.

Seventy-one questionnaires of dogs with CPV infection and 67 of control dogs were analyzed. Significantly more CPV-infected dogs (30/71) compared to control dogs (8/67) had developed chronic gastrointestinal signs later in their lifes ($P < 0.001$). No significant differences could be observed regarding dermatologic and cardiac disorders.

The results of this study suggest that dogs that survive CPV infection have a significantly higher risk for developing chronic gastrointestinal disease. Further prospective studies to assess the risk assessment and prevent these long term effects are needed.

Disclosures: No disclosures to report.

ESCG-O-3
VALIDATION OF A DYSBIOSIS INDEX TO ASSESS MICROBIOTA CHANGES IN FECAL SAMPLES OF DOGS.

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Recent 16S rRNA gene sequencing studies have described alterations in the gut microbiota of dogs with CE compared to healthy dogs. Disadvantages of using a sequencing based approach are the relatively high cost, as well the turnaround time to receive sequencing results. Recently we developed a PCR panel that targets specific bacterial groups that have been found to be consistently altered in dogs with CE. The results of the PCR panel are expressed using a mathematical algorithm that reports microbiota changes as a single numerical value (dysbiosis index). A negative DI indicates normobiosis, whereas a DI > 2 indicates dysbiosis. A DI between 0 and 2 is in the questionable range. The aim of this study was to analytically validate the DI index and also to assess the influence of storage temperatures.

Fecal samples were obtained from healthy dogs and dogs with chronic diarrhea. To test inter-assay variability, feces from 3 dogs each were divided into 10 aliquots and analyzed separately. To assess day-to-day variability, three consecutive samples were tested from 2 healthy and 3 diseased dogs. Fecal samples were also exposed to different storage temperatures and also underwent 5 consecutive repeated freeze-thaw cycles. Fecal DNA was extracted from each sample and analyzed for 7 bacterial groups using quantitative PCR (qPCR) assays, and results of bacterial groups expressed as an index.

Inter-assay variability for 3 samples run 10 consecutive times each in the positive and negative DI range revealed a classification error of 10%. Classification error rate for day-to-day variation was 8.25% for the 5 samples tested. The DI was stable at 4C and -20C for up to 3 weeks (classification error 0% for 5 samples). Up to three freeze-thaw cycles did not alter the interpretation of the dysbiosis index.

In conclusion, a qPCR based dysbiosis index was analytically validated and showed satisfactory performance and stability data for analysis of clinical samples.

Disclosures: Disclosures to report.
Drs. Suchodolski, Steiner, and Lidbury are employees of the Gastrointestinal Laboratory at Texas A&M University that offers the Dysbiosis Index on fee-for-service basis.

ESCG-O-4
MICROBIOMIC AND METABOLOMIC ASSOCIATIONS WITH INCREASED SERUM PANCREATIC LIPASE (FPL) AND TRYPSIN-LIKE IMMUNOREACTIVITY (FTLI) IN GERIATRIC CATS WITH IDIOPATHIC CHRONIC ENTEROPATHY (ICE)..

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Weight loss is common in old cats with ICE and is associated with malabsorption of fat, protein, cobalamin, and tocopherol, and enteric protein loss, and the variable serum cobalamin concentrations in affected cats are strongly associated with differences in the intestinal microbiome (Patil AP and Cupp CJ. Proc. Nestle-Purina Compan Anim Nutr Summit, 55–61, 2010, Williams DA *et al*. J Vet Int Med 30:359, 2016). Many affected cats (13 of 15 in a recent study) also have increased serum concentrations of fPL and/or fTLI, although neither anorexia nor vomiting were notable clinical features in any of these 15 cats. The etiology of this pancreatic pathophysiology is unknown. The objectives of this study were to determine if serum fPL and fTLI concentrations in cats with ICE were associated with changes in the fecal microbiome or serum metabolome.

The study evaluated 46 cats older than 10 years of age that were being fed nutritionally complete and balanced diets. Thirty-one of these cats had ICE demonstrated by increased fecal fat (>20%), subnormal fat digestibility (<90%), subnormal serum cobalamin or increased serum methylmalonic acid, but without exocrine pancreatic insufficiency as assessed by assay of serum fTLI. Both fTLI and fPL were assayed at the GI Lab, Texas A&M University, USA. The fecal microbiome was evaluated by Roche 454 sequencing and analysis by QIIME (Quantitative Insights into Microbial Ecology), while serum metabolomics analysis was done using LC/GC/MS by Metabolon, Durham, NC, USA. Relationships with serum fPL and fTLI were evaluated using OPLS-DA as described (Ramadan Z. *et al*. J Vet Int Med 28:59–65, 2014) with values for Q^2 >0.3 being considered significant, and those >0.5 strongly so.

In the 46 cats neither fPL nor fTLI was significantly associated with the fecal microbiome (Q^2 <0.23). However there were significant associations between the serum metabolome and both fTLI (Q^2 = 0.353) and fPL (Q^2 =0.729). For each enzyme there were several metabolites either positively or negatively correlated with serum concentration (r = 0.3 to 0.85 and r = -0.3 to -0.41). There was little overlap between correlating metabolites for each of the 2 pancreatic marker enzymes.

It is concluded that there is little direct association between the fecal microflora and serum pancreatic enzymes, but that numerous individual metabolites are associated with both fPL and fTLI. The relationships are different for each of these enzymes and any causal relationships remain to be determined.

Disclosures: No disclosures to report
I am a consultant with the GI Lab but their services were provided on a the regular fee per sample basis.
I receive no remuneration from Nestle-Purina for my collaboration with them.

ESCG-O-5
IMPACT OF DIFFERENT COMMERCIALLY AVAILABLE COMPLETE DIETS ON THE DETECTABILITY OF OCCULT BLOOD IN FAECES OF CATS.

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In cats with chronic kidney disease, it is important to distinguish between anemia due to lack of erythropoetin and anemia due to gastrointestinal bleeding because of uremic gastroenteritis. Human screening tests for occult faecal blood have not been validated in cats so far. The aim of this study was to determine the impact of different renal diets on the results of two haemoccult tests in healthy cats. In addition, sensitivity of those two tests to detect occult blood was evaluated.

Three different commercially available renal diets (D1: Vetconcept - Low Protein®; D2: Hills - K/D®; D3: Royal Canin - Renal®) were fed to nine healthy cats for seven days. As comparison, cats were fed raw meat or diet D2 to which hemoglobin (Hb) (in form of feline blood) was added at different concentrations. Starting at day 4, faecal samples were analyzed daily until day 7 with Haemoccult® and Haemoccult Sensa® (Beckmann-Coulter, Krefeld, Germany).

All cats fed with raw meat tested positive for occult blood with both tests. With Haemoccult® 3/24, 0/27, and 13/31 cats fed with D1, D2, and D3, respectively, were tested positive. With 5 mg Hb per kg bodyweight per day added to diet D2, faecal samples were tested positive in 0/10 cats with Haemoccult® and 6/10 with Haemoccult Sensa®.

Only diet D2 is a suitable diet to diagnose gastrointestinal bleeding in cats with chronic kidney disease. To reliably detect minimal amounts of blood, the Haemoccult Sensa® should be used.

Disclosures: No disclosures to report.

ESCG-O-6
EVALUATION OF COELIAC DISEASE ANTIBODIES IN DOGS WITH CHRONIC ENTEROPATHIES.

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Canine idiopathic chronic enteropathies can be challenging to diagnose and manage. No current laboratory or histopathological tests allow differentiation between Food Responsive Diarrhoea (FRD), and Steroid Responsive Diarrhoea (SRD). FRD shares many similarities to Coeliac Disease (CD) in humans, such as complete response to strict elimination diet, and typical histological findings such as shortening of the small intestinal villi. Autoantibodies used to test for CD in humans include anti-reticulin, anti-endomysium (anti-EMA) and anti-de-amidated gliadin peptide antibodies. The aim of this study was to test the hypothesis that anti-reticulin, anti-EMA and de-amidated gliadin antibodies can be useful for the diagnosis of FRD in dogs. We hypothesized that anti-EMA antibodies would be detected more frequently in dogs with FRD compared to healthy dogs and dogs with SRD. Antibodies were detected using a human indirect immunofluorescence assay that was adapted for use in canine patients. Tissues on the BIOCHIP™ (Euroimmun Ltd, GE) for this assay included primate intestine, primate oesophagus, primate liver and GAF-3X (synthetic de-amidated gliadin antigen). Use of these BIOCHIPs™ yields a characteristic fluorescence pattern if samples are considered to be positive.

Serum was evaluated from 20 healthy control dogs, 17 dogs with FRD, and 28 dogs with SRD. All dogs underwent rigorous diagnostic investigations including clinical staging using the

severity scoring (CCECAI), comprehensive laboratory evaluation, ultrasonographic examination of the abdomen and endoscopy with intestinal biopsies. Healthy control dogs and SRD dogs tested negative for any autoantibodies. All dogs with FRD tested negative for antibodies directed against endomysium and de-amidated gliadin peptides, however, five out of 17 dogs with FRD tested positive for anti-reticulin antibodies. There was a significant association between the presence of food-responsive disease and a positive immunofluorescence response for anti-reticulin antibodies when compared to the healthy control ($P = 0.014$) and SRD groups ($P = 0.009$). Although the immunofluorescence pattern visualized was not typical for anti-reticulin patterns usually seen with CD, this finding may indicate the presence of autoantibodies against EMA in dogs with FRD and may warrant further study in larger cohorts.

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ESCG-O-7
EXPRESSION OF P-GLYCOPROTEIN IN THE INTESTINAL EPITHELIUM AND LAMINA PROPRIA OF CATS WITH INFLAMMATORY BOWEL DISEASE AND ALIMENTARY LYMPHOMA.

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Multidrug resistance-1 gene polymorphism has been associated with the development of Inflammatory Bowel Disease (IBD) in humans. Furthermore, it has been proposed that P-gp expression generates resistance to the treatment in canine and human beings.

The aims of this study are to investigate the epithelial and lamina propria (LP) expression of P-gp in cats with IBD and alimentary lymphoma (AL), and to correlate this expression with clinical signs and histopathological scoring.

Cats diagnosed with IBD (n = 14) and AL (n = 16) between 2007 and 2013 were included. The feline chronic enteropathy activity index (FCEAI) was calculated for all cases. Control group was composed by 3 healthy indoor female cats and 5 sick cats died or euthanized (non-gastrointestinal illness). Diagnosis and classification of IBD and AL was established according to WSAVA gastrointestinal standardization group template and the National Cancer Institute formulation, respectively. Furthermore, a modified WSAVA template (villous stunting, epithelial injury, crypt distension and lacteal dilation) was applied for low grade AL (LGAL, n = 12) evaluation.

Immunolabeling for P-gp (C494 antibody) was performed. Epithelial P-gp immunoexpression was calculated according the apical membrane continuity and intensity labeling, LP P-gp immunoexpresssion was scored according the percentage of stained cells and intensity. The most representative segment scored of each patient by WSAVA and modified WSAVA were used for statistical analysis, non-parametric tests where used.

Epithelial P-gp expression was showed in all intestinal segments of the control group but not at the LP. Epithelial discontinuous immunoreactivity was observed in the 44% of lymphoplasmacytic enteritis (LPE), 33% of eosinophilic enteritis (EE) and 75% of LGAL cases, but not in the intermediate or high GAL (I/HGAL, n = 4) cases. Expression in the LP was showed by 67% of LPE, 100% of EE, 67% of LGAL and 75% of I/HGAL cases.

No correlation was found between FCEAI values and epithelial or LP P-gp expression. FCEAI score was significantly different between IBD and AL group but difference was not observed regarding P-gp immunolabeling. Total and modified WSAVA scoring showed a significant correlation with epithelial and LP P-gp expression. However, no statistically significant differences were found for epithelial and LP P-gp expression neither between control and IBD groups, nor between IBD and AL groups. Nevertheless, AL group had statistically significant increased LP expression in compare to control group, but not regarding epithelial immunolabeling. In conclusion, P-gp immunoexpression at the LP of AL may affect the response to treatment and survival in compare to IBD.

Disclosures: No disclosures to report.

ESCG-O-8
IDENTIFICATION OF FACTORS ASSOCIATED WITH SHORT-TERM MORTALITY IN CANINE ACUTE PANCREATITIS.

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Acute pancreatitis (AP) is the most common disease of the exocrine pancreas in dogs. In AP, inflammatory cytokines are released into circulation leading to potentially severe systemic complications and significant morbidity and mortality.

The goal of this study was to investigate risk factors associated with short-term mortality in dogs diagnosed with AP.

Medical records of all dogs evaluated between 2008 and 2015 were reviewed and dogs diagnosed with AP were included. Diagnosis of AP was based on the association of at least two clinical signs consistent with AP (vomiting, abdominal pain, anorexia, lethargy, diarrhoea) present for less than 7 days and serum cPL concentration > 400 µg/L or at least two clinical signs consistent with AP present for less than 7 days, serum cPL concentration between 200 and 400 µg/L and ultrasonographic findings consistent with AP (thickened hypoechoic pancreas with blurred margins and surrounded by hyperechoic adipose tissue).

Clinical signs at admission, laboratory data, serum cPL concentration and date of death within 30 days from diagnosis were recorded. Survival analysis using the Cox proportional hazards model was performed to investigate variables associated with short-term (30 days) mortality. Dogs still alive 30 days after diagnosis were censored.

One hundred and thirty-eight dogs were included. Forty-six dogs (33%) died within 30 days of diagnosis. Multivariate analysis identified that presence of IRIS grade 4 or 5 (*versus* 1, 2, or 3) of acute kidney injury (adjusted hazard ratio [aHR], 8.6; 95% confidence interval [CI], 1.0–71.2; $P = 0.05$), serum bilirubin concentration ≥ 18.7 mg/L (aHR, 6.5; 95%CI, 1.3–32; $P = 0.02$], hypercreatininemia (aHR, 3.4; 95%CI, 1.7–6.8; $P < 0.01$), hypocalcaemia (aHR, 2.9; 95%CI, 1.5–5.9; $P < 0.01$), metabolic acidosis (aHR, 2.4; 95%CI, 1.2–5.1; $P = 0.02$) and serum cPL concentration ≥ 1000 µg/L (aHR, 1.8; 95%CI, 1.0–3.3; $P = 0.04$) were significantly associated with short-term mortality.

This study suggests that presence of serum bilirubin concentration ≥ 18.7 mg/L, hypercreatininemia, hypocalcaemia, metabolic acidosis, and IRIS grade 4 and 5 of acute kidney injury increase short-term mortality in dogs diagnosed with AP. The results of this study add relevant information to the current literature, allowing clinicians to recognize severe cases. Development of acute kidney injury in cases of AP needs to be further investigated.

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ESCG-O-9
ENDOSCOPIC MEASUREMENT OF PYLORIC DIAMETER IN HEALTHY CATS. A PROSPECTIVE STUDY OF 20 CASES.

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To the authors' knowledge, the diameter value of the pylorus sphincter in cats has never been established. As pyloric stenosis is poorly documented in cats, the diagnosis is currently based on clinical signs of pyloric outflow obstruction and abnormal pyloric conformation detected by ultrasonography. The aims of this study were to describe an endoscopic technique allowing the assessment of the pyloric diameter and to report this measure in 20 healthy cats.

Adult healthy cats (1 to 8 years old), weighting between 2.5 and 5.5 kg, were prospectively recruited if they met the following criteria: no vomiting episode during the last 4 weeks, no history of chronic vomiting, no treatment given during the last 3 months, no abnormalities on blood biochemistry. Cats were excluded if gastric inflammation was determined to be superior to 1/3, according to the WSAVA criteria, during the endoscopic procedure. The pyloric diameter was measured with specially-designed interchangeable biocompatible olives (ranging from 3 to 12 mm), inserted in

decreased order and screwed on a biopsy forceps passed through the working channel. The diameter of the first olive able to pass through the pylorus was considered to be equivalent to the pyloric diameter. The duration of the endoscopic procedure was recorded. The influence of age, sex, weight or breed was statistically assessed. Values are expressed as mean (+/- SD).

Twenty-two cats met the inclusion criteria and two cats were excluded because of marked gastric inflammation. The mean age of the remaining 20 cats was 38 (+/- 26 months; range 11–97 months) and the mean weight was 3.8 (+/- 0.8 kg; range 2.5–5.4 kg), with 10 entire males, 9 entire females and 1 spayed female. There were 12 domestic shorthair and 8 Siamese-related cats. The mean pyloric diameter in our population was 9.35 mm (+/- 0.75; range 8–11 mm) with no influence of age, sex, weight or breed. The mean duration of the endoscopic procedure was 4.4 (+/- 2.24 minutes; range 1.5–10 minutes).

This study is, to the authors' knowledge, the first one to describe a method assessing the pyloric diameter in cats. This endoscopic technique was safe and of short duration. In this study, based on 20 healthy cats, the mean diameter of the pylorus was estimated at 9.35 mm. Determination of a reference interval is now warranted in order to help in the diagnosis of pyloric stenosis in cats.

Disclosures: No disclosures to report.

ESCG-O-10

COMPARISON OF THE MICROBIOTA OF DOGS SUFFERING FROM INFLAMMATORY BOWEL DISEASES AND FOOD-RESPONSIVE DIARRHEA.

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Canine chronic enteropathies are characterized by persistent or recurrent clinical signs of gastrointestinal diseases. Among their most important causes are food-responsive diarrhea (FRD), antibiotic-responsive diarrhea (ARD), and inflammatory bowel diseases (IBD). The combination of an underlying host genetic susceptibility, an intestinal dysbiosis, and dietary/environmental factors are suspected as main contributing factors in the pathogenesis of canine IBD. However, actual mechanisms of the host-microbe interactions remain elusive. Furthermore, little information is available on differences of the microbiota of dogs suffering from IBD or FRD. Therefore, the aim of this study was to define the differences between the microbiota of dogs with IBD and FRD in duodenum and colon.

Extracted DNA from duodenal and colonic biopsies from 15 dogs with FRD and 9 dogs with IBD was used for Illumina sequencing of the bacterial 16S rRNA gene and analyzed using Quantitative Insights Into Microbial Ecology (QIIME) pipeline. The analysis of similarities (ANOSIM) function in the statistical software package PRIMER 6 (PRIMER-E Ltd., Luton, UK) was used on the weighted and unweighted UniFrac distance matrix to determine if any groups of samples contained significantly different bacterial communities. Linear discriminant analysis (LDA) effect size (LEfSe) was performed to identify bacterial groups that were significantly associated with disease and duration.

In the colon, there were no significant differences in microbiota structure (ANOSIM; $P = 0.96$) or species richness between FRD and IBD. In the duodenum, also no significant differences were found in microbiota structure or species richness ($P = 0.251$). LEfSe identified several bacterial groups that were differentially altered between groups. Enterococcus, Neisseriaceae, and Gemella were significantly higher in the IBD group (LDA > 3), whereas Lactobacillus and Cryocola were significantly higher in the FRD group.

In conclusion, this study revealed some differences in individual bacterial groups in the duodenum of dogs with IBD and FRD. Additional studies are needed to validate these findings and also to explore the significance these bacterial groups play in the pathophysiology of IBD and FRD.

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ESCG-O-11

UPREGULATION OF SIGNAL TRANSDUCER AND ACTIVATION OF TRANSCRIPTION (STAT)3 IN DOGS WITH INFLAMMATORY BOWEL DISEASE (IBD).

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In human IBD patients the signal transducer and activator of transcription (STAT)3 is activated in epithelial cells and correlates with clinical activity. Although canine IBD seems to involve similar pathogenetic mechanisms, little information about STAT3 exists in dogs.

The aim of this study was to investigate 1) the expression of STAT3 in intestinal biopsies of dogs with IBD 2) STAT3 expression in different subtypes of IBD-patients 3) correlation of clinical or histopathology activity with STAT3 expression.

According to clinical signs and response to therapy, 28 IBD-dogs were grouped as food responsive dogs (FRD) (N = 9), steroid responsive enteropathy (SRE) (N = 10) and protein-losing enteropathy (PLE) (N = 9). Ten healthy Beagles served as controls (CO). All dogs were clinically assessed using the Canine Chronic Enteropathy Activity Index (CCECAI) scoring system. Duodenal mucosal biopsy samples were endoscopically retrieved for histopathological examination using the World Small Animal Veterinary Association (WSAVA) grading. Immunohistochemistry for detection of STAT3 was performed.

In all 4 groups there was a significant difference of the histological and clinical scoring. Compared to CO, a significantly higher STAT3 expression of SRE- and PLE-dogs was detected in the villus epithelium, and in the crypt epithelium (CE) of all 3 patient groups. A significant correlation of WSAVA and STAT3 expression in IBD dogs in the CE could be detected.

Similarly to human IBD-patients, this study shows a significant STAT3-upregulation of different subtypes of IBD-patients compared to CO. Further studies are required to investigate the role of STAT3 as a potential marker for IBD-patients.

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ESCG-O-12

CLONALITY TESTING AS AN AJUNCT TOOL IN CANINE CHRONIC ENTEROPATHY PATIENTS.

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Canine chronic enteropathy (CCE) summarizes disease entities characterized by persistent gastrointestinal symptoms and inflammatory infiltrates. Lymphoplasmacellular enteritis (LPE) is the most common form. Based on the response to treatment, food responsive diarrhoea (FRD), inflammatory bowel disease (IBD, steroid-responsive diarrhea) and protein loosing enteropathy (PLE) are differentiated. Differentiation between LPE and intestinal lymphoma is a diagnostic challenge as histopathology might fail to yield unequivocal results. Inflammatory lymphocytic infiltrates, polyclonal in their origin, often cannot be reliably differentiated from clonally proliferating lymphomas by histopathology alone. Clonality testing for detection of antigen receptor gene rearrangement by polymerase chain reaction might offer a useful solution for this dilemma.

In a retrospective study, clonality testing of histopathology samples in 32 CCE patients with LPE was performed and eventual differences of clonality patterns between IBD, FRD, PLE and intestinal lymphocytic infiltrates of six healthy Beagle dogs were investigated.

The canine IBD activity index (CIBDAI) was used and endoscopic duodenal and colonic biopsies were evaluated by histopathology and clonality testing. Based on clinical data and response to therapy CCE dogs were allocated to 3 groups: FRD (N = 13), IBD (N = 9), IBD with secondary PLE (N = 9). One dog in the FRD group was also diagnosed with histiocytic ulcerative colitis (HUC).

Clonality testing was performed by using primers targeting the complete immunoglobulin heavy chain variable region (IGHV) and T-cell-receptor gamma (TCRG) gene-rearrangements. Size

separation was performed by high-resolution capillary electrophoresis.

CIBDAI was significantly different between groups and improved significantly after 4 weeks of appropriate therapy ($P < 0.05$).

All Beagles showed polyclonal electrophoretic patterns for B- and T-cell primers. All samples from CCE patients showed polyclonal patterns for the B-cell primers. Targeting TCRG, 3 patients showed an oligoclonal pattern of lymphocytic infiltrates in the duodenum. Two of these dogs belonged to the FRD group, one to the PLE group. The FRD-HUC patient showed oligoclonality in the colon. No differences of clonal expression between all groups could be detected. Despite of clinical improvement in all groups, an oligoclonal lymphoid population was detected in four dogs.

In conclusion, clonality testing might be useful as a complementary tool to investigate the nature of a lymphocytic intestinal infiltrate. Results of clonality must be interpreted in context with clinical signs, other diagnostic findings, and response to therapy. More data - that is long term follow up - is needed to decide, if this new tool might help to detect early lymphoma in patients with CCE.

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ESCG-O-13

PRESUMED ACQUIRED PYLORIC STENOSIS IN CATS: EPIDEMIOLOGIC, CLINICAL, HISTOPATHOLOGICAL AND ENDOSCOPIC DATA. A RETROSPECTIVE STUDY OF 34 CASES. V. Freiche[1], F. da Riz[1], M. Faucher[2], A. Lamoureux[1], G. Benchekroun[1], A.J. German[3]. [1]Université Paris-Est, Ecole Nationale Vétérinaire d'Alfort, Maisons-alfort, France, [2]Clinique vétérinaire Alliance, Bordeaux, France, [3]University of Liverpool, Institute of Ageing and Chronic Disease, Liverpool, UK

Acquired pyloric stenosis (APS) is poorly reported in cats and is a diagnostic challenge. This is partly because the dimensions of the healthy feline pylorus have not been defined. However, since the pylorus is usually passable with an 8.8 mm diameter endoscope, inability to intubate the pylorus despite several attempts could be a useful diagnostic indicator of pyloric stenosis (PS). The aim of this retrospective study was to compare the clinical characteristics of 34 cats with possible APS (based on the presence of gastrointestinal signs and an inability to pass an endoscope; group A), with a control group of cats with gastrointestinal signs but where the pylorus was passable (group B).

This study was conducted in two referral centres (2006–2014). All cats had signs of gastrointestinal disease and underwent an upper gastro-intestinal endoscopy as part of their diagnostic investigations, all of which were performed by the same clinician (VF). Group A comprised 34 adult cats with a presumptive diagnosis of APS and Group B included 37 cats. Signalment and all clinical parameters were statistically compared between groups (Chi squared test, Fisher's exact test, Student's t-test).

There were significantly more Siamese and Siamese-related cats in group A (7/34) than in group B (1/37 P = 0.045). However, neither age nor weight were significantly different between the groups. Chronic vomiting was the main presenting complaint (31/33 [94%] in group A, 28/36 [74%] in group B), with significantly more cats vomiting food in group A (29/31), than in group B (18/32 [43%], $P = 0.0019$). The predominant endoscopic findings were compatible with gastritis in both group A (31/34 [91%]) and group B (27/37 [73%]). Using the open tips of biopsy forceps as a guide, the pyloric sphincter seemed to be abnormally small on direct examination in all cats from group A but not group B. Histopathological findings revealed inflammatory lesions and/or fibrosis in 28/34 cats [82%] in group A and 28/37 cats [76%] in group B. However, gastric neoplasia was more common in group B (6/36 [16%]) than in group A (0/34, $P = 0.04$).

This study describes clinical and endoscopic findings in 34 cats presumed to have APS. Compared with the control group, Siamese cats and related breeds are over-represented, and associated histopathological changes are usually inflammatory in nature. Further studies are warranted to define this clinical condition better, and develop reliable methods of diagnosis.

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ESCG-O-14

NO LINEAR CORRELATION BETWEEN HISTOPATHOLOGICAL AND CLINICAL SEVERITY GRADING IN CANINE INFLAMMATORY BOWEL DISEASE (IBD): 102 CASES. L. Heasman, J. Williams, S.L. Priestnall, K. Allenspach. Royal Veterinary College, North mymms, UK

Defining the presence, distribution, and severity of GI disease in endoscopic biopsy specimens from dogs with inflammatory bowel disease (IBD) is difficult. Prior studies have failed to detect a convincing association between mucosal histopathology and clinical signs, or response to therapy and outcome in dogs with IBD. For this reason, a standardized grading scheme for the interpretation of GI histopathologic findings was introduced (WSAVA grading scheme). However, no larger scale studies so far have evaluated whether clinical scoring systems linearly correlate with the WSAVA histopathological grading scheme. Such information would be useful for the clinician as WSAVA grading could be used to monitor treatment response and may give prognostic information. The aim of this study was to evaluate whether dogs that were diagnosed with IBD and had clinical scoring performed using the Canine Chronic Enteropathy Clinical Activity Index (CCECAI) and histopathology scoring using the WSAVA scoring scheme are linearly correlated to one another. Electronic data of WSAVA graded endoscopically retrieved biopsy scores assigned by a veterinary pathologist at one single centre were collected. A maximum of five sites were evaluated per animal: stomach; pylorus (n = 87) and fundus (n = 46), duodenum (n = 96), ileum (n = 37) and colon (n = 61). One hundred and two dogs diagnosed with IBD were included in this study. WSAVA scores were compared to the CCECAI scores assigned to the animals at the time of diagnosis. Linear correlation was assessed using Spearman Rank's test. Linear correlation of scores was very weak, with r^2 ranging from 0.009 to 0.249 (gastric fundus; r^2= 0.05, gastric pylorus; $r^2 = 0.028$, duodenum; $r^2 = 0.249$, ileum; $r^2 = 0.009$ and colon; $r^2 = 0.095$). The only site where linear correlation was significant was the duodenum ($r^2 = 0$ .249, $P = 0.014$). This study indicates that linear correlation of the two grading systems is weak and that clinicians should not rely on one system to predict scores of the other. Studies correlating scores before and after treatment in large numbers of dogs are indicated to further evaluate predictive ability of the WSAVA score.

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ESCG-O-15

HOW DOES INCLUSION OF RED MEAT IN THE CANINE DIET AFFECT THE FECAL MICROBIOTA? RESULTS FROM HIGH-THROUGHPUT SEQUENCING OF THE BACTERIAL 16S RRNA GENE. K.M.V. Herstad[1], K. Gajardo[1], A.M. Bakke[1], J. Ludvigsen[1], K. Rudi[1], M. Sekelja[2], I. Rud[3], L. Moe[1], E. Skancke[1]. [1]Norwegian University of LIfe Sciences, Oslo, Norway, [2]University of Oslo, Oslo, Norway, [3]Nofima, Ås, Norway

The microbial community composition in the gut is largely influenced by diet and may affect health. In humans, a diet dominated by red meat has been associated with colonic diseases such as IBD and colorectal cancer, and gut bacteria may play a role in the etiology. Whether this also applies to dogs is not well documented.

The aim of this study was to evaluate the change in fecal bacterial composition in healthy, client-owned dogs with increasing inclusion of minced beef (MB) in the diet.

Eleven dogs were included in the seven-week study, in which eight dogs participated in all dietary periods. For the first two weeks (CD1), all dogs were acclimated to the same commercial dry food (CD). Over the following three weeks, incremental increases in each dog's total energy requirement was supplied as MB, at the expense of the CD, with MB providing 25 (low; LMB), 50 (medium; MMB) and 75 (high; HMB) percent of energy. This resulted in concomitant increases in protein and fat, and decreases in starch and fiber. For the final two weeks, the dogs were again fed the CD (CD2).

Bacterial populations expressed as operational taxonomic units (OTUs) were characterized in fecal samples from each dietary period using Illumina Miseq based on the V3-V4 region of the 16S rRNA gene. The HMB diet induced lower species richness and

evenness (*ANOVA P*-value 0.04). Differences in the microbial populations at genus level were observed between the HMB and CD diet groups (Permutation testing; $P < 0.05$). The relative abundance of *OTUs* classified as *Clostridia hiranonis* increased, whereas the OTUs classified as saccharolytic bacteria *Ruminococcaceae* spp. and *Faecalibacterium prausnitzii* decreased in samples of dogs fed the HMB diet, which was reversed during CD2 ($P < 0.05$; LDA score >3). Fecal pH as well as butyrate and isovalerate levels were also affected by diet.

In conclusion, the MB content in the diet of dogs influenced the composition and diversity of fecal bacterial populations. Further studies are needed to assess the impact on the gut health of dogs, especially concerning the role of 1) *Clostridia hiranonis* in light of its role in biotransformation of primary bile acids to the potentially harmful secondary bile acids; and 2) reduced relative abundance of butyrate-producing saccharolytic bacteria when consuming a diet with lower carbohydrate content.

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ESCG-O-16

VIRULENCE MARKERS IN MUCOSA-ASSOCIATED ESCHERICHIA COLI FROM DOGS WITH INFLAMMATORY BOWEL DISEASE (IBD). F. Vessieres[1], F. Procoli[1], A. Kehl[2], E. Müller[2], K.W. Simpson[3], M. Bushnell[4], A. Rycroft[4], K. Allenspach[4]. [1]Anderson Moores Veterinary Specialists, Hursley, UK, [2]Laboklin AG, Bad kissingen, Germany, [3]Cornell University, Ithaca, USA, [4]Royal Veterinary College, London, UK

Escherichia coli (*E. coli*) is a member of the resident intestinal microflora. However, *E. coli* is a diverse species and some strains harbour virulence determinants that may cause intestinal disease in favourable circumstances. In people with Crohn's disease and in Boxers with granulomatous colitis, there is evidence that *E. coli* strains that lack virulence determinants typically associated with diarrheagenic strains are involved in the pathogenesis of chronic intestinal inflammation. Furthermore, German Shepherd Dogs (GSDs) with lymphoplasmacytic IBD (LP-IBD) frequently respond to antibiotic treatment, however, the basis of this clinical response is unknown.

The aim of the present study was to prospectively investigate the presence of virulence genes associated with diarheagenic *E.coli* in the intestinal mucosa of dogs with LP-IBD. Twelve GSDs and twenty non-GSDs evaluated between March and October 2013 at the Royal Veterinary College (London, UK) were included in the study. The diagnosis of LP-IBD was based on clinical signs, intestinal histopathology, and exclusion of other known causes of gastro-intestinal signs. *E. coli* was cultured from endoscopically collected mucosal biopsy material on Sheep Blood agar and MacConkey. Colonies showing characteristics consistent with *E. coli* were identified using API20E (bioMérieux). DNA was extracted from the strains using the MagNA Pure 96® System (Roche), followed by loop-mediated isothermal PCR amplification (LAMP) to detect the presence of shigatoxin (stx1 und stx2), heat-stable enterotoxin (sta), and attaching and effacing (intimin) gene (eae). A total number of 47 mucosa-associated *E.coli* strains were isolated from 26/32 dogs. There was a higher frequency of *E.coli* strains being isolated in GSDs (12/12, with 1–6 positive cultures per dog) vs. dogs of other breeds (14/20, with 0–2 positive cultures per dog)($P = 0.035$). None of the *E.coli* strains were positive for stx1, stx2 or sta. The eae gene was found in 4 strains and eae-positive *E. coli* were more frequently isolated from GSD (4/12; 33%) than other breeds with LP-IBD (0/20; 0%) ($P = 0.006$). These results suggest that *E.coli* carrying the eae gene and possibly other, yet to be investigated virulence factors could be involved in the pathogenesis of LP-IBD in GSDs.

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ESVIM – European Society of Veterinary Internal Medicine

ESVIM-O-1

EVALUATION OF PROGNOSTIC FACTORS FOR MORTALITY IN DOGS WITH NON-REGENERATIVE FORMS OF IMMUNE-MEDIATED HAEMOLYTIC ANAEMIA. J.W. Swann, A.S.K. Chan, B. Szladovits, B. Glanemann. Royal Veterinary College, Hatfield, UK

Whereas the majority of dogs with immune-mediated haemolytic anaemia (IMHA) have regenerative anaemia, many have persistent non-regenerative anaemia, possibly indicating that the autoimmune response is directed against precursor cells in the bone marrow. Prognostic factors, including the canine haemolytic anaemia objective score (CHAOS) have been identified for dogs with IMHA but it is not clear whether these factors remain valid in dogs presented with non-regenerative IMHA (nrIMHA).

The aim of this study was to evaluate the association between clinicopathological variables and survival in dogs with nrIMHA, and to compare this to the association with the composite CHAOS.

The electronic records of a tertiary referral institution were searched to identify dogs that were anaemic (with packed cell volume less than 35%) and had at least one of the following features: spontaneous agglutination of red blood cells after dilution in saline, spherocytosis without other evidence of shear damage on evaluation of a fresh blood smear, titre of at least 1:16 in direct antiglobulin test, or detection of erythrophagocytosis by myeloid cells in the bone marrow. Dogs were considered to have nrIMHA if the absolute reticulocyte concentration (ARC) did not increase above $60x10^9$/l within five days of presentation. Underlying causes of immune-mediated disease were excluded by diagnostic imaging, serum biochemistry, testing for vector-borne diseases, and urinalysis. The CHAOS score was calculated for each dog: this score incorporates age, rectal temperature, serum albumin and total bilirubin concentrations and the platelet concentration. Associations between clinicopathological variables and survival were evaluated by Cox proportional hazards analysis, with initial univariable analysis followed by construction of a multivariable model. A separate analysis was conducted with CHAOS as the sole explanatory variable.

Fifty dogs with nrIMHA were included in the study, with mean age 7.3 years (SE: 0.46). The median packed cell volume at presentation was 11% (inter-quartile range [IQR]: 7–14), and the median ARC $5.3x10^9$/l (IQR: 0–16.7). Bone marrow samples were obtained in 37 dogs, revealing erythroid hyperplasia in 19, hypoplasia in 15 and PRCA in 3. Three factors, serum creatinine, albumin and total bilirubin concentrations, were significantly associated with survival in the final multivariable model. In a separate model, CHAOS was also significantly associated with survival.

This study indicates that prognostic factors identified in mixed populations of dogs with IMHA, including serum total bilirubin and creatinine concentrations, also appear to be important in dogs with nrIMHA.

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ESVIM-O-2

SHORT-TERM RESPONSE TO HUMAN INTRAVENOUS IMMUNOGLOBULIN (HIVIG) IN THE MANAGEMENT OF IMMUNE-MEDIATED THROMBOCYTOPENIA (IMT): A PROSPECTIVE COHORT STUDY IN 27 DOGS. A. Zoia[1], M. Drigo[2]. [1]San Marco Veterinary Clinic, Padova, Italy, [2]Department of Animal Medicine, Production and Health, Padua University, Padova, Italy

Platelet count can increase within 1–3.5 days in dogs with IMT treated with prednisolone and hIVIG, but treatment failure and death may still occur. Aims of this study were to investigate short-term response to hIVIG in the management of IMT.

Twenty-seven dogs with IMT/Evans-Syndrome (ES) that received hIVIG were included. Dogs with concurrent diseases or receiving medication/vaccination within 30 days of IMT/ES

diagnosis were classified with secondary IMT (sIMT), the remaining with primary IMT (pIMT). Based on platelet count at 60 ± 12 hr (T_{60}) post-hIVIG infusion dogs were divided in responders (n = 19) or non-responders (n = 8). A positive response was defined as an increase in platelet count≥40,000/μL compared to the value before hIVIG infusion (T_0).

At T_0 there were no differences between non-responders and responders in: sex, presence of any type of bleeding, type of disease (i.e., pIMT *vs*. sIMT or presence of concurrent ES), days of prednisolone treatment and days of hospitalization before hIVIG infusion, platelet count (T_{0PLT}), HCT, serum IgG (T_{0IgG}), total protein [TP], albumin, and C-reactive protein concentrations, plasma D-dimer concentration, and hIVIG administered doses. Non-responders had more signs of mucosal bleeding (i.e., melena/epistaxis/haematuria) compared to responders (75% *vs* 31.6%, $P = 0.049$) and were older (median=125 months, range=77–163 *vs* median=98 months, range=11–179 months, $P = 0.0357$). Twenty-four±12 hr (T_{24}) post-hIVIG infusion, non-responders compared to responders had lower serum albumin (T_{24Alb}) (median=2.0 g/dL, range=1.5–2.5 *vs* median=2.5 g/dL, range=1.6–3.3; $P = 0.0063$), serum globulin (T_{24Glo}) (median=2.9 g/dL, range=2.0–3.8 *vs* median=4.1 g/dL, range=3.3–5.5; $P = 0.0008$), serum IgG (T_{24IgG}) (median=666.5 mg/dL, range=299–990 *vs* median=1374 mg/dL, range=723–1978; $P = 0.0003$), delta IgG (i.e. T_{24IgG}-T_{0IgG}; $T_{24\Delta IgG}$) (median=424 mg/dL, range=28–710 *vs* median=987 mg/dL, range=380–1652; $P = 0.0006$), and serum TP (T_{24TP}) (median=4.7 g/dL, range=3.6–6.3 *vs* median=6.5 g/dL, range=5.1–8.4; $P = 0.0011$). As expected, non-responders compared to responders had lower T_{60} platelet count (T_{60PLT}) (median=14,500/μL, range=8,000–35,000 *vs* median=136,000/μL, range=47,000–1,094,000; $P < 0.0001$) and delta platelet count (i.e., T_{60PLT}-T_{0PLT}; $T_{60\Delta PLT}$) (median= - 4500/μL, range= - 69,000-+23,000 *vs* median=118,000/μL, range=43,000–1,090,000; $P < 0.0001$). Fourteen-days post-hIVIG infusion, mortality was higher in non-responders compared to responders (75% *vs* 0%; $P = 0.001$). ROC curve analysis showed that a $T_{24\Delta IgG}$≥576 mg/dL had PPV=89.5%, NPV=75% in predict a positive response (AUC=0.928, 95%CI=0.759–0.991, $P < 0.0001$). Finally, there was a weak correlation between $T_{24\Delta IgG}$ and hIVIG administered doses, Rho=0.418, $P = 0.03$.

Short-term response to hIVIG infusion in dogs with IMT may occur regardless the dogs have pIMT, sIMT or ES. Older age, mucosal bleeding at admission or ongoing bleeding (decreased T_{24TP}/T_{24Glo}/T_{24Alb}) are poor prognostic indicators for response. Non-responders have increase short-term mortality. $T_{24\Delta IgG}$≥576 mg/dL can predict response to treatment, but only a weak positive correlation between $T_{24\Delta IgG}$ and hIVIG received dose is present.

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ESVIM-O-3
ROMIPLOSTIM TREATMENT IN 7 DOGS WITH IMMUNE-MEDIATED THROMBOCYTOPENIA.

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Pathophysiological mechanisms of immune-mediated thrombocytopenia (ITP) in humans and dogs are similar. Romiplostim has thrombopoietic effects due to the agonism at the thrombopoietin receptor (TPO-R). Romiplostim is utilized in humans for treatment of refractory ITP, however it has not been used in dogs thus far. Because of the similarity of ITP in humans and dogs it should be evaluated whether romiplostim can be used as a new therapeutic option in dogs with ITP that cannot be controlled by standard therapy.

From 10/2014 until 12/2015 7 dogs with refractory or recurring ITP were treated with romiplostim. Inclusion criteria were a diagnosis of primary or secondary ITP based on complete medical records, platelet counts < 150,000/μl and a positive platelet-bound antibody test. Primary ITP was only diagnosed, if there was no evidence of any cause, which might have triggered platelets' destruction. Discrimination of primary and secondary forms of ITP was based on a complete diagnostic work-up (complete blood count, blood smear evaluation, testing for erythrocyte agglutination, clinical chemistry, coagulation panel, diagnostic imaging, tests for infectious diseases, and immunological testing).

Primary and secondary ITP was diagnosed in 5 (2 of them Evans' syndrome) and 2 dogs (with *Ehrlicha canis* infection), respectively. All dogs were pretreated with prednisolone, mycophenolate mofetil, cyclosporine, and dexamethasone alone or in combination. Due to inadequate response or relapses, romiplostim was administered in addition (3–5 μg/kg, median (m) 4.7 μg/kg) subcutaneously. In 5 of 7 dogs, an increase in platelet counts was noted 3–6 days after the first romiplostim injection. One dog with primary ITP had an increase after 10 days and the second administration (10 μg/kg). Another dog with secondary ITP did not respond to 5 but to 13 μg/kg. This dog was lost to follow-up. One dog with a platelet count in the reference range was euthanized due to immune-mediated hemolytic anemia after 2.5 months. During the observation period (3–53 weeks, median 10.7) in 6 of 7 dogs the initially given dose could be reduced. None of the treated dogs developed any side effects. Concomitant therapy with other drugs was gradually reduced and halted in 4 of the dogs when the platelet count was stable. Interestingly, none of the 6 dogs relapsed during the observation period.

The results of this pilot study suggest that the human drug romiplostim may represent a novel therapeutic option in dogs with refractory ITP.

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ESVIM-O-4
BACTERIAL MICROBIOME IN THE NOSE OF HEALTHY DOGS AND IN DOGS WITH NASAL DISEASE.

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The role of bacterial communities in canine nasal disease has not been studied so far using next generation pyrosequencing methods. Aim of the study was to characterize the nasal microbiome of healthy dogs and compare it to that of dogs with nasal disease.

Nasal swabs were collected from healthy dogs (n = 23), dogs with malignant nasal neoplasia (n = 16), and dogs with chronic rhinitis (n = 8). Bacterial DNA was extracted and sequencing of the bacterial 16S rRNA gene was performed. Data were analyzed using Quantitative Insights Into Microbial Ecology (QIIME).

A total of 375 bacterial species out of 26 phyla were detected. In healthy dogs, *Moraxella* spp. were the most common species, followed by *Phyllobacterium* spp., *Cardiobacteriaceae*, and *Staphylococcus* spp. While *Moraxella* spp. were significantly decreased in diseased compared to healthy dogs ($P = 0.0045$), *Pasteurellaceae* were significantly increased ($P = 0.0012$). Shannon diversity index and analysis of similarities used on the unweighted UniFrac distance metric were significantly different when nasal microbial communities of healthy dogs were compared to those of dogs with nasal disease ($P = 0.027$).

The study shows that the canine nasal cavity is inhabitated by a highly species-rich bacterial community, and suggests differences between the nasal microbiome of healthy dogs and dogs with nasal disease.

Disclosures: No disclosures to report.

ESVIM-O-5
COMPARATIVE ANALYSIS OF THE RESPIRATORY MICROBIOTA OF HEALTHY DOGS AND DOGS WITH CANINE IDIOPATHIC PULMONARY FIBROSIS.

E. Roels, B. Taminiau, E. Darnis, F. Neveu, G. Daube, C. Clercx. University of Liège, Liège, Belgium

Canine idiopathic pulmonary fibrosis (CIPF) is a progressive parenchymal lung disease of unknown origin affecting mainly old West Highland white terriers (WHWTs). CIPF shares several clinical and pathologic features with human IPF. The use of next

generation sequencing technologies recently allowed to identify differences in the composition and diversity of the respiratory microbiota in human IPF. Increased bacterial burden in bronchoalveolar lavage fluid (BALF) of IPF patients was proved to predict decline in lung function and mortality, with *Heamophilus*, *Streptococcus*, *Neisseria*, and *Veillonella* spp. being more abundant in IPF cases. The objectives of the present work were to identify and characterize the microbiota present in the lower respiratory tract of healthy beagle dogs and healthy WHWTs compared with the microbiota of WHWTs affected with CIPF. For this purpose, BALF samples were obtained from 4 groups of dogs: young healthy research beagles (n = 6, median age 7.6 months), adult healthy research beagles (n = 6, 8.8 years), healthy client-owned old WHWTs (n = 5, 11.2 years) and client-owned WHWTs affected with CIPF (n = 7, 11.6 years). Metagenetic analysis were performed on V1-V3 hypervariable region of 16S rDNA after total bacterial DNA extraction from BAL specimens and sequencing on a MiSeq Illumina sequencer. Taxonomical assignation and microbiota community analysis were done with MOTHUR V1.35 with an OTU clustering distance of 0.03. Data analyses demonstrated that the same phyla predominated in all groups of dogs with *Proteobacteria*, *Firmicutes*, *Actinobacteria*, and *Bacteroidetes* being the most abundant in a descending order. Bacterial species richness was significantly higher and evenness significantly lower in WHWTs, either healthy or affected with CIPF, in comparison with beagles, while there was no difference between groups for bacterial diversity. Beyond the effect of the breed, impact of the living environment (house-holding vs. experimental kennel) might serve as an explanation for those differences observed between beagles and WHWTs. When comparing specifically CIPF WHWTs with healthy WHWTs, *Pasteurella*, *Conchiformibius* and *Bergeyella* spp. were found more abundant in CIPF dogs. Whether those alterations in the respiratory microbiota of CIPF dogs are a cause of a consequence of the disease remain to be elucidated. In conclusion, results of the present study demonstrate the existence of a core airways microbiota in dogs that might be influenced by the breed, the environment or the disease status. Further studies are needed to better understand whether alteration in the microbiota may take part in the pathogenesis or in the predisposition for CIPF.

Disclosures: No disclosures to report.

ESVIM-O-6
THE UTILITY OF ACUTE PHASE PROTEINS IN THE ASSESSMENT OF TREATMENT RESPONSE IN DOGS WITH BACTERIAL PNEUMONIA.

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Acute phase proteins (APPs) are sensitive markers of inflammation and serum C-reactive protein (CRP) has been shown to be a useful diagnostic biomarker in dogs with bacterial pneumonia (BP). In humans with pneumonia APPs have also great utility as follow-up biomarkers. In order to investigate the applicability of APPs as biomarkers of treatment response in dogs with BP, serum C-reactive protein (CRP), serum amyloid A (SAA) and haptoglobin (Hp) were followed simultaneously along with hematology, serum biochemistry, arterial blood gas analysis and thoracic radiographs during a natural course of BP (n = 19). 64 healthy dogs were included as controls. All measured APPs were initially significantly elevated in dogs with BP compared to healthy controls, but the magnitude of elevation was not connected to disease severity. CRP and SAA reflected well the recovery process and declined rapidly after initiation of therapy. Normalization of serum CRP was applied to guide the length of antibiotic therapy (therapy was stopped 5–7 days after CRP normalization) in 9/17 dogs surviving to discharge (median treatment length 21 days, IQR 19–29 days), whereas 8/17 dogs were treated according to conventional recommendations (median 35, IQR 29–48 respectively). When CRP was applied to guide antibiotic therapy, treatment length was significantly ($P = 0.015$) reduced without increasing the number of relapses. According to this study serum CRP and SAA may be used as biomarkers of treatment response and the normalization of serum CRP may be applied to guide the length of antibiotic therapy in dogs with BP.

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ESVIM-O-7
INVESTIGATION OF LARYNGEAL FUNCTION AND EFFECT OF SURGERY ON LARYNGEAL COLLAPSE IN DOGS WITH BRACHYCEPHALIC SYNDROME.

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Laryngeal collapse is commonly associated with brachycephalic syndrome (BS) and is suspected to be secondary to chronic upper airway obstruction. Although laryngeal collapse is suspected to be a consequence of the lack of rigidity of laryngeal cartilages (chondromalacia), the impact of possible laryngeal dysfunction (laryngeal paresis) has not yet been evaluated. Corrective surgical treatments mainly aim to improve airflow through the rima glottidis. However, the impact of laryngeal collapse on postoperative prognosis is still controversial.

The objectives of the present study were to investigate laryngeal function in anaesthetized dogs with BS using pharmacological stimulation doxapram hydrochloride (Dxp) during laryngoscopy and to investigate whether surgery can worsen laryngeal collapse.

Twenty-six dogs presented with BS were included. At diagnosis, respiratory clinical signs were assessed as well as the degree of laryngeal collapse before and after Dxp injection (1.1 mg/kg intravenously). One month after corrective surgery of the BS, respiratory clinical signs, and the degree of laryngeal collapse were re-evaluated. Respiratory clinical signs were scored (0 to 4) based on the frequency of snoring, inspiratory effort, exercise intolerance and syncope. Degree of laryngeal collapse (from 0 to 3) was assessed according to the classification described by Leonard (1960).

Wilcoxon signed rank test with continuity correction, and Fisher's exact test were used for statistical analysis.

Pugs were significantly more frequently presented with grade 2 or 3 laryngeal collapse ($P < 0.001$) compared to French bulldogs. While the larynx initially appeared paretic in all dogs, significant abduction of laryngeal cartilages could be observed in all dogs after Dxp injection. Moreover, there was a significant difference of the mean degree of laryngeal collapse before (1.64 [0–3]) and after (1.07 [0–3]) Dxp injection ($P < 0.001$) confirmed this observation.

While a significant clinical improvement was observed after surgery in the vast majority of dogs (mean respiratory clinical score (3.15 [1–4] before and 1.5 [0–4] after surgery), there was no significant difference of the mean degree of laryngeal collapse before (1.4 [0–3]) compared with after surgery (1.5 [0–3]). Laryngeal collapse improved, remained stable and worsened in 20% (n = 4), 60% (n = 12) and 20% (n = 4) of dogs respectively after surgery.

As a conclusion, 1) laryngeal collapse in brachycephalic dogs is not associated with absence of laryngeal abduction and 2) preoperative degree of laryngeal collapse should not be used as a criterion to discourage surgery for BS, because of the overall clinical improvement, even if laryngeal collapse may worsen in few dogs after surgery.

Disclosures: No disclosures to report.

ESVIM-O-8
COMPARISON OF SUBMAXIMAL EXERCISE TEST RESULTS AND LEVEL OF BRACHYCEPHALIC OBSTRUCTIVE AIRWAY SYNDROME IN THE ENGLISH BULLDOG.

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Brachycephalic obstructive airway syndrome (BOAS) is related to congenitally flattened facial and skull anatomy. BOAS causes

respiratory distress, heat and exercise intolerance, and gastrointestinal signs. The English Bulldog (EB) is one of the brachycephalic breeds with a high prevalence of BOAS. Currently, the severity of BOAS signs is subjectively assessed. To improve the welfare of brachycephalic breeds, an objective and easy-to-use tool is needed to help breeders to select healthier animals. Exercise tests, such as the 6-min walk test (distance walked measured) or the 1000-m walk test (time to complete measured), could be used to assess the level of BOAS, as exercise intolerance and impaired recovery are key features of BOAS.

This study evaluated the severity of signs and anatomic components of BOAS in a group of prospectively recruited young adult EBs (n = 28) and investigated how well the results of the 6-min walk test and the 1000-m walk test correlate with severity of BOAS. EBs with more severe BOAS walked a shorter distance, longer time and their recovery from exercise took longer than those with only mild signs of BOAS. Control dogs of different breeds (n = 10) performed the exercise tests significantly better than EBs. Body temperature rise during exercise was significantly higher in EBs than in controls. The results of this study support the use of exercise tests for objective evaluation of the level of BOAS.

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ESVIM-O-9

PHARMACOKINETICS OF CASPOFUNGIN IN HEALTHY CATS. J. Leshinsky[1], R. Norris[2], A.J. Mclachlan[3], V.R. Barrs[1]. [1]Faculty of Veterinary Science, School of Life and Environmental Sciences, Sydney, Australia, [2]SydPath, St Vincent's Hospital, Darlinghurst, Australia, [3]Faculty of Pharmacy and Centre for Education and Research on Ageing, University of sydney, Australia

Sino-orbital aspergillosis (SOA) is an invasive feline fungal infection with high mortality. Caspofungin, an echinocandin has been used to successfuly treat several cases. The study aim was to investigate caspofungin pharmacokinetics in healthy adult cats after a) single and b) multiple intravenous (IV) infusions.

In study a) caspofungin (1 mg/kg IV) was administed to 8 healthy cats over 1 h (Day 1). In study b) 6 cats received 1 m/kg caspofungin IV daily for an additional 6 days (Day 2–7). Blood was collected at 0, 0.5 h, 0.75 h, 1 h, 1.25 h, 1.5 h, 2 h, 3 h, 6 h, 9 h, 12 h and 24 h after drug administration (Day 1), before the next dose (Days 2–7), and 24 h after final dosing (Day 8). Plasma caspofungin levels were determined at each time point using a liquid chromatography - mass spectrometry assay validated in accordance with U.S. FDA Guidelines for industry, bioanalytical methods validation.

After a single IV dose mean maximum caspofungin concentration (C_{max}) was 13.65 ± 2.86 mg/ml, reached at 1.7 ± 1.8 h. Terminal elimination of half-life ($t_{1/2}$), caspofungin clearance (CL) and volume of distribution (V) were 15.8 ± 2.4 h, 4.1 ± 0.6 mL/h/kg, 0.90 ± 0.02 L/kg, respectively. After achieving steady-state, mean maximum concentration (Css_{max}) was 1.74 ± 0.27 mg/ml, reached after 3 days of dosing. The $t_{1/2}$ estimated after multiple dosing, clearance (CLss) and volume of distribution (Vss) were 14.5 ± 3.2 h, 3.16 ± 1.06 mL/h/kg, 0.06 ± 0.01 L/kg, respectively. The accumulation ratio was 1.39.

Mean plasma caspofungin concentrations were >1.0 mg/mL for the duration of the 24 h sampling period, which exceeds the minimum inhibitory concentration effective against most *Aspergillus* species. Caspofungin given at 1 mg/kg IV q 24 h is safe and likely to be effective for treating *Aspergillus* infections in cats.

Disclosures: No disclosures to report.

ESVIM-O-10

DETECTION OF ASPERGILLUS FUMIGATUS BY QUANTITATIVE POLYMERASE CHAIN REACTION ASSAYS IN THE BRONCHOALVEOLAR LAVAGE FLUID OF DOGS WITH EOSINOPHILIC BRONCHOPNEUMOPATHY.. M. Canonne-Guibert[1], E. Roels[1], F. Billen[1], I. Peters[2], C. Clercx[1]. [1]Faculty of Veterinary Medicine, University of Liegeacultu, Liège, Belgium, [2]TDDS Ltd., The Innovation Centre, University of Exeter, Exeter, UK

Eosinophilic bronchopneumopathy (EBP) is a canine respiratory disease characterized by eosinophilic infiltration of the lung and bronchial mucosa. Hypersensitivity reaction to aerosolized antigens is suspected to act in the pathogenesis of the disease, while the exact inciting antigens remain presently unidentified. In humans, *Aspergillus* spp. has been proposed as potential trigger for inflammatory/allergic bronchial disease. In dogs, the association between *Aspergillus* and canine inflammatory bronchopneumopathy has not yet been explored. The aim of the present study was to investigate by quantitative polymerase chain reaction (qPCR) the presence of *Aspergillus* spp. in bronchoalveolar lavage fluid (BALF) samples obtained from dogs affected with EBP, compared with healthy dogs and dogs with chronic bronchitis (CB). For this purpose, BALF samples collected from 23 dogs with EBP (mean age = 4.5 years), 14 healthy dogs (6.3 years), and 21 dogs with CB (7.2 years) were retrospectively included and two qPCR assays were used: *Aspergillus* spp. and *Aspergillus fumigatus*. qPCR results were expressed as Ct values; Ct value above 32.1 corresponding to very low DNA copy numbers. *Aspergillus* spp. qPCR yielded positive results in two EBP dogs (Ct = 34 and 33), 1 CB dog (Ct = 36) and one healthy dog (Ct = 33), while *Aspergillus fumigatus* qPCR was only positive in the same 2 EBP dogs (Ct = 32), but not in healthy and CB dogs. Results of the present study suggest that an association between *Aspergillus* and canine EBP is unlikely. However, absence of *Aspergillus* genetic material in BALF samples cannot definitively rule out the implication of this pathogen in the disease. Future studies should include investigation of serum *Aspergillus*-specific antibodies in order to definitively elucidate the role of *Aspergillus fumigatus* in canine EBP.

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ESVIM-O-11

PYREXIA IN CATS: A RETROSPECTIVE ANALYSIS OF DEMOGRAPHIC CHARACTERISTICS, DIAGNOSTIC INVESTIGATIONS, DIAGNOSIS AND INFLUENCE OF PRIOR TREATMENT IN 106 CASES. S. Spencer[1], I. Ramsey[2], S. Tasker[1]. [1]University of Bristol, Bristol, UK, [2]Small Animal Hospital, University of Glasgow, Glasgow, UK

There are no published studies identifying the causes of pyrexia in cats. The primary aim of this study was to describe the features and diagnoses of a population of cats referred with pyrexia. A secondary objective was to describe, and evaluate the utility of, diagnostic investigations performed. Finally, treatments before referral and their possible effect on reaching a diagnosis were assessed.

Clinical records of cats with pyrexia (>39.2ºC) documented at least twice (at the referring and/or referral practices) were retrospectively reviewed. Cases were assigned into the following disease categories based on diagnosis: infectious, inflammatory, immune-mediated, neoplastic, miscellaneous and no diagnosis (pyrexia of unknown origin, PUO). When more than one diagnosis was made in a case, the diagnosis deemed most likely to be the cause of the pyrexia was used for categorisation, or if unclear was attributed to 'miscellaneous'. Differences in signalment, peak temperature before referral, temperature at presentation, presence/severity of common haematological and serum biochemical abnormalities, and outcome were all evaluated between disease categories. Diagnostic investigations were classified as 'enabling', 'assisting' or 'not helpful' in achieving a diagnosis. Effect of treatment before referral was assessed for any association with temperature at presentation and ability to reach a diagnosis. Chi-squared tests were used for categorical data and Kruskall-Wallis testing for continuous data.

Infectious disease was most common category (41/106, 38.7%), with 22 cats having feline infectious peritonitis. Inflammatory conditions were found in 19/106 (17.9%), neoplasia in 13/106 (12.3%; including 6 cats with lymphoma), miscellaneous causes in 11/106 (10.4%) and immune-mediated disease in 6/106 cats (5.7%). Despite often extensive diagnostic investigations, 16/106 (15.0%) had PUO. Pedigree versus non-pedigree status ($P = 0.019$) and age ($P = 0.003$) differed significantly between disease categories, as did outcome ($P = 0.019$), but PUO was not associated with a worse outcome than other categories ($P = 0.46$). Cytology (including

fluid analysis) and histopathology most often 'enabled' or 'assisted' in reaching a diagnosis. Most cats (91/106, 85.8%) received treatment before referral; antimicrobials were administered in 82.1% of cases. Non-steroidal anti-inflammatory administration was significantly associated with a lower temperature at presentation ($P = 0.010$). Ability to reach a diagnosis was not associated with treatment before referral ($P = 0.99$).

This is the first study of the causes of pyrexia in cats and shows that, in contrast to dogs, infectious diseases are most common and immune-mediated disease is comparatively rare. PUO was not associated with a worse outcome, in agreement with human reports.

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ST works for the Molecular Diagnostic Unit, Langford Veterinary Services, University of Bristol, which carried out the haemoplasma PCRs described in the study.
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No statement of disclosure for SS.

ESVIM-O-12
EVALUATION OF FREE MAGNESIUM CONCENTRATION AS A PROGNOSTIC FACTOR FOR MORTALITY IN DOGS PRESENTED TO A VETERINARY EMERGENCY SERVICE.
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Serum magnesium exists in free, protein-bound and complexed fractions; the sum per unit volume is described by the total magnesium concentration (t[Mg^{++}]), but its relationship with free magnesium concentration (f[Mg^{++}]) has not been described in dogs. Abnormalities in t[Mg^{++}] have been associated with prolonged hospitalisation and decreased survival in dogs, but it remains unclear whether magnesium measurements offer prognostic value beyond that of validated tools, such as the acute patient physiologic and laboratory evaluation (APPLE) score.

The aims of this study were to determine the relationship between f[Mg^{++}] and t[Mg^{++}] in dogs presented to a veterinary emergency centre, and to explore any association between f[Mg^{++}] and survival.

Dogs were included in the study if blood was obtained at initial presentation for immediate measurement of plasma f[Mg^{++}], using an ion-selective electrode. In a subset of dogs, serum samples were obtained contemporaneously for measurement of t[Mg^{++}]: these were separated from the cell pellet within two hours, frozen at -20°C and analysed as a single batch with an ILab 600 analyser, using an enzymatic reaction method. The primary outcome was survival to discharge, and the APPLE-fast score (incorporating glucose, albumin and lactate concentrations, mentation and platelet count) was calculated for each dog at initial presentation. Correlation between plasma f[Mg^{++}] and serum t[Mg^{++}] was assessed with Spearman's rho coefficient. Association between f[Mg^{++}] and survival was evaluated by logistic regression, with survival to discharge as the dependent variable and APPLE-fast score as a fixed factor. Classification, Hosmer-Lemeshow goodness of fit (H-M) and area under receiver operator characteristic curve (AUROC) were calculated with and without inclusion of f[Mg^{++}] in the final model. The study received approval from an ethical review committee.

Plasma f[Mg^{++}] was measured in 152 dogs, with serum t[Mg^{++}] measured in 33. There was significant correlation between f[Mg^{++}] and t[Mg^{++}] (Spearman's rho 0.491, $P < 0.001$). The APPLE-fast score was significantly associated with survival to discharge (odds ratio 1.101, 95% confidence interval 1.030–1.178, $P = 0.005$), but f[Mg^{++}] was not associated with survival when entered into this model ($P = 0.440$). Inclusion of f[Mg^{++}] resulted in similar model parameters (classification 68.4%, H-M 0.195, AUROC 0.705), compared to the model containing only the APPLE-fast score (classification 70.4%, H-M 0.103, AUROC 0.693).

Plasma f[Mg^{++}] was easily measured in dogs and correlated well with serum t[Mg^{++}]. Measurement of f[Mg^{++}] did not improve the ability to predict outcome in dogs in an emergency setting when considered alongside the APPLE-fast score.

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ESVONC – European Society of Veterinary Oncology

ESVONC-O-1
BIG DATA: PRESENTATION AND TREATMENT OF COMPANION ANIMAL NEOPLASIA IN UK FIRST OPINION PRACTICE.
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Neoplasia is a common cause for presentation of companion animals to veterinary surgeons in the UK. However, there are few national statistics characterizing either the presentation, or the management of neoplasia in companion animal general practice. We used electronic health records (EHR) gathered from UK small animal practices through the Small Animal Veterinary Surveillance Network (SAVSNET). These were used to characterize the frequency of presentation for neoplasia, common tumour locations and treatments pursued in cats and dogs.

EHR collected between November 2013 and October 2015 included animal signalment and results from a short questionnaire presented to veterinary surgeons after ~20% of consultations where neoplasia had been identified as the main reason for presentation. Proportions and confidence intervals (95%) were calculated using robust standard errors to allow for clustering within the veterinary practice.

EHRs were obtained from 381,876 unique animals (245,696 dogs and 115,079 cats) from 159 veterinary practices (366 sites). The proportion of dogs that attended veterinary practices for at least one neoplasia-related consultation (mean: 4.3%, 95% CI: 4.2%-4.4%) was h\def\mybox{\vrule depth -0.5mm height 4mm width 8mm}igher than the proportion of cats (2.4%, 95% CI: 2.3%-2.5%). For both dogs and cats neutered animals were more frequently presented for neoplasia than entire animals.

In total, 3,694 neoplasia questionnaires (2,733 dogs, 730 cats) were collected. In dogs, skin and subcutaneous tissues were the most commonly presented tumour locations (49.0 and 24.0% respectively), whilst in cats it was skin (33.0%) followed by intraabdominal (21.4%). The most common time to present an animal for neoplasia was within one month in 52.6% of dogs and 39.3% of cats, however, 8.3% of dogs and 8.8% of cats were presented having had the tumour for greater than one year. Treatment was planned in 53.4% of dogs and 48.5% of cats that presented for a

neoplastic condition, although in ~26.0% of dogs and cats the decision to treat was not determined at the time of consultation. The most common treatment planned was surgery in dogs (57.8%) and analgesia / anti-inflammatory in cats (39.8%); mainly performed in general practice. Only 2.2% of canine patients and 1.1% of feline patients were referred for treatment of neoplasia.

These results demonstrate that SAVSNET is a powerful tool for collection of epidemiological data regarding neoplasia in small animals attending UK veterinary practices. Big data sets will help in establishing outcomes of patients treated in general practice and provide information to accelerate and revolutionize our understanding of companion animal neoplasia.

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ESVONC-O-2
IMPACT OF PRE-CHEMOTHERAPY NEUTROPHIL COUNT ON CHEMOTHERAPY ADMINISTRATION AND TOXICITY.

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Complete blood counts (CBCs) are routinely assessed prior to administration of chemotherapy in dogs in an effort to minimize clinical illness. Neutrophil criteria ("cutoffs") that suggest it is safe to administer chemotherapy are arbitrary and vary across clinicians. Chemotherapy dose intensity is theoretically important for maximal tumour response, suggesting determination of an optimal neutrophil "cutoff"is also important. Similarly, arbitrary guidelines are utilized for the administration of prophylactic antibiotics for neutropenic dogs. The primary objective of this study was to evaluate the impact of various pre-treatment absolute neutrophil count (ANC) "cutoffs"on chemotherapy administration and to determine if there was an association between pre-treatment ANC and incidence and severity of toxicity. The secondary objective was to evaluate a currently utilized neutrophil criteria algorithm used to guide the prescription of prophylactic antibiotics in afebrile, clinically well, neutropenic dogs.

Six hundred-fifteen CBCs from 64 dogs that presented for standardized multidrug chemotherapy following a diagnosis of high-grade lymphoma were evaluated and stratified according to their ANC. ANC classes included <1.5 x 10^9/L, 1.5–2.0 x 10^9/L, 2.0–2.5 x 10^9/L, and 2.5–3.0 x 10^9/L. The number of events in which chemotherapy would not have been administered due to an ANC value below each "cutoff"was determined. Chemotherapy-related toxicities were graded per standardized criteria and Mann-Whitney tests were performed to determine the presence of an association between pre-treatment ANC class and toxicity. To address the secondary objective, afebrile, clinically well, neutropenic dogs with ANC <1.5 x 10^9/L but above the clinic's criteria for prophylactic antibiotics were evaluated.

Of the 615 CBCs evaluated, chemotherapy would not have been administered in 6.0% (N = 38), 8.6% (N = 54), and 13.6% (N = 85) of visits with an ANC "cutoff"of 1.5 x 10^9/L, 2.0 x 10^9/L, and 2.5 x 10^9/L, respectively. There was no association between pre-treatment ANC class and grade or likelihood of toxicity. When dogs with ANCs <1.5 x 10^9/L in which prophylactic antibiotics were not dispensed were considered separately, all dogs with ANC 0.75–1.0 x 10^9/L (N = 6) and with ANC 1.0–1.5 x 10^9/L (N = 22) recovered spontaneously without medical intervention.

As expected, a pre-treatment ANC "cutoff"of 1.5 x 10^9/L was associated with a lower number of dogs requiring dose delays and importantly, pre-treatment ANC was not associated with an increased likelihood of toxicity. Preliminary evaluation suggests that establishing an ANC "cutoff"near 0.75 x 10^9/L in which to prescribe prophylactic antibiotics may be clinically rational.

Disclosures: No disclosures to report.

ESVONC-O-3
ALTERNATIVE LENGTHENING OF TELOMERES IS USED AS TELOMERE MAINTENANCE MECHANISM IN VARIOUS CANINE SARCOMAS.

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Besides activation of telomerase tumor cells use alternative lengthening of telomeres (ALT) as telomere maintenance mechanism (TMM) to become immortal. ALT is found more often in human mesenchymal than epithelial tumors. Canine tumors are not characterized for ALT yet and the aim of this study was to evaluate this TMM in various canine sarcoma subtypes.

Sixty-four canine sarcoma samples (20 snap-frozen, 44 FFPE) and six canine sarcoma cell lines were screened for ALT by C-circle assay. Telomere length was assessed via qPCR and telomere restriction-fragments including pulsed-field electrophoresis. ALT-associated mutations were evaluated by immunohistochemistry. Telomerase activity (TA) and gene expression were analyzed by TRAP and qPCR. Eight human sarcoma cell lines and DNA from 20 human neuroblastomas were used as comparative controls.

ALT was found in 9.4% (6/64) of canine sarcomas including aggressive subtypes as hemangiosarcoma, osteosarcoma and histiocytic sarcoma. In selected samples further characteristics of ALT such as long heterogeneous telomeres, loss of ATRX, elevated p53 expression and a high level of colocalization of DAXX with telomeres were demonstrated. TA was detected in 93% (14/15) snap-frozen samples. Both TMMs coexisted in one histiocytic sarcoma, but both were absent in one hemangiosarcoma. All sarcoma cell lines were TA-positive and ALT-negative.

Canine sarcomas seem to share many similarities with their human counterparts and appear attractive for comparative telomere research. As in humans, ALT might have a higher prevalence in aggressive canine sarcoma subtypes. Overall, besides TA also ALT has to be considered as a potential target for therapeutic approaches.

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ESVONC-O-4
DOSE ESCALATION STUDY TO EVALUATE SAFETY, TOLERABILITY AND EFFICACY OF INTRAVENOUS ETOPOSIDE PHOSPHATE ADMINISTRATION (ETOPOPHOS®) IN 27 DOGS WITH MULTICENTRIC LYMPHOMA.

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Etoposide (VP-16), a semisynthetic derivative of podophyllotoxine, is a cytotoxic chemotherapy drug mediated by inhibition of topoisomerase II. Etoposide is widely used in various humans' solid and hematopoietic cancers but little data is available concerning its potential antitumor efficacy in dogs. Previous studies on canine lymphoma treated with intravenous administration of etoposide showed a minimal therapeutic effect associated with hematologic toxicity and severe acute hypersensitivity reactions probably associated with the vehicle (polysorbate-80) used for the parenteral formulation. The objectives of this dose-escalation clinical trial are to assess the safety, the tolerability and the efficacy of intravenous etoposide phosphate (ETOPOPHOS®) in dogs with multicentric lymphoma. ETOPOPHOS® is an etoposide preparation which does not contain polysorbate-80. This IV formulation is expected to be more likely tolerate in dogs.

Twenty-seven owned-dogs with stage III-V multicentric lymphomas were enrolled. Signalments, clinical findings, histology, complete staging results and responses to treatment were recorded. Seven dose levels were evaluated to determine the recommended dose: 35 mg/m^2 (n = 3), 42 mg/m^2 (n = 5), 50 mg/m^2 (n = 4), 60 mg/m^2 (n = 3), 75 mg/m^2 (n = 4), 100 mg/m^2 (n = 6) and 120 mg/m^2 (n = 2). The protocol consisted of three cycles of

etoposide phosphate (ETOPOPHOS®) IV injections every 2 weeks, with a 3-hour injection once daily on 3 consecutive days. Adverse effects were graded according to the Veterinary Cooperative Oncology Group criteria. A complete end-staging was realized 60 days after inclusion (D60).

At dose levels 35, 42, 50, 60, and 75 mg/m^2 a minimal therapeutic effect was observed (n = 19, 6PR at D60). In 6 dogs treated with dose level 100 mg/m^2, 4 dogs achieved a PR and 1 dog a CR at D60 (ORR = 83%). In dogs treated with dose levels under 120 mg/m^2, the main adverse event observed in 8 dogs was a reversible gastrointestinal toxicity (grade 1 to 3), and myelotoxicity was rare (grade 1 to 3 in 4 dogs). A grade 4 neutropenia was reported in only one dog at dose level 42 mg/m^2. In 2 dogs treated at dose level 120 mg/m^2, severe gastrointestinal toxicities (grade 4) and severe myelotoxicities (grade 4 neutropenia) were reported. No dogs had acute hypersensitivity reactions during the study.

The recommended dose of etoposide phosphate (ETOPOPHOS®) in dogs is 100 mg/m^2 with an ORR of 83% (5/6). Only a moderate reversible gastrointestinal toxicity, no severe myelotoxicity and no hypersensitivity reaction was reported at this dose level.

Disclosures: This study was conducted by Oncovet Clinical Research (OCR) as part of a collaborative research project between OCR and Pierre Fabre Medicament.

ESVONC-O-5

CASE-CONTROL STUDY OF CHEMOTHERAPY FOR THE TREATMENT OF CANINE MESOTHELIOMAS: 16 CASES. G.M.M. Chamel[1], D. Sayag[1], F. Floch[2], I. Bublot[1], I. Goy-Thollot[1], C. Fournel-Fleury[1], F. Ponce[1]. [1]VetAgro Sup, Marcy l'étoile, France, [2]Oncovet, Villeneuve-d'ascq, France

Mesotheliomas are rare tumors in dogs known to induce effusions in cœlomic cavities. Neoplastic tissue biopsy is often difficult to obtain and, even if cytological diagnosis can be straightforward in some cases, it can be challenging in others. Therefore, diagnosis of mesothelioma is complicated. Only a few cases are described in the literature and no study assesses in a case-control manner the efficiency of surgery, radiation therapy or chemotherapy.

The aim of this retrospective case-control study was to evaluate the efficiency of chemotherapy.

Dogs with a cytological and/or histological diagnosis of mesothelioma were collected in the medical database. Dogs that were treated with intravenous (IV) and/or intracavitary (IC) chemotherapy were included in Group 1 and dogs that did not received cytotoxic treatment in Group 2. Signalment, type and duration of clinical signs, anatomic location of the mesothelioma, results of staging procedures, cytological and/or histological examinations and type of treatment (surgery, chemotherapy) were collected for all dogs. Follow-up data were obtained from the medical records or from telephone interview of the owners or referring veterinarians. Progression-free survival (PFS) defined as time between diagnosis and evidence of disease progression or death was calculated for all dogs. PFS functions were estimated using the Kaplan Meier method and were compared between groups using the log rank test.

Sixteen dogs were included in the study between March 2004 and December 2014. There was 8 pleural, 5 pericardial, 2 peritoneal and 1 concomitant pleural and pericardial mesotheliomas. There was no significant difference of age, weight and sex ratio between the two groups. Ten dogs were treated with various chemotherapy protocols, 9 of which received both IV (carboplatin (7), doxorubicin (7) mitoxantrone (1) and mitomycin C (1)) and IC chemotherapy (carboplatin (5), cisplatin (4)). Chemotherapy administration was associated with a significantly higher PFS (Median PFS 353 (range 100–656) vs 48 days (range 0–151); $P = 0.001$). Six dogs also underwent a pericardiectomy.

This study is showing for the first time that dogs with mesothelioma could benefit from cytotoxic chemotherapy. However a larger prospective study using a standardized chemotherapy protocol, applied to specific anatomic forms of the disease is warranted to confirm this finding.

Disclosures: No disclosures to report.

ESVONC-O-6

COMBINATION TARGETING OF PI3 KINASE AND MTOR FOR TREATMENT OF CANINE MELANOMA. J. Smich, J. Morrison, A.J. Mutsaers. Ontario Veterinary College, University of Guelph, Guelph, Canada

Canine malignant melanoma is an aggressive neoplasm that is highly metastatic and resistant to conventional chemotherapy treatment. Previous work has demonstrated that canine melanoma cell lines may contain activated AKT and mTOR pathways, as well as sensitivity to mTOR inhibitors, such as rapamycin. The aim of this study was to assess combination treatment using dual inhibition of PI3k and mTOR and compare results to that achieved with inhibition of each pathway individually. Five established primary canine melanoma cell lines were grown in monolayer culture in vitro under standard conditions. Cell lines were derived from a canine primary oral melanoma, primary cutaneous melanoma, metastatic lymph node, or subcutaneous metastasis. Cells were treated with PI3k inhibitor LY294002, mTOR inhibitor rapamycin, or dual inhibitor GSK2126458 for 24 -72 hours. Cell viability was assessed using resazurin dye, with absorbance read on a spectrophotometer. Western blot was used to evaluate drug treatment impact on pathway components, including phosphorylated and total AKT, mTOR, and p70S6K. A dose-dependent decrease in cell viability was observed in all cell lines. Dual inhibition of PI3k and mTOR with GSK2126458 was more potent in pathway target inhibition and resulted in lower cell viability IC50 values than either of the other drugs tested. Dual inhibition of PI3k and mTOR may be more efficacious than single pathway targeting in canine melanoma cells. Future studies will assess the potential for this targeted strategy to sensitize the chemotherapy response in this notoriously treatment resistant tumour type.

Disclosures: No disclosures to report.

ESVCN – European Society of Veterinary Clinical Nutrition

ESVCN-O-1

HOW DOES THE NUTRITIONAL ASSESSMENT OF DOGS VARY IN A VETERINARY STAFF?. P. Scarpa, C. Palestrini, S.P. Marelli, M. Giraldi, M. Ghiringhelli, M. Raja, E. Fusi. University of Milan, Milano, Italy

The nutritional status of the patient is usually evaluated recording the body weight (BW) and assessing body condition score (BCS) and muscle condition score (MCS). Because differences in scoring could exist among trained and untrained veterinary personnel, the aim of the study was to assess the reproducibility of these scoring techniques between different operators in dogs.

Seventy-five adult dogs (30 Boxers; 16 English Cocker Spaniel; 22 Golden Retriever; 7 Labrador Retriever) were weighted and blinded assessed for BCS and MCS by five different evaluators (i.e. internist, nutritionist, behaviorist, vet student and dog show judge), according to the official nutritional guidelines. In particular, BCS scoring was evaluated using a 9-points scale, while the MCS scoring considered the visual examination and the palpation of the muscle over the temporal bones, scapulae, ribs, lumbar vertebrae and pelvic bones. Chi-square test was performed and statistical significance of the analysis was set at $P < 0.05$. The agreement between the different operators scoring was evaluated by Cohen's kappa.

Chi-square test performed between the five evaluators' assessments was significant ($P < 0.001$). The Cohen's kappa obtained estimating the BCS scoring showed a fair to moderate agreement between the evaluators (kappa = 0.2–0.48). In particular, the higher concordance was detected between the student and the internist (kappa = 0.45) compared with the others. Considering MCS, the kappa agreement of the evaluations was in the range of 0.19–0.55. The best agreement was between the nutritionist and the judge. English cocker spaniel was the most difficult breed to be evaluated, showing the worst level of concordance between the evaluators.

These data confirm the difficulties in obtaining a unique nutritional evaluation. This lack in concordance could be due to the different practice area in which the evaluators were mainly involved. So caution should be taken into consideration of BCS and MCS scoring, when more practitioners are involved in the

clinical management of the dogs. In order to reduce this limit, an adequate training could be performed involving all the staff.

Disclosures: No disclosures to report.

ESVCN-O-2
THE BODY FAT INDEX CHART IS EQUIVALENT TO DEXA FOR DETERMINATION OF PERCENT BODY FAT DURING WEIGHT LOSS AND WEIGHT MAINTENANCE IN DOGS.

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More than 53% of dogs in the United States are considered overweight or obese. Many pet owners are unsuccessful in reducing their pet's body weight. A critical component of a successful weight loss regimen is a good estimate of body composition as the starting point to calculate an appropriate food amount for weight loss. The newly developed method called the Body Fat Index (BFI) differentiates between levels of obesity and establishes a link between the BFI and an ideal body weight. Dual-Energy X-ray Absorptiometry (DEXA) provides the most accurate way of measuring percent body fat; however, it is not readily available to the general practitioner. The current study compares percent body fat determined from the BFI chart and DEXA scan for a group of obese dogs during weight loss and weight maintenance fed a food formulated for helping dogs achieve a healthy weight containing 8.2 g protein, 3.4 g fat, 5.7 g insoluble fiber, 0.9 g soluble fiber, and 11 mg L-carnitine per 100 kilocalories. The protocol and procedures were approved by the institutional animal care and use committee.

Thirteen obese dogs were fed for weight loss until they achieved their ideal body weight (IBW), followed by a 6-month weight maintenance phase. All dogs were group housed to allow for socialization and had access to outdoor runs. Three animal care technicians independently determined the BFI for each dog once per month; an average BFI was calculated. The BFI Chart included images and descriptors that were used to determine the dog's percent body fat. The dogs underwent a monthly DEXA scan during the weight loss phase and every two months during the weight maintenance phase.

Including the entire study population, the values for percent body fat determined by BFI and DEXA were strongly correlated ($r = 0.81$). For dogs between ages 1 and 5, the correlation was stronger ($r = 0.94$) than for dogs ≥6y of age ($r = 0.76$). The BFI slightly underestimated the percent body fat in older dogs. Older dogs have a higher percent body fat at their IBW compared to younger dogs at their IBW.

The purpose of this study was to evaluate the usefulness of the new BFI Risk Chart to repeatedly estimate percent body fat in overweight dogs during weight loss and during a period of stable, normal body weight. The results show that the new method is an excellent tool for the determination of body fat and practical to use in the veterinary clinic.

Disclosures: Disclosures to report.
Presenter and co-authors are employees of Hill's Pet Nutrition, Inc. The body fat index chart used in this study was developed by Hill's Pet Nutrition.

ESVCN-O-3
BIOCHEMICAL PARAMETERS RELATED TO THE METABOLIC SYNDROME IN HEALTHY DOGS AND THEIR RELATIONSHIPS WITH BODY CONDITION SCORE.

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The concept of « metabolic syndrome » (MS) gathers all pathophysiological changes that derive from excess body fat in humans. Obese dogs share some components of the MS, such as hypercholesterolemia, hypertriglyceridemia and insulin resistance. However, unlike people, dogs seem to be resistant to obesity-related diseases like atherosclerosis or type-II diabetes mellitus. Elucidating the effects of body composition on lipid metabolism and glucose homeostasis in dogs may allow better understanding of the MS. The aim of this study was to investigate, in healthy dogs, potential associations between body conditions score (BCS) and biochemical parameters involved in the MS.

Data from 534 dogs were retrieved as part of the European LUPA project, and included 419 males (15 Boxer, 125 Belgian Shepherd dog, 35 Cavalier King Charles Spaniel, 40 Dachshund, 39 Doberman, 45 Finnish Lapphund, 66 German Shepherd dog, and 52 Labrador retriever) and 115 females (73 Labrador retriever and 44 Newfoundland). Ages ranged from 2 to 6 years old. Dogs were weighed, a BCS was assigned (using a 1-to-9 scale), and those over 7 or under 2 were excluded. Dogs were considered as healthy based on history, physical examination, CBC, biochemistry, and complete cardiovascular work-up. Circulating concentrations of cholesterol, free fatty acids (FFA), triglycerides, C-reactive protein (CRP), insulin, glucose, fructosamine, cortisol and aldosterone were measured. Spearman's correlations with a Bonferroni-corrected *P*-value (0.0007) were computed between all variables, both in the overall group and within breeds. A Mann-Whitney test was used to compare dogs categorised into "lean" (BCS<or=5) and "overweight" (BCS>5), and ANCOVA was used to test the effect of breed along with the BCS.

Taking all dogs into account, BCS was positively correlated with cholesterol, triglycerides and fructosamine, cholesterol with triglycerides and fructosamine, FFA with triglycerides, insulin with CRP and glucose, and fructosamine with cortisol and glucose. Aldosterone was correlated negatively with age and positively with triglycerides and cortisol. Some of these correlations were also observed when testing within breeds. The "overweight" group had significantly higher cholesterol, FFA, triglycerides, fructosamine and aldosterone, and were significantly older than the "lean" group. An effect of BCS persisted on cholesterol, insulin and age despite correction for the different breeds.

Metabolic changes occur in association with overweight body condition in otherwise healthy dogs, although breed effects also contribute. Further characterisation of the interactions between body fat deposition and glucose and lipid metabolism may provide insights into canine obesity-related metabolic disturbances.

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ESVCN-O-4
CLINICOPATHOLOGICAL FINDINGS IN OBESE DOGS BEFORE AND AFTER WEIGHT LOSS: A COHORT STUDY.

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Obesity is a common medical disorder in dogs, and can predispose to a number of other diseases. However, information is limited as to the clinicopathological changes that can be seen as a result of obesity and subsequent weight loss, as well as whether such changes could predict outcomes of a weight management regime.
100 client-owned dogs were included in this observational cohort study. Dogs underwent a controlled weight loss programme using a purpose-formulated diet. Routine haematology, serum biochemistry and urinalysis were performed before and after weight loss. Associations between clinicopathological findings and various outcomes were assessed.

69 of the dogs successfully reached their target weight (based on post-weight loss assessment by dual-energy X-ray absorptiometry), and 31 dogs stopped the programme prematurely, 8 of which were euthanased for an unrelated disease. In the dogs reaching target weight, leucocytes ($P < 0.001$), lymphocytes ($P = 0.007$), monocytes ($P < 0.001$), albumin ($P < 0.001$), ALP ($P < 0.001$), calcium ($P < 0.001$), creatinine ($P = 0.039$), cholesterol ($P < 0.001$), and total protein ($P < 0.001$) all decreased during the weight loss regime, whereas urea concentration increased ($P = 0.039$). Further, the magnitude of changes in cholesterol (Kendall's tau -0.23, $P = 0.009$), and albumin (Kendall's tau -0.31, $P < 0.001$) were negatively associated with percentage of weight lost (i.e. the more weight lost the greater the decrease). Finally, pre-weight-loss glucose concentration was greater ($P < 0.001$) whilst sodium ($P = 0.039$) and creatinine ($P = 0.027$) concentrations were less in

dogs failing to reach their target weight than in dogs that were subsequently successful in their weight loss.

Whilst many clinicopathological parameters change as a result of controlled weight loss in obese dogs, the clinical significance of this is unknown. Further work is required to determine whether pre-weight-loss glucose concentration could be used to predict the outcome of a weight programme.

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ESVCN-O-5

EFFECTIVENESS OF A NEW DIETETIC FOOD TO ACHIEVE WEIGHT LOSS AND TO IMPROVE MOBILITY IN CLIENT-OWNED OBESE DOGS WITH OSTEOARTHRITIS.

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Excessive body weight contributes to the severity of clinical signs in dogs with osteoarthritis. The purpose of this study was to determine the effectiveness of a new dietetic food (NDF)* to achieve weight loss and to improve mobility in obese/overweight client-owned dogs with osteoarthritis. The objectives were 1) to evaluate weight loss parameters and 2) to assess clinical signs related to osteoarthritis in dogs fed the NDF. Thirty-eight dogs were enrolled in the study. Initial and follow-up evaluations (monthly for 6 months) included determination of body weight, body condition score (BCS), body fat index (BFI), and evaluation of osteoarthritis-related parameters as assessed by the veterinarian (lameness, weight bearing, pain on joint palpation) and the owner (difficulty rising, aggression, reluctance to walk and to play, inactivity). Begging behaviour, faecal score and acceptance of food were also evaluated. Initial veterinary consultation consisted of physical examination, nutritional assessment, determination of ideal body weight (IBW), development of weight-loss feeding guidelines (DER = 70 x $IBW_{kg}^{0.75}$), and explanation of the assessments performed. Statistical analysis comprised scatterplots, regression analysis, summary statistics, Friedman's chi-square test, and a mixed model ANOVA to assess changes over time (statistical significance $P < 0.05$). Eighty nine percent of the dogs lost weight (n = 34) with an average weight loss of 12.6% (SEM, 1.3%) over 6 months and an average weekly weight-loss rate of 0.5% (SEM, 0.04%) of starting body weight. The mean duration of weight loss was 174 days (SD, 36 days) with an average of 33 days (SD, 13 days) between rechecks. BCS and BFI in the dogs that lost weight were significantly lower compared with baseline in months 2–6 of the study. Difficulty rising and reluctance to play improved significantly compared with baseline starting at month 2 of the study whereas reluctance to walk and inactivity improved significantly compared with baseline starting at month 3 of the study. Similarly, lameness, weight bearing, and pain on palpation improved significantly compared with baseline starting in month 3 of the study. Faecal scores were unaffected and begging was significantly lower in months 3 and 4 compared with baseline. In conclusion, this clinical study confirmed the effectiveness of the NDF* in achieving weight loss and improvement of clinical signs related to osteoarthritis in overweight/obese client-owned dogs. Owners and veterinarians reported significant improvements in dog's weight and mobility without negative side effects.

* Hill's[TRADEMARK] Prescription Diet[TRADEMARK] Metabolic + Mobility Canine, dry (caloric distribution: protein=27%, fat=37%, carbohydrate=36%)

Disclosures: Disclosures to report.

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ESVCN-O-6

EARLY ORAL VOLUNTARY NUTRITION IN ANOREXIC CRITICAL ILL DOGS: A RETROSPECTIVE STUDY IN 137 DOGS.

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Critically ill dogs are characterized by marked variations in energy requirement. The aim of this study was to evaluate retrospectively the effect of early oral voluntary nutrition on mortality and length of hospitalization in anorexic dogs with SIRS.

Medical records of anorexic dogs admitted with criteria of SIRS (Hauptman, 1997) at Ospedale Veterinario Gregorio VII and OVUD of University of Teramo, between January 2012 and August 2014 were reviewed. The severity of anorexia was defined by the time of on-set and duration of anorexia prior to presentation (mild < 24 hour, moderate 24–72 hours, severe anorexia > 72 hours).

Medical treatment for SIRS was instituted depending on the underlying disease and mainly consisted of fluid-therapy support, analgesia, antibiotics; anti-thrombotic therapy and blood or plasma transfusion when required. Antiemetic therapy (maropitant, 1 mg/Kg q 24 h SC and metoclopramide 1.1 -2.2 mg/Kg q 24 h CRI) was given to each anorexic dog independently by the concurrent presence of vomiting. Nutritional requirement was calculated by Basal Metabolic Rate (BMR - 97 x $BW_{kg}^{0.655}$-); recovery diet (Royal Canine) or a/d (Hill's) was given via oral voluntary or friendly eating. The partial parenteral nutrition (0.70 x BMR) was given in each dog with severe anorexia. Chi squared test was utilized for statistical analysis of categorical data, and Mann Whitney test for independent non parametric data (MedCal).

One-hundred-thirty-seven dogs were included, fourteen (10%) were mildly anorexic, 34 (25%) moderately anorexic and 89 (65%) severely anorexic. Fifty-six dogs (41%) were diagnosed with acute gastroenteritis, 11 (8%), with septic peritonitis, 10 (7%) with pyometra, and 7 (5%) with acute pancreatitis. Forty-six dogs (34%) started eating voluntarily within 72 hours from admission, 30 dogs (40%) 72 hours after admission, and 61 dogs (44%) never ate food voluntarily. Fifty-nine dogs (43%) died: 57 dogs (42%) never resumed eating, and two dogs (1%) started eating after 72 hours from admission. Significant difference in mortality rate was found between severe anorexic group and moderate anorexic group ($P = 0.0095$). No significant differences were found in mortality rate and in length of hospitalization among different disease processes. Statistically significant difference was observed in length of hospitalization between dogs that gained voluntary eating within 72 hours (5 ± 2 days) and after 72 hours (8 ± 3 days) after admission ($P = 0.001$).

In conclusion, early oral voluntary nutrition in anorexic dogs with SIRS is associated with a lower mortality rate and shorter length of hospitalization.

Disclosures: No disclosures to report.

ISCAID – International Society for Companion Animal Infectious Diseases

ISCAID-P-1

FREQUENCY AND CLINICAL, HEMATOLOGICAL AND BIOCHEMICAL FINDINGS OF FELINE IMMUNODEFICIENCY VIRUS (FIV) AND FELINE LEUKEMIA VIRUS (FELV) IN CATS, IN TURKEY.

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University of Istanbul, Avcilar, Istanbul, Turkey, [3]Cevre Analysis Laboratories, Tatli Pinar sokak, Mart Plaza, Kat-2, Kagithane, Istanbul, Turkey

The aim of this study was to investigate the frequency of Feline Immunodefiency Virus (FIV) and Feline Leukemia Virus (FeLV) in cats in Istanbul, Turkey and to evaluate the relationship between clinical and laboratory findings. For this, 169 cats submitted to veterinary clinics in Istanbul were analysed by ELISA. Antibodies to FIV were detected in 19 cats (%11) and FeLV antigen in 2 cats (%1). Blood samples of 169 cats were also analysed for hematology and biochemistry. FIV and FeLV were detected mostly in male cats and were between 2–7 years old. In addition, WBC count, BUN and Urea were high in both FIV positive cats while lymphocyte count, hemoglobin and hematocrit value were found to be low. In conclusion, FIV infection is still affecting cats health in Turkey. it would be good to analyse the FIV and FeLV positive cats for hematology and biochemistry to understand the status and prognosis of the diseases.

Disclosures: No disclosures to report.

ISCAID-P-2
LUNGWORM OCCURRENCE IN DOGS AND CATS IN ROME: A RETROSPECTIVE STUDY (JULY 2010–MARCH 2016).

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Lungworm infection is a potentially life-threatening parasitic infections in dogs and cats and might represent an underestimated disease in urban and suburban areas.

The aim of this study was to report the occurrence of lungworm infection in dogs and cats belonging to urban and suburban areas of Rome presented to Ospedale Veterinario Gregorio VII between July 2010 and March 2016.

Twenty cats, nineteen DSH cat and one Siamese cat, with a mean age of 2.8 months (1.5–8 months) were included; twelve cats were male. All cats were stray cats. Main clinical signs were coughing (9) and dyspnea (7); three cast were asymptomatic. Fourteen cats had radiological examination characterized by mild (5), moderate (2) or severe (7). a mixed broncho-alveolar-interstitial pattern. All cats but three had positive Baermann result with identification of *Aelurostrongylus abstrusus*. All cats received fenbendazole 50 mg/kg for 3 weeks and fully recovered.

Twenty-one dogs with a mean age of 45.5 months (2–156 months) were included; thirteen dogs were intact male. Three dogs were mixed-breed dog the others belonged to different breeds. Only 6 dogs had a history of risk exposure. Main duration of clinical signs was 10.6 days (1–30 days) with coughing (12 dogs) and dyspnea (7) the main symptoms. Three dogs had only neurological signs. Eight dogs had a mean hematocrit of 22.6% (15.3–30.1%) and concurrent disseminated intravascular coagulation. All dogs but one had thoracic radiographs characterized by a diffuse moderate (2) or severe (18) mixed alveolar-bronchial-interstitial pattern. Thirteen dogs had positive Baermann result, two of them tested positive for *Angiostrongylus vasorum* (IDEXX Angio-detect-test) and one negative; overall, nine dogs were tested for *Angiostrongylus v.* and eight tested positive; two dogs with negative fecal result were diagnosed post mortem with lung mixed infection and disseminated *Aelurostrongylus a.* infection respectively. One dog was diagnosed on BAL and one on lung cytology. Five dogs died; the others recovered. Therapy, other than fenbendazole 50 mg/kg for 3 weeks, depended on the clinical status.

Lungworm infection might be an underestimated disease in urban and suburban areas and should be considered in the differential diagnosis of dogs and cats presenting with respiratory disease. Limitation of this study was is retrospective view and that not all dogs with positive Baermann had lungworm infection typing; the small number of dogs tested for *Angiostrongylus v.* was due to the late introduction of the in-clinic test. Cats of uncertain provenance should be routinely screened.

Disclosures: No disclosures to report.

ISCAID-P-3
THE CONSTITUENT PROFILE OF TRANS-TRACHEAL WASH FLUID IN COMPLICATED AND NON-COMPLICATED RESPIRATORY FORM OF CANINE DISTEMPER INFECTED DOGS.

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Canine distemper (CD) is a highly contagious in young non-vaccinated dogs. The symptoms vary among respiratory, gastrointestinal, dermatologic, ophthalmic or neurological signs and these symptoms are often exaggerated by secondary infections. This study was designed to analyze the various components of transtracheal wash (TTW) of CD infected dogs For this purpose 25 dogs: 12 apparently healthy dogs and 13 CD infected dogs diagnosed by immune-chromatographic assay on ocular and nasal discharges (The Canine Distemper Ag Test Kit). All dogs were submitted to cytological, biochemical and microbiological examinations of TTW as well as hematological examination. CD infected dogs were sub-grouped into complicated and non-complicated groups. Hematological findings of non-complicated group revealed insignificant lymphopenia with significant monocytosis. Regarding complicated group, the hematological constituent showed regenerative anemia, leukocytosis, neutrophilia and monocytosis. Microscopical examination of blood smear in both groups showed canine distemper inclusion bodies inside neutrophils and red blood corpuscles which is characteristic for canine distemper. Concerning the cytological findings of TTW of complicated and non-complicated dogs, the results revealed significant decrease of alveolar macrophages, lymphocyte and epithelial cells with significant increase in reactive macrophages and degenerated neutrophils. Total nucleated cell count showed significant increase only in complicated CD infected dogs. Intra-cellular bacteria, *Pnuemocystis carinii and Toxoplasma gondii* were noticed microscopically in stained cytological preparation of complicated CD group. Biochemically, complicated CD group showed significant increase of corrected alkaline phosphatase (ALP) and phosphorous with significant increase of matrix metallo-proteinase-2 (MMP2) and total gelatinases while MMP9 showed significant decrease. Non-complicated CD group showed significant increase of corrected ALP only with significant increase MMP2, complex-form gelatinases and total gelatinases while MMP9 showed significant decrease.Bacterial isolates from complicated CD group were *Pseudomonas aeruginosa*, *Citrobacter spp., Escherichia coli* and Beta-hemolytic *streptococcus spp*.

Keywords: TTW, MMP, cytological analysis, canine distemper.

Disclosures: No disclosures to report.

ISCAID-P-5
A DESCRIPTIVE STUDY OF CLINICAL CANINE LEISHMANIOSIS IN DOGS VACCINATED WITH CANILEISH.

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A vaccine against canine leishmaniosis was launched in some European Countries in 2011. Since then, veterinarians practicing in Spain, an endemic focus of canine leishmaniosis, have sporadically diagnosed clinical leishmaniosis in dogs previously vaccinated. The aim of this descriptive retrospective study was to define and evaluate clinicopathological findings in dogs with canine leishmaniosis previously vaccinated with CaniLeish. An active search for clinical cases from several veterinary hospitals in Spain was carried out. Sixteen sick dogs with clinical signs and/or clinicopathological abnormalities compatible with leishmaniosis and diagnosed based on visualization of *Leishmania* amastigotes by cytological evaluation, histopathological evaluation ± immunohistochemistry or molecular techniques were included. Clinical records as well as laboratory or imaging reports were thoroughly evaluated and information was gathered. The clinical presentation of all the dogs diagnosed with clinical leishmaniosis occurred between September 2012 and February 2016. Age ranged from one to 9 years with a median of 3.5 years. The majority of dogs (n = 13, 81%) were pure bred with 85% (n = 11) belonging to large breeds such as the Boxer or Labrador and only 15% (n = 2)

to small breeds (Yorkshire Terrier and French Bull dog). Three large mixed-breed dogs (19%) were also diagnosed. Interestingly, males ($n = 11$, 69%) were more frequently diagnosed than females ($n = 5$, 31%). The most common clinicopathological findings were ulcerative or nodular cutaneous lesions, lymphadenomegaly, lameness, mild to moderate non-regenerative anemia, hypergammaglobulinemia, proteinuria and renal azotemia. Serology based on immunofluorescence or quantitative ELISA at the time of diagnosis was positive in all dogs with the exception of one dog, which was negative. Most dogs received a full vaccination protocol, although in some cases, vaccine was not administered in the same veterinary center where clinical leishmaniosis was diagnosed. Dogs were apparently healthy at the time of vaccination and most of them were considered seronegative based on a rapid serological test. Interestingly, the majority of dogs were diagnosed with clinical leishmaniosis prior to the first annual revaccination. The mean ± standard deviation of time between vaccination and appearance of clinical illness was 7 ± 3 months with a range of 2 and 12 months. In conclusion, this study describes, for the first time, clinicopathological data in dogs with leishmaniosis after vaccination. Moreover, the majority of dogs were diagnosed few months after vaccination highlighting the importance of the use of accurate screening diagnostic tests prior to vaccination in dogs living in endemic areas.

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ISCAID-P-6
TYPING OF FELINE CORONAVIRUS BIOTYPES IN CATS WITH FEVER OF UNKNOWN ORIGIN. C. Leutenegger, M. Estrada, N. Sanders, M. Seguin. IDEXX Laboratories, Inc., West Sacramento, USA

Fever of unknown origin (FUO) is an early non-specific sign of different etiologies including infectious disease. The list of differential diagnoses for FUO is extensive. To rule infectious causes in or out, broad panels of blood-borne agents including feline coronavirus (FCoV) are a useful tools and have gained attraction in recent years.

Conversion from the benign biotype (FECV) to the virulent biotype (FIPV) of FCoV is believed to occur through spike gene fusion peptide mutations. These changes in the viral genome perturb cell tropism provoking systemic spread and ultimately leading to the clinical manifestation of fatal FIP.

A study aimed to determine the frequency of 15 infectious agents found 39 (8.6%) FCoV in the whole blood of 454 cats with FUO using real-time PCR. Despite low viral load, spike gene fusion peptide based genotyping was achieved in 12 isolates (30.8%). The FIPV associated fusion peptide mutation L1058M was found in 9 isolates whereas 3 cases were determined as wildtype FECV.

Clinical follow-up of the 12 genotyped cases was successful in 10 (8 FIPV and 2 FECV cases). The 8 FIPV case reviews showed quick clinical detoriation despite empirial therapy attempts and euthanasia of all cases within an average of 9.6 days (2 to 27 days). Two of the 3 FECV cases could be followed up; one case was euthanized within 6 days with high clinical suspision of FIP, the second case euthanized after 2 months and 5 days with respiratory distress and polylymphadenopathy.

This study suggests to consider systemically circulating FCoV detectable in whole blood of FUO cats to be an early indicator of progression to FIP.

Disclosures: Disclosures to report: The authors are employees of IDEXX Laboratories.

ISCAID-P-7
SEROPREVALENCE OF ANTIBODIES TO TICK-BORNE ENCEPHALITIS VIRUS IN 433 DOGS WITH NEUROLOGICAL SIGNS. D. Breu, J. Guthardt, E. Mueller. Laboklin, Bad kissingen, Germany

Tick-borne encephalitis is a zoonotic disease transmitted by ticks. The causative agent is tick-borne encephalitis virus (TBEV), a member of the genus Flavivirus. Since no anti-TBEV canine vaccine is available, seropositivity of dogs indicates natural exposures to Flavivirus. Dogs have served as sentinels in identifying the risk areas for humans of the natural Flavivirus foci and the seroprevalences in healthy dogs were shown to fluctuate from 0–30% depending on areas. Dogs may be resistant to developing clinical signs but clinical cases are often fatal. Our study had two aims: (i) assess the TBEV-seroprevalence in dogs showing neurological signs and its relationship with regard to gender, age and breed, (ii) evaluate the possible concordance of TBEV-seroprevalence and the specific areas suspected of Flavivirus foci in accordance with the RKI (Robert-Koch Institute, Berlin, Germany) classification of 'risk counties'. Between 2013 and 2015, we analysed 433 blood samples obtained from dogs with various unspecified neurological signs suspected of TBEV-infection. The majority of the samples came from Germany (299), Austria (54), Czech Republic (33), Sweden (15), Switzerland (12), and Norway (10). IgG-antibodies to TBEV were assayed using a commercially available ELISA. Based on the Antibody-titre results, dogs could be classified as follows: Ab-positive (>126 U/ml): 48/433 (11.1%), 'borderline range' (≥63 ≤ 126 U/ml): 20/433 (4.6%), and Ab-negative (<63 U/ml): 365/433 (84.3%). By breed with ≥10 dogs, Ab-positive dogs were in the following decreasing order: Golden Retrievers, Labrador Retrievers, Yorkshire Terriers, Mongrels, and Bernese Mountain Dogs. No gender-dependency could be detected. The median age of the Ab-positive dogs was 6.5 (1–13) years. 28/299 (9.4%) dogs from Germany were Ab-positive and 27/28 (96.4%) came from risk areas (Bavaria, Baden-Wuerttemberg, Hesse, Thuringia, and Saarland). Dogs from other countries presented the following Ab-positivity; Austria: 14/54 (26%), Czech Republic: 4/33 (12.1%), Norway: 1/10 (10%) and Switzerland: 0/12 (0%). Our present study showed that (i) Retrievers were the predominant breeds with respect to TBEV-seropositivity and (ii) a high concordance was confirmed between seropositive dogs with neurological signs and the TBEV-risk areas in Germany as defined by the classification of the RKI. Our data also suggested that, although seroprevalence could be low, TBE should be considered a potentially useful differential diagnosis in dogs with neurological signs when the dog has a history of travelling or living in risk areas and, in that case, the serological diagnosis should be confirmed by a paired sample, taken two weeks apart.

Disclosures: Disclosures to report: The authors Breu D and Guthardt J are employed at Laboklin GmbH & Co KG, Germany. Mueller, is owner/manager of the Laboklin GmbH & Co KG, Germany.

ISCAID-P-8
PREVALENCE AND PHYLOGENETIC ANALYSIS OF FELINE MORBILLIVIRUS IN CATS IN ISTANBUL, TURKEY. H. Yilmaz[1], B.K. Tekelioglu[2], A. Gurel[1], E. Altan Tarakci[1], U. Cizmecigil[4], O. Erdogan Bamac[1], G. Yuzbasioglu Ozturk[1], O. Aydin[1], C. Helps[3], J. Richt[4], N. Turan[1]. [1]University of Istanbul, Veterinary Faculty, Istanbul, Turkey, [2]University of Cukurova, Veterinary Faculty, Dept of Virology, Adana, Turkey, [3]University of Bristol, School of Veterinary Science, Bristol, UK, [4]Kansas State University, College of Veterinary Medicine, Kansas, USA

Feline morbillivirus (FmoPV) recently gained importance since it is considered to be associated with tubule-interstitial nephritis and chronic kidney disease in cats. This study was performed to investigate the frequency, histo-pathology and phylogeny of feline morbillivirus (FmoPV) in cats in Istanbul, Turkey. Cats were clinically examined, the presence of FmoPV-RNA was determined ($n = 95$ unhealthy and $n = 15$ dead), histopathology performed and FmoPV phylogenetic analysis were undertaken. FmoPV RNA was detected by RT-PCR in six cats (5.4%), three were unhealthy and three had died. The tissues of the three dead cats were also positive by immuno-histochemistry for the antibody to N protein of FmoPV. Phylogenetic analysis of the 6 FmoPV positive cats showed that the strains were grouped into Cluster D and had high similarity (98.5–100%) with FmoPV strains from Japan (AB924120; AB910309) and Germany (KR269601, KR269600).

In the three FmoPV-RNA positive cats, signs of the respiratory, urinary and digestive system were observed as well as weight loss, fever and depression in some cats. In FmoPV-RNA positive

unhealthy 3 cats, proteinuria, bilirubinuria, nitrituria, glucosuria in one cat, bacteriauria and residue in the urine of all cats were found. On histopathology of FmoPV-RNA positive dead cats, tubulo-interstitial nephritis that was characterised by severe granular and vacuolar degeneration in the epithelial cells of the cortical and medullary tubules as well as mononuclear cell infiltrates. Widespread lymphoid cell infiltrates were observed both in the renal cortex and medullary regions of the kidneys. Cellular infiltration, cholangio-hepatitis and focal necrosis in the liver were also found.

In conclusion, this is the first study which shows the presence of feline morbillivirus infection in cats in Turkey. Sick cats particularly the ones with kidney disease should be tested for this virus. The genotypes found in this study was similar to previously reported strains indicating that circulating morbilliviruses in Turkey are conserved.

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ISCAID-P-9

BACTERIAL MICROBIOME IN THE NOSE OF HEALTHY CATS AND IN CATS WITH NASAL DISEASE. E.S. Dorn[1], B. Tress[1], J. Suchodolski[2], K. Weber[1], K. Hartmann[1], B. Schulz[1]. [1]LMU University of Munich, Munich, Germany, [2]College of Veterinary Medicine and Biomedical Sciences, Texas A&M University, College Station, USA

Microbial populations in the feline nose have not been assessed using sequencing of bacterial 16S rRNA genes so far. Aim of the study was to describe the nasal microbiome of healthy cats and cats with nasal disease. Furthermore, the influence of signalement and environment were investigated.

Bacterial DNA was extracted from nasal swabs of healthy cats ($n = 28$), cats with nasal neoplasia ($n = 16$), and cats with feline upper respiratory tract disease (FURTD) ($n = 18$) and used for pyrosequencing of the 16S rRNA gene. Data analysis was performed using Quantitative Insights Into Microbial Ecology (QIIME). A total of 375 bacterial species out of 24 phyla were identified. In all groups, *Moraxella* spp. was the most common species, followed by *Pasteurella* spp. in cats with FURTD.

Shannon diversity index and analysis of similarities used on the unweighted UniFrac distance matrix were significantly different when nasal microbial communities of healthy cats were compared for age ($P = 0.002$) and indoor/outdoor status ($P = 0.001$).

The study demonstrates that the feline nose is inhabited by variable and diverse microbial communities, and suggests differences between the nasal microbiome of healthy cats depending on age and indoor/outdoor status.

Disclosures: No disclosures to report.

ISCAID-P-11

NATURAL INFECTION WITH ANGIOSTRONGYLUS VASORUM IN 23 DOGS IN BERLIN/BRANDENBURG – A RETROSPECTIVE CASE SERIES (2013–2016). D.J. Dorn[1], E. Huisinga[2], B. Kohn[1]. [1]Freie Universität Berlin, Berlin, Germany, [2]IDEXX Laboratories, Ludwigsburg, Germany

Angiostrongylus (A.) vasorum is a mainly gastropode (slugs, snails) borne disease with a nematode classified in the superfamily Metastrongyloidae being the causative agent. The life cycle of this emerging parasite accounts for various clinical signs. In Germany *A. vasorum* infections have mainly been reported in the southern and western parts of Germany. However *A. vasorum* infection was detected in 11 out of 122 red foxes from Brandenburg. They are the suggested reservoir hosts in this area.

The aim of this study was to provide further insights on this parasite and its occurrence in the Berlin/Brandenburg area: clinical signs, laboratory and radiographical changes, as well as treatment and outcome.

Medical records of dogs diagnosed with *A. vasorum* were evaluated retrospectively. The inclusion criterion was a diagnosis of *A. vasorum* infection based on detection of larvae in fecal samples (8), in tracheal wash fluid (6) and/or via antigen testing (IDEXX, Angio Detectтм) in serum (15).

In 23 dogs consisting of 19 different breeds and 3 crossbreed dogs angiostrongylosis was diagnosed. The median age was 4 years (range 0.5 to 11), 15 dogs were male and 8 female. Twenty of 23 dogs came from Berlin. Eight of 14 dogs with a known travel history had never left Germany. The most common signs on admission were cough (48%), tachypnea/dyspnea (30%), vomitus (17%) and neurological signs (17%). Hematological changes included leukocytosis (70%), eosinophilia (78%), neutrophilia (65%), monocytosis (65%), thrombocytopenia (30%) and anemia (26%). Biochemistry abnormalities were hyperproteinemia (50%), hypoalbuminemia (57%), azotemia (20%), and hypercalcemia (14%). Four of 8 dogs had a prolonged activated partial thromboplastin time. Thoracic radiographic abnormalities were detected in 15 dogs (65%).

Twenty-two dogs were treated with moxidectin, 1 dog received fenbendazol in addition. One dog was treated with fenbendazol only. Additional medication included prednisolone (6), theophylline (8) and antimicrobial therapy (8). Eight dogs needed hospitalization. Two dogs died after admission (during anesthesia; due to progressing neurological signs and bleeding diathesis). Nineteen dogs recovered, 2 were lost to follow-up. Median time of anthelmintic treatment was 4 weeks (range 3 to 16).

A. vasorum infection is an emerging disease and should be considered as important differential diagnosis for various clinical signs in the Berlin/Brandenburg area.

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ISCAID-P-12

SINGLE AND MIXED FELINE LUNGWORM INFECTIONS: CLINICAL, RADIOGRAPHIC AND THERAPEUTIC FEATURES OF TWENTY-SIX CASES (2013–2015). P.E. Crisi, G. Aste, D. Traversa, A. di Cesare, E. Febo, M. Vignoli, D. Santori, A. Luciani, A. Boari. University of Teramo, Teramo, Italy

The aim of study was to describe retrospectively clinical, radiographic and therapeutic features in cats from Italy diagnosed with lungworm infections.

In 2013–2015, twenty-six cats infected by lungworms at the Veterinary Teaching Hospital of the University of Teramo underwent to physical examination, laboratory analysis, thoracic radiography and fecal examination. Parasites elements were identified by floatation and Baermann-Wetzel methods and all results were confirmed by PCR. All animals were treated with different anthelmintics and followed-up every 2 weeks until recovery. All cats (13 males, 13 females), with median age of 24.9 months (2–132), lived or were allowed to roam outdoor. Infections by *Aelurostrongylus abstrusus* ($n = 15$), *Troglostrongylus brevior* ($n = 3$) and *Capillaria aerophila* ($n = 1$) and co-infections by *T. brevior*/*A. abstrusus* ($n = 6$) and *T. brevior*/*C. aerophila* ($n = 1$) were diagnosed. All cats harboring *T. brevior* ($n = 10$) had less than four months. Respiratory signs recorded were coughing ($n = 12$), increased vesicular sounds ($n = 10$), dyspnoea ($n = 9$), tachypnoea ($n = 6$), abdominal breathing ($n = 5$), oculo-nasal discharge ($n = 5$), sneezing ($n = 4$), wheezing ($n = 2$) and crackles ($n = 1$). One cat was asymptomatic. Haematobiochemical abnormalities were anemia ($n = 7$), neutrophilia ($n = 7$), eosinopenia ($n = 2$), eosinophilia ($n = 1$) and monocytosis ($n = 1$). Radiographic features were interstitial ($n = 24$), bronchial ($n = 21$), alveolar ($n = 10$) and vascular ($n = 2$) patterns. Twenty-five cats showed a complete recovery within 2–6 weeks, while one kitten died few days after the diagnosis. Cats infected by *A. abstrusus*, after a 3-day course of oral fenbendazole ($n = 3$) or one ($n = 4$), two ($n = 7$) or three ($n = 1$) topical moxidectin two weeks apart, recovered within 14–42 days. Animals with troglostrongylosis recovered in 14–42 days after a single administration of moxidectin ($n = 2$) or emodepside ($n = 1$). Cats with co-infection by *T. brevior*/*A. abstrusus* received single topical emodepside ($n = 1$), single oral milbemycin oxime ($n = 2$), or two ($n = 2$), three ($n = 1$) administrations of moxidectin. Five cats were healthy in 14–42 days, while one, treated with milbemycin oxime, died after an acute onset of dyspnoea. Two cats infected by *C. aerophila* and *T.brevior*/*C. aerophila* received a single

administration of eprinomectin and emodepside, respectively, and they were healthy after two weeks.

Lungworms should always be included in the differential diagnoses in cats living in endemic areas and presenting respiratory and radiographic signs and copromicroscopic examinations should be considered as first step. As radiographic changes may be evident before the onset of clinical signs, radiographic examinations are mandatory if lungworms are suspected. In fact, in most cases, a timely therapy guarantees the recovery, being various compounds effective against felid lungworms.

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ISCAID-P-13

EVALUATION OF A POINT OF CARE RAPID IGM DETECTION TEST (WITNESS® LEPTO) FOR DIAGNOSIS OF CANINE LEPTOSPIROSIS. H. Hapke[1], J. Lizer[2], M. Grahlmann[1], B. Kohn[1]. [1]Small Animal Clinic, Faculty Veterinary Medicine, Freie Universität of Berlin, Berlin, Germany, [2]Zoetis Veterinary Medicine Research and Development, Kalamazoo, USA

The purpose of this investigation was to evaluate the diagnostic sensitivity and specificity of a point of care lateral flow test (WITNESS® Lepto, Zoetis) that detects IgM to *Leptospira*, using well-characterized canine sera archived at the Freie Universität Berlin. The test requires 5 µL of serum, plasma, or whole blood, and a result is obtained in 10 minutes.

A total of 187 samples collected from 122 dogs in four different groups were tested: (i) 37 dogs with acute clinical leptospirosis confirmed by one or more of the following: acute MAT serology (titer of ≥1:800 for non-vaccine serovars), convalescent MAT serology, blood PCR, urine PCR. Convalescent sera from nine of these dogs, collected approximately two weeks after the acute sample, were also tested; (ii) 15 dogs with clinical signs compatible with leptospirosis but a different final diagnosis; (iii) 45 healthy dogs, and (iv) 25 recently vaccinated dogs sampled 0, 4, and 12 weeks post-vaccination (wpv), with six animals also tested at 26 wpv.

The WITNESS test detected 28 of 37 infected animals (Group 1; 75.7%) while only 9/37 (24.3%) had high diagnostic titers on acute MAT. Of the 9 false negative samples on the WITNESS test, only 1 had a high diagnostic acute MAT titer. Seroconversion in the Group 1 convalescent samples was evident as all nine were WITNESS-positive, compared 5 of the 9 that were WITNESS-positive with the acute sample. All Group 2 and 44/45 (97.8%) Group 3 dogs were negative on WITNESS. In this population of dogs, the WITNESS diagnostic sensitivity and specificity were therefore 75.7% (95% CI 60.3–87.2%) and 98.3% (92.5–99.8%), respectively. The WITNESS test did also detect vaccine-generated IgM for up to 12 wpv. After an initial rapid increase in positive tests −16/25 (64%) by 4 wpv-only 6/25 (24%) remained positive 12 wpv and these dogs returned to negative WITNESS status by 26 wpv.

In conclusion, WITNESS® Lepto is a reliable test for the diagnosis of acute leptospirosis and is capable of detecting IgM ealier than MAT. A negative result should be interpreted as leptospirosis-negative, however if suspicion remains, confirmatory testing is necessary. A positive test is indicative of leptospirosis but must be considered within the context of clinical presentation and the timing of the most recent Leptospira vaccination.

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ISCAID-P-14

NOSOCOMIAL FAECAL COLONIZATION BY EXTENDED-SPECTRUM β-LACTAMASE PRODUCER GRAM-NEGATIVE BACTERIA IN HEALTHY DOGS. A. Belas, J. Correia, C. Marques, A. Reisinho, N. Couto, R. Bessa, L. Telo Da Gama, C. Pomba. Faculty of Veterinary Medicine – CIISA, Lisboa, Portugal

The aim of this study were to detect and quantify the presence of β-lactamase producing Gram-negative bacteria resistant to third generation cephalosporins (3CG) in the intestinal tract of dogs treated surgically and to identify the possible risks factors responsible for the colonization and for the increased bacterial quantification.

Fecal samples were collected at the Veterinary Teaching Hospital (VTH) from the Faculty of Veterinary Medicine – University of Lisbon between January and July 2014. Two groups of dogs were enrolled: 1. dogs submitted to surgical procedures (surgery group); 2. dogs living in close contact with the hospital/hospital staff (environmental control group). 3CG-resistant bacteria were isolated and quantified from MacConkey plates containing 2 µg/µl of cefotaxime. Susceptibility testing was performed by disk diffusion method according to CLSI guidelines. ESBL/*p*AmpC genes were detected by PCR. Potential risk factors for ESBL/pAmpC-producing bacteria faecal carriage were obtained through a questionnaire to the owner regarding age, gender, cohabitation with other animals, antimicrobial treatment within the last year, hospitalisation, resident (dogs from hospital staff, veterinary medicine students and kennel). For the environmental control group it was also considered: contact time (years) and frequency of contact with the hospital. Data were analysed by logistic regression models from SAS software. The results were considered statistically significant $P \geq 0.05$.

Fecal samples were collected from 43 dogs belonging to the environmental control group (C1ca) and 25 dogs from the surgery group: on admission to the hospital before surgery (C1cx, $n = 25$) and after surgery (C2cx, $n = 22$). The number of dogs colonized with 3CG-resistant isolates was significantly higher in C2cx (73%, $n = 16/22$) comparing to C1cx ($P = 0.007$) and C1ca ($P = 0.017$). The bacteria number were significantly higher in C2cx then in C1cx ($P = 0.004$) and C1ca group ($P < 0.0001$), and in C1ca group when compared to C1cx ($P = 0.0006$). The resident risk factor was the only one significant ($P = 0.030$) for the increased number of colonized animals in C2cx, and the contact time with VTH was a significant ($P = 0.001$) risk factor for the increased bacterial quantification. In both groups, *Escherichia coli* was the most prevalent 3CG-resistant bacteria and *bla*CTX-M was the most frequent β-lactamase identified (C1ca group $n = 3$, C1cx $n = 1$ and C2cx $n = 6$). The pAmpC genes were only detected in C1ca group where two *bla*CMY-producing *E.coli* were isolated.

This study enhances the importance of nosocomial colonization, infection control systems and judicious antimicrobial therapy in order to improve animal health and safeguard Public Health.

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SCH – Society of Comparative Hepatology

SCH-P-1

REAL-TIME ASSESSMENT OF CANINE LIVER FUNCTION: VARIATION OF TRANSCUTANEOUSLY DETERMINED INDOCYANINE GREEN PLASMA DISAPPEARANCE RATE (ICG-PDR) IN HEALTHY DOGS. A.P. Grobelna[1], F. Restitutti[1], I. Kallio-Kujala[1], J. Honkavaara[1], S.G. Sakka[2], T. Spillmann[1]. [1]University of Helsinki, Helsinki, Finland, [2]University of Witten/Herdecke, Cologne-Merheim Medical Center (CMMC), Witten, Germany

Indocyanine green (ICG) is a fluorescent dye exclusively eliminated by the liver into the bile. ICG clearance determination has been used successfully to evaluate hepatic function in laboratory dogs. However, it has rarely been used in clinical setting as the analysis of the serum ICG concentration requires an advanced laboratory technique (high performance liquid chromatography). Our recent study in healthy Beagle dogs revealed a good correlation ($r^2 = 0.81$) between ICG clearance and a transcutaneous method determining the ICG plasma disappearance rate (ICG-PDR in %/min) with a near infrared spectroscopy probe placed on the tail (http://www.sciencedirect.com/science/article/pii/S1090023315004645). In human medicine, the main indication for measuring ICG-PDR has been the prognostic assessment of liver failure and liver

transplantation. The present study evaluated the day-to-day variation of ICG-PDR in healthy Beagle dogs to assess the repeatability of the test.

We studied six healthy laboratory Beagle dogs undergoing ICG-PDR testing on three consecutive days, in standardized conditions. ICG was given intravenously (0.5 mg/kg) and ICG-PDR was determined by using the PulsioFlex monitoring platform with the LiMon module probe (Pulsion, Munich, Germany). Daily ICG-PDR values from all dogs were compared and the coefficient of intrasubject variation (%CV) was calculated. Mean ICG-PDR was 7.8 ± 3.4%/min on day one, 8.8 ± 3.7%/min on day two, and 7.9 ± 2.6%/min on day three. There was no significant difference between the days and the mean ICG-PDR was similar to previously reported data (7.79 ± 3.3%/min). However, the mean %CV of ICG-PDR was very high (35.9 ± 16.8%) with the ighest individual %CV being 52.5%. In this limited number of animals, repeatability of transcutaneous ICG-PDR in its current form was rather poor. It seems unlikely that the test method will be useful for the repeated assessment of mild to moderate changes in canine liver function. However, future studies are warranted to assess the prognostic value of ICG-PDR for canine patients with severe acute or chronic end stage liver failure comparable to its current indication in human medicine.

Disclosures: Employee/Salary – Agnieszka Grobelna is an employee of the University of Helsinki from January 2016 until December 2016. Ira Kallio-Kujala is working at a private veterinary clicic at Evidensia Finland. Flavia Restitutti was an employee of the University of Helsinki from May 2009 until May 2011. During the years of 2013 and 2014 she worked as sole trader. Since April 2016 she is an ECVAA resident at the Veterinärmedizinische Universität Wien. Thomas Spillmann was Hill's professor of small animal clinical nutrition at the Veterinary University, Hannover, Germany from 2004–2005. Since 2005 he has been employed as professor of small animal internal medicine at the Veterinary Faculty, University of Helsinki, Finland. Samir Sakka is a professor for Anesthesiology and Intensive Care Medicine of the University of Witten/Herdecke at the Medical Centre Cologne-Merheim. He is Head of the Interdisciplinary operative Intensive Care Unit. Juhana Honkavaara is presently employed as a hospital veterinarian at the Veterinary Faculty, University of Helsinki, Finland. Grants/Research – Agnieszka Grobelna has received grants from the Finnish Veterinary Foundation, Finnish Foundation of Veterinary Research, ANIWEL and Doctoral Programme in Clinical Veterinary Medicine. Flavia Restitutti has received grants from the Finnish Veterinary Foundation and Finnish Foundation of Veterinary Research. Thomas Spillmann has received research grants from the German Research Society, the Finnish Foundation of Veterinary Research, and the Finnish Veterinary Foundation. His PhD students received grants from the Doctoral Program – Clinical Veterinary Sciences, University of Helsinki, Finland; the Center of International Mobility (CIMO)/Finland; the Finnish Foundation of Veterinary Research; the Finnish Veterinary Foundation; the Finnish Culture Foundation; the Emil Aaltonen Foundation/Finland; the Alfred Kordelin Foundation/Finland; Agria/Sweden; the Swedish Kennel Club Research Foundation; the Ulla Yard Foundation/Sweden; Ciencia Sem Fronteiras/Brazil; and the Archimedes Foundation/Estonia. Samir Sakka has received research grants from the German Research Society and the German Ministry for Education and Research (Bundesministerium für Bildung und Forschung, BMBF). Juhana Honkavaara has received research grants from the Finnish Foundation of Veterinary Research, the Finnish Veterinary Foundation, Winn Feline Foundation and the Morris Animal Fund.

Speaking & consultancies: Thomas Spillmann has been a consultant for IPSAT, Finland. He has given lectures on behalf of Royal Canin, Hill's, Iams, Purina, Triolab/Finland, zoetis/Finland, the Finnish Association of Veterinary Practitioners, the German Small Animal Veterinary Association, the British Small Animal Veterinary Association, the Estonian Small Animal Veterinary Association, the World Small Animal Veterinary Association, the Federation of European Companion Animal Veterinary Associations, and the European College of Small Animal Internal Medicine – Companion Animals. Samir Sakka is a consultant and member of the Medical Advisory Board of Pulsion Medical Systems SE, Feldkirch, Germany. He has received honoraria for attending from Basilea, Astra Zeneca and MSD for giving lectures. Juhana Honkavaara is a scientific advisor for Vetcare Ltd, Finland. He has given lectures on behalf of Vetcare, Zoetis, Orion Pharma, the Finnish Association of Veterinary Practitioners, the Finnish Veterinary Association and the Finnish Veterinary Technicians' Association. He is also a consultant for the Veterinary Information Network (VIN).

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SCH-P-2
HYBRID COIL EMBOLIZATION TECHNIQUE FOR PORTOSYSTEMIC SHUNT OCCLUSION IN FIVE ANIMALS.
T.M. Nakata, A. Uemura, S. Goya, K. Shimada, R. Fukushima, R. Tanaka, P. Chantawong, T. Kawaguchi. Tokyo University of Agriculture and Technology, Fuchu, Japan

Congenital portosystemic shunts (PSS) are rare vascular anomalies and the primary treatment is the surgical attenuation of shunting flow. In this study, a hybrid technique was used to permit coil embolization using larger catheters in smaller animals or to enable the approach of difficult access shunting vessels (SV). We reviewed clinico-surgical features, laboratory data, abdominal imaging results (contrasted-computed tomography [CT] and portography), and outcomes in two male dogs (Yorkshire terrier [YT] and Akita [AK]), and three male cats (Exotic Short Hair [EH], American Short Hair [AH] Russian Blue [RB]) with PSS. Intrahepatic (IH) PSS between the portal vein (PV) and the caudal vena cava were diagnosed in four animals [YT, AK, EH, RB] and an extrahepatic shunt in the cat [AH]. Diagnoses and accurate SV anatomy were obtained from perioperative CT and intraoperative portography images associate with hyperammonemia. Left-sided IHPSS were visualized in four animals. Two cats presented seizure episodes previous to the surgery. Two dogs and a cat had previously undergone partial shunt ligation with posterior recurrent hyperammonemia. Mean age at the time of diagnosis was nine months (range five to twelve months). French multipurpose catheters (3–5Fr) were inserted in the mesenteric vein or PV and advanced to the shunt site through a guidewire after transperitoneal approaches. Coil anchors were inserted in the SV of a dog [AK] and a cat [RB] previous to coil embolization procedure. PSS attenuation required deployment of additional coils due to persistent shunting flow in the dogs. The pushable coils were used to occlude PSS in the dogs because of low probability of coil migration, and the detachable microcoils were used to occlude the PSS in the cats due to the adaptability to irregular SVs and possibility of retrieve the device in case of instable coil deployment. PV pressures were measured to determine pre- and post-occlusion plausible changes. Preoperative serum ammonia ranged from 95 to 254 μmol/L and from 15 to 130 μmol/L in postoperative period. Serum liver enzymes remained elevated in the follow-up period in all patients. However, neurological and gastrointestinal abnormalities gradually improved

in the short-term post-operative period. The residual PSS flow is expected to gradually cease due to blood clotting around the coils. Nevertheless, a long-term follow-up is recommended after PSS attenuation because of the risks involving coil dislocation and shunt recanalization. Follow-up signs of liver dysfunction were managed using low protein diet and hepatoprotectives drugs.

Disclosures: No disclosures to report.

ESVC – European Society of Veterinary Cardiology

ESVC-P-1

RAPID RIGHT VENTRICULAR PACING FOR INTERVENTIONAL PROCEDURES IN DOGS: SAFETY AND RATE TITRATION. R. Pariaut[1], J. Vila[2], T. Ribas[2], A. Shelby[2], A. Dacunha[2]. [1]Cornell University, Ithaca, NY, USA, [2]Louisiana State University, Baton Rouge, LA, USA

Balloon valvuloplasty is the treatment of choice to treat stenotic cardiac valves in dogs. Pulsatile blood flow can cause movement of the catheter during balloon inflation leading to suboptimal results. Extreme tachycardia via rapid ventricular pacing causes an abrupt reduction in cardiac output, and is used in people to improve balloon stability during interventional procedures. The purpose of this study was to determine the safety of rapid pacing in dogs, and the optimal pacing rate required for the procedure. We hypothesize that rapid right ventricular pacing does not result in ventricular arrhythmias and that pacing rates above 240 beats/min are necessary to decrease systolic blood pressure by 50%.

Percutaneous access of the jugular vein was obtained in 4 adult research dogs. A 4-Fr temporary pacing lead was positioned in the right ventricle under fluoroscopic guidance. Pacing protocol was initiated for 10 seconds at a rate of 180 beats/min. The pacing rate was increased by increments of 20 beats until a 50% drop in systolic blood pressure was recorded. Dogs were allowed to recover for 3 minutes between each pacing protocol.

A 50% decrease in systolic blood pressure was achieved at heart rates of 240–260 beats/min in all dogs. No arrhythmias or complications from rapid pacing were noted. This technique was subsequently applied successfully during valvuloplasty procedures in one dog with severe subaortic stenosis and one dog with severe pulmonic stenosis.

Rapid ventricular pacing successfully reduces blood pressure and systolic blood flow, which can be used to increase balloon stability during valve dilatation. It does not appear to induce ventricular arrhythmias. Additional studies are needed to evaluate if rapid ventricular pacing can improve success of balloon valvuloplasty in dogs.

Disclosures: No disclosures to report.

ESVC-P-2

EFFECT OF BENAZEPRIL AND PIMOBENDAN ON SERUM ANGIOTENSIN-CONVERTING ENZYME ACTIVITY IN DOGS. J.N. King, J. Hornfeld, C. Christinaz, G. Strehlau, M. Peyrou. Elanco Animal Health, Basel, Switzerland

The effect of benazepril on serum angiotensin-converting enzyme (ACE) activity was evaluated in healthy beagle dogs. The aim of the study was to compare the effect of twice a day versus once a day administration of benazepril, and to evaluate the effect of pimobendan on ACE inhibition by benazepril. A total of 48 dogs were randomised into four groups ($n = 6$ female and males per group) in a prospective, parallel-group design study. The four groups were: A control (placebo twice daily); B (0.5 mg/kg benazepril once daily in the morning); C (0.25 mg/kg benazepril twice daily); D (0.25 mg/kg benazepril and 0.125 mg/kg pimobendan, both twice daily). The test items were administered orally for 15 days. Serum ACE activity was measured using a commercial radio-enzymatic assay from blood samples taken at baseline and at 12 times post-dosing on day 1 and again at day 15 (steady state).

Groups B, C and D were associated with significant reductions in serum ACE activity compared to baseline on both days 1 and 15. For the test of overall treatment effect post-dosing, groups B, C and D were associated with significantly lower ACE activity compared to the control group (all $P < 0.0001$), with no differences between groups B, C and D. Non-inferiority was shown for group C versus B, D versus B, and D versus C.

In conclusion, 0.25 mg/kg benazepril twice daily produced equivalent inhibition of serum ACE activity compared to 0.5 mg/kg benazepril once daily. Furthermore, addition of 0.125 mg/kg pimobendan twice daily had no significant effect on the inhibition of serum ACE activity produced by 0.25 mg/kg benazepril twice daily.

The results support the use of benazepril either once or twice daily in dogs, and the combination of benazepril with pimobendan.

Disclosures: Disclosures to report: The study was sponsored by, and at the time of the study all authors were employed by, Elanco Animal Health which markets benazepril and a benazepril/pimobendan combination.

ESVC-P-4

TAPSE-TO-AORTIC RATIO PROVIDES A BODYWEIGHT-INDEPENDENT ASSESSMENT OF RIGHT VENTRICULAR SYSTOLIC FUNCTION. M. Rishniw[1], D. Caivano[2], D. Dickson[3], R. Pariaut[4]. [1]Veterinary Information Network, Davis, USA, [2]University of Perugia, Perugia, Italy, [3]HeartVets Veterinary Cardiology Service, Porthcawl, UK, [4]Cornell University College of Veterinary Medicine, Ithaca, USA

Tricuspid annular systolic plane excursion (TAPSE) has been proposed as a measure of right ventricular (RV) systolic function. It is decreased below reference intervals in dogs with severe pulmonary hypertension. However, TAPSE, a linear measurement of tricuspid annular movement, scales non-linearly with bodyweight in dogs. We examined whether TAPSE could be normalized to linear aortic measurements to create a bodyweight-independent measure of RV systolic function. Echocardiographic evaluations were performed on 127 healthy dogs (50 dogs had been included in a previous study of TAPSE), 55 dogs with heart disease but no pulmonary hypertension (tricuspid regurgitant velocity <3 m/s) and 39 dogs with pulmonary hypertension of various etiologies and severities (tricuspid regurgitant velocity >2.9 m/s). TAPSE:Ao was regressed against bodyweight and, in dogs with pulmonary hypertension, against tricuspid velocity. TAPSE scaled non-linearly against bodyweight (as previously reported), but TAPSE:Ao largely removed the effect of bodyweight, with a non-parametrically determined lower reference limit of 0.67. Only 3/127 healthy dogs had TAPSE:Ao <0.7. Dogs with heart disease but no pulmonary hypertension showed a slight negative association of TAPSE:Ao with bodyweight with 4/55 dogs having TAPSE:Ao <0.7. In dogs with pulmonary hypertension TAPSE:Ao had a negative association with tricuspid velocity. However, only 5/39 dogs had TAPSE:Ao <0.7; all these dogs had TR velocities >4.4 m/s. TAPSE:Ao <0.7 was 97% specific, but only 38% sensitive in identifying dogs with severe pulmonary hypertension. TAPSE:Ao is a bodyweight independent measure of RV systolic function in dogs. Normal dogs have TAPSE:Ao >0.67. However, it does not appear to be a sensitive indicator of pulmonary hypertension.

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ESVC-P-5

ANALYSIS OF HEMATLOGICAL AND BIOCHEMICAL BLOOD PARAMETERS IN DOGS AFTER ELECTRICAL CARDIOVERSION OF ATRIAL FIBRILLATION IN DOGS. A. Noszczyk-Nowak, A. Janiszewski, A. Cepiel, U. Paslawska. University of Environmental and Life Science, Wroclaw, Poland, Wroclaw, Poland

Electrical cardioversion is a therapeutic procedure used to convert various types of arrhythmia back to sinus rhythm. It is used to restore the sinus rhythm in dogs with atrial fibrillation. The effect of the electrical energy used during cardioversion on red blood cells is not fully understood. Studies on humans reported lysis of red blood cells following electrical cardioversion. Similar studies have not been carried out in dogs.

The aim of the study was to assess the effect of electrical cardioversion on chosen red blood cell parameters.

The study was carried out on 14 large and giant breed dogs weighing from 30 to 84 kg with lone atrial fibrillation (lone AF). Electrical cardioversion was carried out under general anaesthesia with an infusion of propofol and fentanyl after premedication using medetomidine and midazolam. The cardioversion was carried out with biphasic 70–360 J cardioversion (using the Lifepak 12 Medtronic defibrillator). Blood was collected at:

- T0: during the atrial fibrillation, prior to cardioversion.
- T1: 30 min. after electrical cardioversion.

The number of red blood cells (RBCx10^{12}/l) and the red blood cell indices (Hb, Ht, MCV [fL], MCH [pg], MCHC [mmol/l], RDW) were recorded. The levels of total (BIL-T [mg/dl] and direct bilirubin (BIL-D [mg/dl] were evaluated two hours after blood collection.

In all cases, electrical cardioversion was effective. A maximum output of 360 J was used. No significant changes in the number of red blood cells and the red blood cell indices were noted after electrical cardioversion: RBC T0: 6.42 ± 0.74 versus T1: 6.26 ± 0.82, MCV T0: 72.48 ± 4.28 versus T1: 72.62 ± 4.19, MCH T0: 24.5 ± 1.77 versus T1: 24.27 ± 1.87, MCHC T0: 24.9 ± 7.3 versus T1: 25.07 ± 6.53, RDW T0: 14.99 ± 1.13 versus T1: 15.02 ± 1.05. Similarly, there were no statistically significant differences in the levels of total (T0: 3.3 ± 0.76 versus T1: 3.2 ± 0.77) and direct bilirubin (T0: 2.5 ± 1.07 versus T1: 2.47 ± 1.11)

We found that electrical cardioversion in dogs did not lead to statistically significant or clinical red blood cell lysis.

There are no conflicts of interest for any of the authors listed.

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Disclosures: No disclosures to report.

ESVC-P-6

SHORT-TERM HEART RATE VARIABILITY (HRV) IN DOGS WITH SICK SINUS SYNDROME COMPARE WITH HEALTHY DOGS. A. Noszczyk-Nowak, S. Bogucki. University of Environmental and Life Science, Wroclaw, Poland, Wroclaw, Poland

Heart rate variability (HRV) is a known risk factor for mortality in healthy and dogs with heart failure. In healthy human reference of normal values for short-term measures of HRV (ST-HRV) were published as an appendix to the paper "Heart rate variability: Standards of measurement, physiological interpretation and clinical use' (*Circulation*, 1996; 93, 1043–1065). In healthy dogs reference values of ST-HRV were publish (*Pol J Vet Sci.* 2015, 18, 307–312). The aim of the study was to compare normal value of short-term HRV in healthy dogs (H) ($n = 50$) and dogs with sick sinus syndrome (SSS) ($n = 10$). The ECG was recorded continuously for at least 180 min in dark and clam room. All QRS complexes from ECG were first edited automatically and then manually by careful inspection of the RR intervals. The data had no atrial or ventricular premature complexes. Signals were transformed into a spectrum by Fast Fourier Transformation. Heart rate variability parameters were measured at fixed time at the number of sample 60 min. Separate frequency (Hz) components of the HRV were obtained including very low frequency (VLF), low frequency (LF), high frequency (HF), total power (TP) and LF/HF ratio. The time domain parameters (ms) were analyzed as follows: mean NN, SDNN, SDANN, SDNN index and pNN50 (mean ± SD). A computerized software package Statistica version 10.0, StatSoft, Poland was used to statistically analyse the data. Data were compared by *t*-test. All data are displayed as the mean ± standard deviation and statistical significance was set at 5%. Results of ST-HRV parameters (mean ± SD) healthy dogs versus dogs with SSS: VLF (ms^2) 984.9* ± 327.7 versus 1678.5* ± 482.78, LF (ms^2) 1501.2* ± 761.4 versus 2769.83* ± 924.36, HF (ms^2) 5845.4* ± 2914.2 versus 11106.16* ± 2528.95, TP (ms^2) 11065.3* ± 3866.8 versus 19072.33* ± 2577.33, LF/HF 0.28 ± 0.11 versus 0.25 ± 0.11, NN 677.68* ± 126.89 versus 1004.2* ± 64.95, SDNN (ms) 208.86* ± 77.1 versus 378.16* ± 40.43, SDANN (ms) 70.75* ± 30.9 versus 125.5* ± 58.69, SDNNI (ms) 190.75* ± 76.12 versus 341.4* ± 56.69, pNN50 (%) 71.84* ± 13.96 versus 85.68* ± 8.12.

*Statistical significant.

ST-V HR may be useful for the identification of dogs with SSS. There are no conflicts of interest for any of the authors listed.

Disclosures: No disclosures to report.

ESVC-P-7

SERUM CHOLINE CONCENTRATION: A POTENTIAL BIOMARKER FOR MYOCARDIAL ISCHEMIA IN DOGS AND CATS. M. Kocaturk, Z. Yilmaz, M. Cansev, P. Levent, M. Turkyilmaz. Uludag University, Faculty of Veterinary Medicine, Bursa, Turkey

Research of new biomarkers to detect myocardial injury is crucial in medicine. Although whole blood and serum choline are suggested as emerging biomarkers in patients with myocardial ischemia, there is no available data on its usefulness for predicting cardiac events in dogs and cats. Thus, this study was aimed to evaluate the use of serum choline concentration as a potential biomarker for myocardial ischemia, and determine whether there was a correlation between cardiac troponin (cTnI) and serum choline in dogs and cats with heart diseases.

Dogs with congestive heart failure ($n = 10$) and cats with either hypertrophic cardiomyopathy ($n = 9$) or dilated cardiomyopathy ($n = 5$) were used as cardiac group. Heart disease was diagnosed based on the clinical, radiologic, electrocardiographic (ECG) and echocardiographic findings. Myocardial injury was determined by elevation of serum cTnI level; dogs >0.07 ng/mL and cats >0.16 ng/mL. Healthy age- and breed-matched dogs ($n = 10$) and cats ($n = 10$) were used as controls. All dogs and cats selected for this study were sero-negative for common vector-borne pathogens and feline infectious diseases, respectively. Serum free-choline concentration of each sample was analyzed by high performance liquid chromatography in triplicate and results were expressed as micromolar (μM).

ECG revealed the strain patterns of left ventricular (LV) hypertrophy or dilation. Statistically significant differences were found between echocardiographic measurements of LV size (eg. LVDd and LVDs) and function (EF% and FS%) of controls and affected dogs and cats. Serum cTnI concentrations in dogs and cats were (median [range]) 0.03 [0.01–0.06] ng/mL and 0.06 [0.05–0.07] ng/mL) for the control groups, 0.25 [0.13–3.1] ng/mL and 1.0 [0.8–2.4] ng/mL for the cardiac groups, with significantly differences ($P < 0.05$) between groups, respectively. Serum choline concentrations in dogs were 14.8 [6.5–19.2] μM for control group, and 27.1 [15.8–52.3] μM for cardiac group. Serum choline concentrations in cats were 8.3 [5.8–8.7] μM for control group, and 11.9 [11.3–12.1] μM for cardiac group. Serum choline concentrations in the cardiac groups were higher ($P < 0.001$) than those of healthy controls. There was a positive correlation between serum levels of choline and cTnI. Serum choline level did not correlate significantly with geometric and functional parameters of LV and serum markers of hepato-renal disease (ALT, BUN and Cr).

These data suggest that serum choline concentration might be used as a biomarker for the diagnosis of myocardial ischemia in dogs and cats with various heart diseases, and thereby may contribute to differentiate between ischemic and non-ischemic etiologies of cTnI elevations.

Disclosures: No disclosures to report.

ESVC-P-8

RIGHT VENTRICULAR OUTFLOW TRACT FRACTIONAL SHORTENING: A NEW ECHOCARDIOGRAPHIC INDEX OF THE RIGHT VENTRICULAR SYSTOLIC FUNCTION. D. Caivano[1], F. Birettoni[1], M. Rishniw[2], V. Patata[1], M.E. Giorgi[1], F. Porciello[1]. [1]University of Perugia, Perugia, Italy, [2]Veterinary Information Network, Davis, USA

Assessing right ventricular (RV) systolic function remains a challenge because of its complex morphology. Tricuspid annular plane excursion, fractional area change, tissue Doppler imaging and speckle-tracking echocardiography have been used to assess RV

systolic function in healthy dogs and dogs with pulmonary artery hypertension (PAH). We hypothesized that RV outflow tract (RVOT) function might provide a simple, useful estimate of RV function and PAH. Specifically, we measured RVOT fractional shortening (RVOT-FS) to determine if this index helps identify RV dysfunction in dogs with PAH (tricuspid regurgitation velocity-TRV >3 m/sec).

One hundred fifteen dogs [42 healthy dogs, 40 dogs with mitral valve disease (MVD) without PAH and 33 dogs with PAH] underwent complete echocardiographic evaluation. We acquired 2D guided M-mode recordings of the RV outflow tract from the parasternal short axis view at the level of the aortic root. We placed the M-mode line perpendicular to RVOT and parallel to the commissure of the aortic valve between the non-coronary and left-coronary cups. RVOT-FS was calculated as: RVOT dimensions (end-diastole – end-systole)/end-diastole *100. A mean of 3 measurements from each dog was used for the statistical analysis.

Healthy dogs and MVD dogs without PAH had higher RVOT-FS than dogs with PAH ($P < 0.000001$). No dogs with RVOT-FS >51% had PAH. All dogs with TRV >4 m/sec had RVOT-FS <44%. A cut-off of 44% had 100% specificity and 60% sensitivity for identifying PAH. No relationship of body weight, left-atrial-to-aortic ratio or heart rate and RVOT-FS could be identified ($P > 0.1$).

Our data suggest that RVOT-FS might help identify a subset of dogs with PAH. RVOT-FS was significantly modified in dogs with severe and moderate PAH, suggesting a RV systolic dysfunction only in these classes of PAH.

Disclosures: No disclosures to report.

ESVC-P-9

COMPARISON OF M-MODE AND TWO-DIMENSIONAL ECHOCARDIOGRAPHY IN EVALUATING THE LEFT ATRIUM TO AORTA RATIO IN CATS. F. Marchesotti[1], T. Vezzosi[2], E. Zini[1], O. Domenech[1]. [1]Istituto Veterinario di Novara, Granozzo Con Monticello (NO), Italy, [2]Department of Veterinary Sciences, University of Pisa, San Piero a Grado (PI), Italy

Assessment of the left atrial (LA) size is crucial in cats with cardiomyopathies because LA dilation, which results from an increased diastolic filling pressure, predisposes towards the development of congestive heart failure and arterial thromboembolism. In addition, LA dilation has been shown to be a negative prognostic factor in cats affected by hypertrophic cardiomyopathy. The aim of this study was to evaluate the agreement between M-mode and two-dimensional (2D) echocardiography in the assessment of LA size in cats.

The study was retrospective and observational. Cats with and without heart diseases were included. The LA and aorta (AO) were measured in M-mode and 2D using a standard right parasternal short axis view at the aortic valve level. A left atrium to aorta ratio (LA/AO) >1.5 was considered indicative of LA enlargement. Cohen's kappa agreement was calculated and Bland-Altman plots were obtained.

A total of 188 client-owned cats were included: 104 with heart disease and 84 without heart disease. LA and AO dimensions in M-mode were 13.9 ± 3.7 mm and 8.7 ± 1.5 mm, respectively, and in 2D were 14.1 ± 3.5 mm and 8.8 ± 1.4 mm, respectively. Bland-Altman plots showed that the mean difference for the evaluation of AO dimensions between 2D and M-mode was 0.1 ± 1.0 mm and that of LA was 0.1 ± 1.4 mm. LA/AO measured in 2D and M-mode was 1.6 ± 0.5 and 1.6 ± 0.5, respectively, with a median difference between the two methods of 0.0 ± 0.2. Cohen's kappa yielded a good agreement between the two methods in the interpretation of LA/AO ratio (kappa = 0.760; 95% CI: 0.54–0.99), with 184 agreements out of 188 (97.6%).

In conclusion, 2D echocardiography resulted in a slightly higher estimation of the LA and AO diameters in comparison to M-mode, but not for the LA/AO. Because a good agreement was documented between M-mode and 2D evaluation of the LA/AO, the two methods can be used interchangeably to measure this echocardiographic index in cats.

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ESVC-P-10

SURVIVAL AND PROGNOSTIC FACTORS IN CATS WITH RESTRICTIVE CARDIOMYOPATHY: A REVIEW OF 103 CASES. C. Locatelli[1], D. Pradelli[2], G. Campo[3], I. Spalla[4], P.G. Brambilla[3], A. Savarese[1], C. Bussadori[2]. [1]Univerisity of Milan, Milan, Italy, [2]Clinica Veterinaria Gran Sasso, Milano, Italy, [3]University of Milan, Milano, Italy, [4]Royal Veterinary College, Brookmans Park, UK

Restrictive cardiomyopathy (RCM), which approximately accounts for 20% of referred feline (CMs), is a primary myocardial disorder characterized by diastolic dysfunction and a poor prognosis. Large studies focusing on RCM in the cat are scant. The aims of this retrospective study were to describe epidemiological characteristics and to analyze prognostic factors affecting survival in cats with RCM.

The clinical archives of the Clinica Veterinaria Gran Sasso (Italy) and of the cardiology unit of DIMEVET (University of Milan, Italy) from 1997 to 2015 were reviewed for all cats diagnosed with RCM based on an echocardiographic exam. The diagnosis was based on distinctive echocardiographic phenotype of left atrial/biatrial enlargement, normal left ventricular (LV) wall thickness, and restrictive LV filling pattern with pulsed Doppler echocardiography. Inclusion criteria were any patient with a complete case record and an echocardiographic diagnosis of RCM. Cats diagnosed with another form of cardiomyopathies CMs, with congenital heart disease, with hypertension or hyperthyroidism or those with incomplete case records were excluded. Follow-up status and cause of death were determined by reviewing the medical records or by phone interviews with the owners.

One hundred three cats (61 male and 42 female) were included in the study with a mean age of 10 years (SD 4.45) and a median weight of 3.8 kg (IQR 3.2–5 kg); most of the cats were domestic shorthair (67%) or Persians (18%). Almost all cats were showing clinical signs (96%). Dyspnea was the most common clinical sign, being evident in 82.5% of the cats. Dyspnea was attributable to pleural effusion (PE) in 50 cats, pulmonary edema in 22 cats and both in 13 cats. Hind limb paresis or paralysis due to aortic thromboembolism was evident in 14 cats. Follow-up information was available for 67 cats. Median survival time (MST) in cats with RCM was 133 days. A statistically significant different ($P = 0.004$) MST was identified in cats with dyspnea (68 days) and in cats without dyspnea (731 days). Likewise a statistically significant ($P = 0.004$) different MST was identified in cats with PE (68 days) and in cats without PE (186 days).

MST of cats with dyspnea/PE is in this study significantly shorter than MST in cats without dyspnea/PE. The present results confirmed that cats with RCM had short survival time (MST 133 days), but worse prognosis should be prospected to the owner in cats with dyspnea or PE. Better prognosis may be prospected only in cats without dyspnea.

Disclosures: No disclosures to report.

ESVC-P-11

PLASMA COENZYME Q10 CONCENTRATION DOES NOT PREDICT SURVIVAL IN CANINE CARDIOVASCULAR PATIENTS. A. Domanjko Petric[1], B. Verk[1], P. Jazbec Križman[2], A. Nemec Svete[1]. [1]Veterinary Faculty, Ljubljana, Slovenia, [2]Institute of Chemistry, Ljubljana, Slovenia

A decreased level of coenzyme Q10 (CoQ_{10}) in plasma and myocardium has been found in cardiovascular diseases in human patients. Moreover, low levels of CoQ_{10} have been found to be an independent predictor of mortality in chronic heart failure in human patients. The aim of our study was to investigate the survival of referred population of canine cardiovascular patients; with regard to the therapy (Yes/No) and plasma CoQ_{10} concentration at the first visit.

Seventy-two client-owned dogs were included in the present study, 29 of them were healthy controls. The other 43 dogs were referred cardiovascular patients with various diseases that were classified into ISACHC classes (International Small Animal Cardiac Health Council; ISACHC). Cardiovascular disease was confirmed on the basis of history, clinical examination, thoracic radiographs, electrocardiogram and echocardiography. The effect

of therapy on survival was studied in advanced stages (class II and III). Plasma CoQ_{10} was determined using HPLC-atmospheric pressure chemical ionization-tandem mass spectrometry method. Cardiac biomarker NT-proBNP (ELISA test) was analysed to screen the disease severity. A Kaplan-Meier analysis was used to estimate survival, but since the group that received cardiac therapy had significantly higher CoQ_{10} concentrations than the patients without therapy, this variable was taken into account by using the Cox proportional hazards regression model. Results of the Kaplan-Meier analysis showed significantly longer survival in the group that already received therapy ($P = 0.036$). When analysing with Cox model, the hazard ratio of patients with therapy was 0.40 (95% CI 0.17–0.96; $P = 0.039$), indicating also a better survival as compared with group without therapy. In the model CoQ_{10} had no significant effect ($P = 0.836$).

In conclusion it is important to start cardiac therapy as soon as possible as early therapy has significant effect on survival. Results of CoQ_{10} warrant further studies to conclude its effect on survival in canine cardiovascular patients.

Disclosures: No disclosures to report.

ESVC-P-12
INFLAMMATORY MARKERS (TNF-ALPHA, IL-6, CRP) IN DOGS IN CONGESTIVE HEART FAILURE. A. Domanjko Petric, B. Verk, N. Cebulj-Kadunc, A. Nemec Svete. Veterinary Faculty, Ljubljana, Slovenia

It has been reported that cytokines contribute to the pathogenesis of congestive heart failure (CHF) in human and canine cardiovascular patients. Human studies revealed increased circulating levels of interleukin-6 (IL-6) and tumour necrosis factor-alpha (TNF-alpha) in heart failure patients. Additionally, increased C-reactive protein (CRP) concentration has been found in humans and dogs in congestive heart failure. The aim of the study was to investigate whether the levels of circulating cytokines (TNF-alpha, IL-6 and CRP) are elevated in dogs with various heart diseases and heart failure. Additionally, the effect of therapy on measured parameters was evaluated in advanced stages of the disease (International Small Animal Cardiac Health Council (ISACHC) II and III). Cardiac biomarker NT-proBNP was analysed to screen the disease severity. Fifty-eight client-owned dogs were enrolled in this study: 48 dogs with confirmed cardiovascular disease and 10 healthy dogs. Cardiovascular patients were classified into ISACHC classes. Cardiovascular disease was confirmed on the basis of history, clinical examination, thoracic radiographs, electrocardiogram and echocardiography. Patients with other diseases were excluded from the study. Serum concentrations of inflammatory markers were determined with ELISA kits. Plasma NT-proBNP (second-generation Cardiopet® proBNP) levels were analysed by IDEXX Laboratory. Kruskal-Wallis analysis followed by the Mann-Whitney U test with Bonferroni adjustment ($P < 0.008$) was used for comparison of measured parameters among groups of patients and healthy dogs. The effect of therapy was tested with Mann-Whitney U test. Interleukin-6 and TNF-alpha concentrations did not differ significantly among ISACHC groups and between control group and ISACHC groups. The highest TNF-alpha concentration was found in ISACHC III (median 7.956 pg/mL versus 3.900 pg/mL in ISACHC II and I). CRP concentration was significantly higher in ISACHC III (3.53 mg/L) and ISACHC II (4.401 mg/L) than in control group (0.900 mg/L); however no significant differences in CRP concentrations were found among ISACHC groups. The results showed no significant differences in any of measured parameters between patients with and withouth therapy. A positive significant correlation was found between NT-proBNP and IL-6 in ISACHC II; correlations with TNF-alpha and CRP were not significant in neither group of patients. Increased CRP concentrations in advanced stages of heart failure and significant positive correlation between IL-6 and NT-proBNP indicate systemic inflammation in dogs with CHF. Therapy had no effect on measured inflammatory markers. Futher studies in larger groups of canine cardiovascular patients might confirm that cytokines are responsible for the progression of heart failure.

Disclosures: No disclosures to report.

ESVC-P-13
CHARACTERIZATION OF ATRIAL AND VENTRICULAR PATHOLOGY IN FELINE HYPERTROPHIC AND DILATED CARDIOMYOPATHY. P. Fox, E. Herrold, L. Wiley. Animal Medical Center, New York, USA

Few contemporary data detail cardiac chamber pathology in feline cardiomyopathy. We aimed to characterize, measure, and contrast gross morphology involving all atrial and ventricular chambers in feline HCM and DCM.

Fifty-two feline hearts (28-HCM, 24-DCM) were sectioned in right-parasternal-long-axis echocardiographic planes (LV inflow-outflow [IFOF], $n = 36$, four-chamber [4C], $n = 16$). Using stereomicroscopy, hearts were examined for chamber morphology and infarctions, photographed, and digitally measured at multiple levels (LA, RA, LV, RV walls).

Age and body weight [mean, range]: (HCM: 13 yrs, 2–18 yrs versus DCM: 11 yrs, 5–17 yrs], [HCM: 4.9 kg, 3.2–7.9 kg versus DCM: 4.8 kg, 3.3–6.1 kg] were NS ($P = 0.09$, 0.77 respectively). LV short-axis internal dimensions were: HCM: 7.9 ± 3.0 mm (IFOF), 5.7 ± 2.3 mm (4C); DCM: 16.3 ± 3.3 mm (IFOF), 11.8 ± 3.1 mm (4C). IVS thickness comparing chordal-vs-papillary-vs-annular level: HCM-IFOF, chordal (9.2 ± 1.4 mm) and papillary (8.8 ± 1.6 mm) >annular (7.1 ± 1.2 mm) ($P < 0.05$); the same relationship held in 4C view. IVS DCM-IFOF, thickness was greater at papillary (median: 4.1 mm) versus annular (median: 2.7 mm) ($P < 0.05$); same relationship in 4C. LVW at chordal level: HCM: 8.9 ± 1.8 mm (IFOF) versus 9.1 ± 2.0 mm (4C); DCM: 5.0 ± 0.8 mm (IFOF) versus 5.3 ± 2.4 mm (4C). RV wall-4C: HCM-base (1.6 ± 0.7 mm) versus mid-RV wall (1.5 ± 0.7 mm) ($P > 0.05$), but both >RV-apex (1.1 mm ± 0.4 mm) ($P < 0.05$); DCM- at base (median: 1.2 mm) versus mid-RV (median: 1.1 mm) versus RV-apex (median: 1.1 mm), ($P > 0.05$). Wall thicknesses (range) for LA (0.2–2.1 mm) and RA (0.1–1 mm) were NS per respective, measured location ($P > 0.05$). Transmural LV myocardial infarctions occurred in 7/28–18% HCM (apical-LV $n = 2$; mid-LVW $n = 5$) and 5/24–21% DCM (apical-LV $n = 4$, mid-LVW $n = 1$), and were 4.6–10.6 mm long.

These data provide context for echocardiographic examination and should assist pathologic assessments at necropsyassessments at necropsy.

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ESVC-P-14
ECHOCARDIOGRAPHIC FINDINGS IN 87 APPARENTLY HEALTHY ADULT BULL TERRIERS. H.E. van Meeuwen[1], M.J.M. Dirven[2]. [1]Kliniek voor Gezelschapsdieren Eersel, Eersel, The Netherlands, [2]Utrecht University, Utrecht, The Netherlands

English Bull Terriers (EBT) may well have a high prevalence of murmurs and are presumed to be predisposed for mitral valve dysplasia, mitral valve stenosis and left ventricular outflow tract obstruction (LVOTO). These cardiac disorders could lead to congestive heart failure, syncope and sudden death. Aforementioned disorders are congenital and might be hereditary. The relative prevalence of heart disease in the Dutch and Belgian EBT breeding population has not been reported. Many EBT are presented to the "Kliniek voor Gezelschapsdieren Eersel"(KVGD) for echocardiography prior to breeding. The aim of this study was to report on echocardiographic findings in the Dutch and Belgian breeding population of EBT.

Case records of all EBT that underwent an echocardiographic screening prior to breeding in the KVGD between January 1st 2010 until April 1st 2016 were reviewed retrospectively ($n = 87$). All EBT underwent a routine physical examination. Subsequently, 2D, M-mode and Doppler transthoracic echocardiography with continuous ECG monitoring was performed in all animals.

All 87 dogs were considered to be asymptomatic by their owners. Of the 87 dogs, 37 were entire males and 50 were entire females. Age varied from 8 to 70 months (average 26 months). Weight ranged from 21 to 38 kg (average of 29.1 kg). A murmur was detected in 22/87 animals (25%) with a maximum intensity of 3/6. The average left ventricular diameter in diastole and systole were 4.16 cm and 2.85 cm respectively. Compared to published breed specific reference ranges as well as reference ranges for the

general dog population indexed to body weight, these measurements were within limits. The average aortic diameter measured was 2.13 cm. Compared to dogs from other breeds with the same weight, this value is in the lower normal reference range. The maximal aortic velocity (VmaxAo) measured in all dogs was 1.6–4.5 m/s (subcostal measurement), with an average of 2.25 m/s. Only 15 dogs had a VmaxAo below 2.0 m/s (17%).

In this population of apparently healthy EBT increased VmaxAo and smaller aortic diameters were found. A physiological mitral regurgitation jet was quite common (25%), but no mitral valve dysplasia or mitral valve stenosis was seen. Further prospective observational studies are needed to determine specific EBT reference ranges, true prevalence, natural history and heredity of heart disease in the EBT breed.

Disclosures: No disclosures to report.

ESVC-P-15
FINDINGS FROM ELECTROCARDIOGRAPHY IN IRISH WOLFHOUNDS WITH AND WITHOUT CARDIOMYOPATHY.

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Sudden death (SD) commonly occurs in dog breeds with a high predisposition to VPDs, like Doberman pinschers or boxers. Irish wolfhounds (IW) have a high prevalence of dilated cardiomyopathy (DCM) and atrial fibrillation (AF). A recently performed longitudinal study of 134 IW with DCM, and 47 IW with initial lone AF revealed that SD occurred in 21 to 25% of these dogs.

The objective of this study was to compare ECG findings of IW with cardiomyopathy (CM) to those without.

Between 5/1990-3/2016 IW (n = 1588; 732 m; 856 f) were examined by physical examination, echocardiography and electrocardiography (AV). Dogs were longitudinally followed, and owners instructed to report date and circumstances of death. DCM was diagnosed in 411 dogs (248 m, 163 f), of these associated with sinus rhythm in 29 m and 39 f, and with AF in 219 m and 124 f. AF was the only abnormality of 19 m and 24 f, and additionally was diagnosed in 4 dogs with valvular disease.

VPDs at one or more occasions were recorded in 9.7% of IW with DCM and 3.4% of normal dogs. Doubles, triplets, bigeminus , or runs were found in few normal IW and few with DCM, while multifocal VPDs were only seen in 5 dogs with DCM.

SVPDs as singles were detected in 3 dogs with DCM and 13 normal IW; SV tachycardia was present in 14 IW without and 14 dogs with DCM, of these, 11 developed AF later.

RBBB was diagnosed in 3 IW with and 10 without DCM, while 3 IW with and one without DCM had LBBB. LAFB were more common in IW without DCM (10 versus 1 with DCM). Other abnormalities of QRS complexes like notched and splintered forms were common in both groups (8.5% of dogs with DCM and 9.5% of normal IW).

In this study, SD occurred in 27 female IW with DCM or AF, only one of these had shown VPDs (4/min) earlier. But, in 9 of 59 male IW that died from SD, VPDs had been recorded (multifocal VPDs in 1, runs in 1, singles in 7).

In conclusion, AF is the most common ECG abnormality in IW. SD occurs in a significant proportion of dogs with DCM or AF. In 15% of male IW VPDs had been recorded before SD occurred.

Disclosures: No disclosures to report.

ESVC-P-17
PULMONARY VEIN-TO-PULMONARY ARTERY RATIO HELPS IDENTIFY DOGS WITH CONGESTIVE HEART FAILURE SECONDARY TO MITRAL VALVE DISEASE.

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Pulmonary-vein-to-pulmonary-artery ratio (PV:PA) has been proposed as a method of identifying various stages of cardiovascular disease, including congestive heart failure (CHF) and pulmonary hypertension (PH). However, few studies exist that have examined the diagnostic utility of PV:PA, or other PV or PA measurements in the diagnosis of CHF or PH.

M-mode echocardiographic evaluations were performed on 93 dogs with mitral valve disease (MMVD) +/-PH (tricuspid regurgitant velocity <3 m/s). The right ostium of the PV and PA were measured at the maximal and minimal diameters (mechanically timed), and at the peak of the QRS and end of the T-waves (ECG timed). Left atrium and aorta were measured at the onset of diastole. Dogs were classified as being subclinical (B1, B2) or having CHF (C). Various indices of PV and PA were calculated. These indices were examined in a subset of dogs with similar LA:Ao but different clinical classifications (B2[n = 24] versus C [n = 12]) to determine the clinical utility of PV:PA in identifying CHF. PV and PA indices were also examined in dogs with (n = 35) and without (n = 26) PH to determine the clinical utility of identifying PH.

Only the ECG-timed PV:PA obtained at the peak of the QRS was different between subclinical and CHF dogs with similar LA:Ao. PV:PA-QRS at the optimal cut-off of 1.6 was 75% sensitive and 69% specific for detecting CHF. PA:Ao (measured at the smallest diameter or QRS) >0.45 was approximately 55% sensitive and 90% specific for identifying moderate PH (TR velocity >3.5 m/s). PA distensibility index did not perform better to identify moderate PH.

PV and PA echocardiographic indices might be useful in discriminating subclinical and CHF dogs with similar degrees of cardiac enlargement, and identifying dogs with moderate-severe PH.

Disclosures: No disclosures to report.

ESVC-P-18
PILOT STUDY OF THE FEASIBILITY, SAFETY, AND TOLERANCE OF SUBCUTANEOUS SYNTHETIC CANINE B-TYPE NATRIURETIC PEPTIDE IN HEALTHY DOGS AND DOGS WITH STAGE B1 MYXOMATOUS MITRAL VALVE DISEASE.

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B-type natriuretic peptide (BNP) is an endogenous "cardioprotective"natriuretic, vasodilatory, and diuretic peptide that mediates its actions through cyclic GMP (cGMP). BNP is produced by myocardiocytes in response to stress but is overwhelmed by other neurohormonal systems during heart failure. In humans with acute congestive heart failure, exogenous intravenous BNP helps alleviate signs of dyspnea. In addition, BNP has longer-term anti-remodeling properties, and developing methods to chronically administer BNP to humans and dogs with heart disease is a subject of interest. Administration of exogenous BNP has not been previously reported in privately-owned dogs. We sought to determine the feasibility, safety, and tolerance of subcutaneous synthetic canine B-type natriuretic peptide (syncBNP) (Phoenix Pharmaceuticals, Burlingame, CA) by performing a modified 3 × 3 phase-1 intra-patient dose escalation study in 6 dogs, including 2 healthy dogs and 4 dogs with stage B1 myxomatous mitral valve disease (MMVD). Stage 1 involved administering a "subtherapeutic"dose of 2.5 mcg/kg syncBNP to 3 dogs followed by a second "therapeutic"dose of 5.0 mcg/kg 4 hours later. Stage 2 administered a baseline dose of 5.0 mcg/kg followed by a "maximum"dose of 10.0 mcg/kg 4 hours later in an additional 3 dogs. syncBNP injections were well-tolerated in all dogs at all concentrations with no statistically significant differences in blood pressure, heart rate and rhythm, or serum creatnine and BUN before and after syncBNP administration. Median plasma cGMP concentration was significantly higher at 45 and 120 minutes after the 5.0 mcg/kg dose as compared to baseline (baseline, 131.5 pmol/mL [IQR = 117.5–144.8]; 45 min, 154.6 [145.6–205.7]; 120 min, 192.7–153.1–239.6]; P = 0.042). There were no significant differences in serum aldosterone, plasma renin activity, urine specific gravity, urinary fractional excretion of sodium, or urinary cGMP concentration. A single subcutaneous injection of syncBNP at 5.0 mcg/kg did not cause any adverse reactions and was associated with an increase in the BNP secondary messenger, cGMP. Further studies investigating the clinical utility of acute and chronic syncBNP in dogs with naturally-occurring heart disease are warranted.

Disclosures: No disclosures to report.

ESVC-P-19
USE OF TORASEMIDE IN CATS FOR CONGESTIVE HEART FAILURE. R. Mcdonald. University of Glasgow, Glasgow, UK

Torasemide is a loop diuretic which is more potent and of greater persistency than furosemide. Torasemide is a potentially useful treatment for dogs and cats in congestive heart failure (CHF) but is only licensed for use in dogs in the UK. The aim of this study was to describe the use of oral torasemide in cats with naturally occurring CHF and to report tolerability and adverse effects.

Two hospital databases were searched for cats with cardiac disease receiving torasemide from March 2014-March 2016; 11 client-owned cats with suitable records were subsequently retrospectively evaluated.

Collected data included signalment, presenting signs, diagnosis, concurrent medications, maximum dose of furosemide before transition to torasemide, starting torasemide dose, maximum torasemide dose reached during CHF therapy, survival time after commencing torasemide and comparison of renal parameters and electrolytes prior-to and after commencing torasemide. Adverse reactions were recorded. A board-certified cardiologist retrospectively reviewed the cases. All owners signed consent forms to permit the use of off-licensed drugs.

Cats included all had CHF and had acquired cardiomyopathy or congenital cardiac disease confirmed on echocardiography. All were initially treated with furosemide; 55% were on oral therapy, 45% on intravenous therapy.

Various concurrent therapies included ACE inhibitors, spironolactone, antithrombotics, pimobendan, diltiazem, atenolol, carbimazole, famotidine, mirtazapine. At initiation of torasemide, cats were either poorly responsive to oral furosemide ($n = 9$) or management was deemed more appropriate with torasemide ($n = 2$).

The median dose of furosemide was 6 mg/kg/24 hrs (range 1–10 mg/kg/24 hrs) prior to commencing torasemide. The median initial dose of torasemide was 0.5 mg/kg/24 hr (0.1–0.75 mg/kg/24 hrs) administered once or divided into twice daily dosing.
At the first recheck there was a trend towards an increase in creatinine and urea and a decrease in potassium. Azotaemia was observed to be more marked in patients receiving a higher dose of torasemide. During chronic therapy, torasemide was reduced in 3 cats due to increasing azotaemia.

At the time of writing, 5 cats were still alive. Mortality was due to euthanasia for refractory CHF ($n = 4$), progressive azotemia after starting torasemide ($n = 1$) and 1 cat was lost to follow up. Median survival time was 48 d (7–177 d) with a median final torasemide dose of 0.36 mg/kg/24 hrs (0.21–0.75 mg/kg/24 hrs).

Oral torasemide was tolerated by this population of cats with CHF. The main adverse clinical effect was worsening azotaemia. Prospective studies are needed to further evaluate the use of torasemide in cats.

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ESVC-P-20
IRON STATUS IN DOGS WITH MITRAL VALVE DISEASE. A. Savarese, M. Probo, C. Locatelli, G. Traini, P.G. Brambilla, S. Paltrinieri. University of Milan, Milano, Italy

In people, anemia and serum iron (SI) deficiency (SID) are frequent co-morbidities in chronic heart failure (CHF). Recent studies showed that SID alone reduces quality of life and survival.

Mitral valve disease (MVD) is the most common acquired heart disease in dogs, which can lead to CHF.

To the best of our knowledge, no studies have examined iron status in MVD dogs.

The aims were to determine prevalence and characteristics of SID (SI < 90 μg/dL) in dogs with MVD, to analyze differences in SI among ACVIM classes, symptomatic and asymptomatic patients, and to study the association between SID and survival.

Fifty privately owned MVD dogs admitted to the Cardiology Service of DIMEVET (January 2015–April 2016) with complete physical evaluation, chest x-ray, echocardiographic examination and serum biochemical panel were included. Patients with other heart or systemic diseases were excluded.

Blood samples were collected during routine clinical evaluation; complete CBC and routine biochemistry were performed using an automated laser hematology analyzer and automated spectrophotometer, while excess serum was frozen until analysis. Iron status was evaluated measuring SI and total iron-binding capacity (TIBC); percentage transferrin saturation (% SAT) was calculated.

The median age of dogs was 11 years (IQR 10–14) and median body weight 11 kg (IQR 6–22). Most were intact males (42%). The most represented breed was mongrel (46%). Twenty dogs were ACVIM class B1 (40%), 12 B2 (24%), 15 C (30%) and 3 D (6%). Non-symptomatic and symptomatic dogs were respectively 64% ($n = 32$) and 36% ($n = 18$).

The prevalence of SID in MVD dogs was 16% (8/50: 6 symptomatic and 2 non-symptomatic). Only 3 patients (6%) presented anemia (Hct ≤ 37%). TIBC was within or above the reference range (NV: 270–496 μg/dL) in all dogs with SID, except one (reduced TIBC), while % SAT was below the minimum level (NV: >23%) in 5/8 dogs (62%).

No differences in SI were found between ACVIM classes and symptomatic/non-symptomatic patients.
Log-rank analysis showed shorter survival in MVD dogs with SID (P value: 0.020), nevertheless multivariate Cox analysis showed that only symptoms presence affect survival.

Our results show that SID, although does not appear to influence survival, is more common in symptomatic dogs and can be occasionally present without anemia in dogs with MVD; TIBC and % SAT values suggest that SID is most frequently true (primary SID) than functional (secondary to inflammatory conditions).

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ESVC-P-21
RELATIONSHIP BETWEEN ONE-DIMENSIONAL LEFT ATRIAL PHASIC FUNCTION AND POST-CAPILLARY PULMONARY HYPERTENSION IN DOGS WITH DEGENERATIVE MITRAL VALVE DISEASE. A.C. Merveille, E. Roels, A. Gautier, C. Clercx, K. Mc Entee. Faculty of Veterinary Medicine, University of Liège, Liège, Belgium

Post-capillary pulmonary hypertension is common in dogs with degenerative mitral valve disease (DMVD). Its prevalence increases with severity of DMVD and its presence is a predictor of worse outcome. Left atrial (LA) function and size are prognostic indicators in DMVD. In dogs, LA contractile function has been shown to decrease with severity of DMVD. In human with chronic mitral regurgitation, LA function is an important correlate of right ventricular systolic pressure. The aim of this study was to assess if LA dysfunction was associated with PH in dogs with DMVD. Dogs with DMVD and a measurable tricuspid regurgitation (TR) were retrospectively recruited. Maximal LA diameter, LA diameter at the onset of the P wave and minimal LA diameter were measured on anatomic M-mode from 2D cineloops on aortic short axis view. Left atrial reservoir (LA expansion index; Total LA shortening fraction), conduit (Passive LA shortening fraction) and contractile function (Active LA shortening fraction) indices were derived from above measures. Ninety three dogs including ACVIM stage B1 (22), B2 (28), C (39) and D (4), were included. Dogs were assigned to pulmonary hypertensive group (PH) (TR pressure gradient >40 mmHg) ($n = 29$, median: 51 mmHg; range: 40–114) or pulmonary normotensive group (PN) ($n = 64$, 29 mmHg; 5–40). LA reservoir and contractile function indices were reduced in ACVIM stage C and D compared to asymptomatic stages ($P < 0.001$) and TR pressure gradient was higher in symptomatic dogs ($P < 0.05$) compared to asymptomatic dogs. TR gradient was positively correlated with LA size measured at different time intervals ($P < 0.001$) and negatively correlated with LA reservoir ($P = 0.02$) and contractile ($P = 0.009$) variables LA reservoir variables ($P = 0.008$), and active LA shortening fraction ($P = 0.006$) were lower in PH group compared to PN ANCOVA was used to test the categorical effect of ACVIM stages along with the effects of LA function indices on TR pressure gradient. ACVIM stage had a strong effect on TR gradient ($P < 0.001$) but LA function parameters did not persist after correction for ACVIM stages. This study confirmed that, in dogs with DMVD, PH is strongly associated with the stage of heart failure but failed to show an independent relationship between LA dysfunction and development of PH. The

reason may be a lack of accuracy of one dimensional variables to assess LA phasic function or the absence of causal link between LA dysfunction and development of pulmonary hypertension in DMVD dogs.

Disclosures: No disclosures to report.

ESVC-P-22

PREVALENCE AND ASSOCIATION OF MINERALISATION OF THE HEART AND GREAT VESSELS IN DOGS ON COMPUTED TOMOGRAPHIC IMAGING. P. Sebastian[1], C. Warren-Smith[1], S. Fonfara[2], K. Borgeat[3], D. Casamian-Sorrosal[1]. [1]Langford Veterinary Services, School of Veterinary Science, University of Bristol, Bristol, UK, [2]Ontario Veterinary College, University og Guelph, Guelph, Canada, [3]Highcroft Veterinary Referrals, Bristol, UK

Mineralisation of the heart and great vessels has been reported as an incidental radiographic finding in dogs. The prevalence has been reported at 0.61% on thoracic radiography. Thoracic computed tomography (CT) imaging is being used more frequently in dogs in recent years, but the CT prevalence of mineralisation is unreported. It may be higher because of the increased sensitivity of CT compared with radiography. The aim of the study was therefore to describe the prevalence and location of cardiac and great vessel mineralisation in dogs and to evaluate its association with age, sex and concurrent disease.

Thoracic CT studies of 878 dogs carried out between 2011–2014 at a veterinary teaching hospital were reviewed. Poor quality CTs were excluded, resulting in 802 dogs available for inclusion. A single, trained operator systematically reviewed all CT studies and a panel of three Board-certified Cardiologists and one Board-certified Diagnostic Imager reviewed all abnormalities. The cases were grouped by: sex (male/female); age (1–5 years, ≥5 to 10 years, and >10 years), and concurrent disease process: neoplasia, cardiorespiratory, neurological, internal medicine, surgical (soft tissue and orthopaedics), and miscellaneous.

Mineralisation of the heart and/or great vessels was documented in 97/802 (12%) dogs. The most frequent localisation was the aortic bulb, which was seen in 67 (8.4%) dogs, followed by localised areas of the ascending aorta in 16 (2%) dogs. Mineralisation of the cranial vena cava and intracardiac mineralisations were present in 7 (0.9%) dogs each.

Dogs younger than 5 years had less mineralisation than older dogs ($P = 0.018$), but no statistical difference was observed between dogs 5 ≤ 10 years and dogs >10 years old. No association of mineralisation with sex or concurrent disease type was detected.

In conclusion, mineralisation of the heart and/or great vessels is present in 12% of dogs on thoracic CT. The aortic bulb is the most frequent site observed, accounting for >75% of mineralisation. Dogs >5 years old were more likely to demonstrate mineralisation than younger dogs. No association with disease state suggests that this is an incidental finding, despite the remarkably higher prevalence detected on CT than plain radiography.

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ESVC-P-23

HEART RATE VARIABILITY IN DOGS WITH CHRONIC KIDNEY FAILURE. P.M. Saftencu, D. Mocanu, A. Baisan, G. Solcan, M. Musteata. University of Agricultural Sciences and Veterinary Medicine „Ion Ioescu de la, Iasi, Romania

Cardiorenal syndrome is a new entity in veterinary medicine that has drawn attention to the importance of the constant interplay of these two systems in both kidney and heart failure, in which two main mechanisms are present: activation of the renninangiotensin-aldosteron axis and an increase in sympathetic tone. Sympathetic overdrive is hard to asses in clinical conditions, but cardiac autonomic modulation of both parasympathetic and sympathetic components can be easily evaluated in real time, using the heart rate variability technique (HVR). From our knowledge there is no research made regarding the evaluation of HRV in dogs with chronic kidney disease (CKD).

The purpose of our study was to asses the sympathetic activity in dogs with chronic kidney disease, using the heart rate variability analysis (HRV) on short time ECG monitoring (5 minutes). We included 10 dogs (various age and breeds) with chronic kidney disease (CKD group), diagnosed according to IRIS classifications. We evaluate time domain and frequency domain parameters to estimate overall HRV (SDNN), vagal tone activity (pNN50 and HF) and sympathetic tone (LF and LF/HF), using Kubios HRV software. To compare the results we included HRV data from 10 healthy dogs (no heart or kidney disease present) with matched age, weight and gender.

Our results showed a significant decrease in overall HRV (SDNN) ($P < 0.01$) in the CKD group associated with a significant decreased vagal tone (pNN50 and HF) ($P < 0.001$ and $P < 0.001$). Moreover the sympathetic tone was increased ($P < 0.001$ and $P < 0.05$) in the CKD group compared with the healthy group.

Our study showed that dogs with CKD have an increased sympathetic tone associated with low vagal activity. This autonomic imbalance is known to predict a bad outcome in dogs with heart disease. In humans, HRV analysis is used as a marker of the evolution and treatment outcome in patients with kidney failure. Further studies are needed to include autonomic imbalance as a tool in monitoring the clinical evolution of dogs with CKD.

Disclosures: No disclosures to report.

ESVC-P-24

A NEW STANDARDIZED METHOD FOR SEMI-QUANTITATIVE ASSESSMENT OF LEFT ATRIAL SIZE ON CANINE THORACIC RADIOGRAPHS. V. Szatmári, N.J. van Bijsterveldt, F. Vilaplana Grosso, E. Teske, V. Szatmári. Utrecht University, Faculty of Veterinary Medicine, Utrecht, The Netherlands

Left atrial size is a clinically important parameter, that reflects the severity of chronic cardiac disorders; such as myxomatous valve degeneration, which is the most common cardiac disease in dogs. First opinion veterinary practices lack an easy and standardized method to assess left atrial size reliably. Though two-dimensional echocardiography would be an excellent modality for this purpose, performing cardiac ultrasonography requires advanced training and quite some experience. Furthermore, ultrasonography is less widely available than radiography. Though vertebral heart scale (VHS) is a simple quantitative method to assess the cardiac size on thoracic radiographs, VHS says nothing specific about the size of the left atrium.

We describe a new standardized method for estimating left atrial size on lateral thoracic radiographs in dogs. The principle of this method is to draw a straight line between the dorsal border of the tracheal bifurcation and the point where the ventral border of the caudal vena cava crosses the cranial crus of the diaphragm. These anatomic landmarks are easy to recognize and are similar to those used for determining the VHS. We hypothesized that if the cardiac silhouette exceeds this line dorsally, the left atrium is enlarged, if not then it is normal.

Ten veterinary students applied this line-method to 100 radiographs, which were selected from the clinic's archive in a period of 5 years. Inclusion criterion was that an echocardiogram was performed by a cardiologist on the same day when the radiographs were made, to serve as a golden standard. The students used a 5-point ordinal scale to score the left atrial size.

The receiver operating characteristic curve showed a discriminative ability of 0.74, which means a moderate accuracy. When the test was marked positive only when the students were absolutely sure about the left atrial enlargement, the line-method's sensitivity was 0.45 and its specificity was 0.91. The correlation between the line-method and the echocardiographic left atrial to aortic ratio was 0.56, which means a moderate positive correlation. A multiple logistic regression analysis showed that our new line-method is a valuable test when radiologists are unavailable.

We expect that this simple, standardized method would help practicing veterinarians to decide whether the left atrium on a radiograph is enlarged or normal. As a result, in the absence of a radiologist's opinion, using the line-method could facilitate the

rapid differentiation between cardiogenic pulmonary edema and primary respiratory disorders in dogs with tachypnea or dyspnea.

Disclosures: No disclosures to report.

ESVC-P-25
QUANTIFICATION OF MITRAL REGURGITATION IN ANATOLIAN SHEPHERD DOGS WITH ASYMPTOMATIC DEGENERATIVE MITRAL VALVE DISEASE. K. Kursad, H. Guzelbektes, I. Sen, Y. Koc, A. Naseri, M. Ince. Selcuk University, Faculty of Veterinary Medicine, Konya, Turkey

Mitral regurgitation (MR) in dogs is mostly caused by chronic degenerative mitral valvular disease (DMVD). The severity of regurgitation may be quantified by various means. The maximal ratio of the regurgitant jet area signal by Color Doppler to left atrium area (ARJ/LAA) is a semiquantitative method. The other method to determine regurgitant volume (RegV) quantitively is the subtraction method, where the regurgitant volume (RegV) is determined by subtracting the effective systemic stroke volume from the total, left ventricular stroke volume. There is a debate about the value of each of these quantification methods and only a few studies have reported the comparative value. The goal of this study was to compare these methods to quantify RegV and regurgitant fraction (RF) in asymptomatic Anatolian Shepherd Dogs (ASH) with DMVD.

The severity of heart disease was classified using the CHIEF system based on radiographic heart and echocardiographic left atrium (LA) size. The control group consisted of 35 healthy ASH. In 38 ASH with DMVD (20 B1 and 18 B2), the severity of MR was assessed by ARJ/LAA and subtraction method.

The severity of mitral regurgitation determined by ARJ/LAA was significantly ($P < 0.05$) higher in B2 group than B1 group. The RegV in B1 dogs (20.9 ± 3.3 ml) was statistically ($P < 0.05$) different from B2 dogs (65.9 ± 6.2 ml). The RF in B1 dogs ($24 \pm 3\%$) was statistically ($P < 0.05$) different from B2 dogs ($41 \pm 3\%$). ARJ/LAA was positively correlated to left atrial to aortic root ratio (LA/Ao), N-terminal pro-BNP (NT-proBNP), RegV and RF. RegV was positively correlated to LA/Ao, NT-proBNP and RF. RF was positively correlated to LA/Ao, NT-proBNP and RegV. Observed agreement between the assays was 81% for ARJ/LAA versus RegV and was 73% for ARJ/LAA versus RF, and kappa statistic values for ARJ/LAA versus RegV and for ARJ/LAA versus RF were 0.63 (substantial agreement) and 0.50 (moderate agreement) respectively. In our hands, ARJ/LAA was easy to obtain as opposed to subtraction method.

Our results indicate that each quantification method was valuable to assess the severity of disease in ASH with MR and all were in good accordance with echocardiographic heart size and NT-proBNP levels. Therefore, each of these non-invasive methods may be useful to serially assess the severity of MR in DMVD in order to monitor the progression of disease. Future studies have to evaluate, if these will be useful to predict the risk or time of decompensation in asymptomatic dogs.

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ESVNU – European Society of Veterinary Nephrology and Urology

ESVNU-P-1
EFFECTIVENESS OF A FEED SUPPLEMENT TO CONTROL HYPERPHOSPHATEMIA AND METABOLIC ACIDOSIS IN ADVANCED STAGES OF FELINE CHRONIC KIDNEY DISEASE (CKD). N. Bruni[1], E. Biesibetti[2], R. Rizzi[3], M. Bigliati[4], T. Cocca[5]. [1]Candioli farma, Beinasco, Italy, [2]Dep. of Veterinary Science, University of Turin, Grugliasco, Italy, [3]Dep. of Veterinary Science and Public Health, University of Milan, Milano, Italy, [4]Istituto Profilattico e Farmaceutico Candioli & C. S.p.A, Beinasco, Italy, [5]Clinica Veterinaria Napolivet, Napoli, Italy

When diet alone is not sufficient it is necessary to supplement the diet of CKD cats with specific substances[1]. These are phosphate binders and alkalinizing agents. The aim of this retrospective study was to evaluate the effectiveness of a feed supplement containing a mix of substances to bind the phosphate and correct the metabolic acidosis in cats with CKD (IRIS, International Renal Interest Society, stage 3 and 4). 10 cats (median BW 4 (3;6) Kg, BCS 3/5 (2;4), 11 (9;12) years) fed with a balanced renal diet were involved in the retrospective analysis. Treatment consisted in oral administration of the product (Renal, Candioli Pharma) containing calcium carbonate, calcium lactate gluconate, sodium bicarbonate and chitosan given for 60 days. The animals were evaluated at the beginning of the study and at 15, 30, 60 days (T0, T15, T30, T60) for: BW, BCS, food intake, blood pressure and for routinely hematochemical, biochemical and urinary parameters. All statistical analyses were performed using SAS software. After checking normality data were analyzed using Kruskal-Wallis and Wilcoxon tests. Results are expressed as median (interquartile range). Letters show differences among rows ($P < 0.05$).

Statistically significant reduction of serum phosphorus concentration was obtained through the study (reduction of 59% at T60 versus T0). Also a statistically significant increase of bicarbonate was seen (7% from T0 to T60). At T60 was also recorded an increase of ionized calcium level, which however was in normal range. It was also detected a statistically significant difference for the albumin/globulin ratio between day 15 and day 60.

Even if many studies on phosphate binders are conducted on healthy animals it is important to evaluate their efficacy also in cats with CKD. In fact the addition of a phosphorus binder may reduce food intake in azotemic cats[3] but that effect was not seen in the present study. The feed supplement was effective to reduce blood phosphate levels and to increase blood bicarbonate levels, thus improving cats' clinical conditions for the duration of the study.

Disclosures: Candioli Farmaceutici is the funding sponsor in writing the manuscript and the feed producer (Candioli Renal).

ESVNU-P-2
RELATIONSHIP AND CLINICAL RELEVANCE OF URINE OSMOLALITY AND SPECIFIC GRAVITY IN HEALTHY CATS RECEIVING VARIOUS INTRAVENOUS SOLUTES. T. Bouzouraa, J.M. Bonnet-Garin, M. Hugonnard, B. Rannou, L. Chabanne, J.L. Cadoré. VetAgro Sup Lyon, Marcy l'étoile, France

In humans, urine osmolality (UOsm) is better than specific gravity (USG) in assessing renal function. USG and UOsm correlate well in concentrated urine of non-perfused healthy cats. In cats suspected of early chronic kidney disease (CKD) receiving intravenous (IV) infusion, decreased USG is difficult to inteprete. It reflects either tubular injury or urine dilution following infusion-induced diuresis. To date, the consequence of IV infusion on USG, UOsm and their relationship remains unknown.

We evaluated individual variation and relationship of USG and UOsm in healthy cats receiving IV infusion over 24 hours.

Non-fasted healthy cats under 5 years, belonging to students of our Veterinary Teaching Hospital received IV infusion (4 ml/kg/h) of Lactated Ringer (RL) or NaCl, and were sampled by cystocentesis at baseline (T_0) and T_2, T_6, T_{12}, T_{24}. Target number of samples was 60. Baseline urine dipstick and sediment were normal. Three students, blinded to the measurements of the others, evaluated USG (3 measurements) and corresponding UOsm (2 measurements) in random order. Inter- and intra-observer variability were assessed (Pearson coefficient; PC). The relationship was studied and variations of median UOsm and USG were compared with baseline (Wilcoxon-Mann-Whitney test). The effect of the solute infused was assessed. Our institutional ethical committee approved the protocol.

Sixteen cats were included, among them 6 females and 10 males (median age: 24 months, median weight: 4.1 kg). Half received RL and the remainders, NaCl. In all, 67 samples were treated. No complication occurred.

Minor variations in USG measurements supported excellent analytic precision of optic refractometry. Median USG and UOsm correlated well for all samples (PC > 0.981). Median USG significantly decreased from baseline at T_{12} and T_{24} (but not at T_2 and T_6) whereas median UOsm significantly decreased from baseline at

T_6, T_{12} and T_{24} (but not at T_2, $P < 0.01$). The 2 parameters varied similarly regardless of the solute infused.

USG and UOsm correlated strongly regardless either of urine dilution or the type of infused solute (probably because we used 2 isotonic solutes of close osmolality). Clinicians can keep using USG as a reliable surrogate for renal function. UOsm and USG significantly decreased after 6 and 12 hours of IV infusion, respectively. It remains unknown whether these observations in healthy cats are relevant in practice to cats suspected of early CKD. If so, clinicians would have 12 hours after beginning IV infusion to sample urine and evaluate USG reliably.

Disclosures: No disclosures to report.

ESVNU-P-3

FORMULA FOR ESTIMATION OF URINE OSMOLALITY IN HEALTHY CATS. T. Bouzouraa, J.M. Bonnet-Garin, M. Hugonnard, B. Rannou, L. Chabanne, J.L. Cadoré. VetAgro Sup Lyon, Marcy l'étoile, France

In humans, urine osmolality (UOsm) is better than urine specific gravity (USG) in assessing hydration status and renal function. In veterinary medicine, UOsm cannot be used routinely as few clinics are equipped with osmometers. Some studies provided formulas for the estimation of serum osmolality in cats using concentrations of major cations (sodium, chloride) and unchanged molecules (urea, glucose) but there is, for now, no publications that propose an estimate of UOsm.

We aimed at deriving formulas to estimate urinary osmolality in healthy cats receiving intravenous (IV) infusion for a 24-hour period.

Non-fasted healthy cats under 5 years, belonging to students of our Veterinary Teaching Hospital and with normal clinical findings were sampled by cystocentesis at baseline (T_0) and T_2, T_6, T_{12}, T_{24} after the beginning of IV infusion (4 ml/kg/h) of isotonic solute. Baseline urine dipstick and sediment analysis were normal and chronic kidney disease was excluded according to IRIS guidelines (2013). Three students, blinded to the measurement of others, evaluated UOsm in random order, on 2 separate occasions, using a freezing point depression osmometer (Roeblingosmometer®, Giessen, Germany). Urine samples were further submitted for measurements of urea, creatinine, sodium, chloride, potassium and glucose concentrations using an automated analyzer (Konelab 30i®, Thermo Scientific, Cergy Pontoise, France). After visual inspection of quantile-quantile plots to confirm normal distribution, relationships between urinary metabolites and effective UOsm were studied through linear regression with subsequent evaluation of the Pearson's correlation coefficient (PC). Our institutional ethical committee approved the protocol.

Five cats (4 females, 1 male, median age: 21 months, median weight: 3.9 kg) were sampled five times over 24 hours. In all, 23 samples were treated. No complication occurred.

Median (Minimum-Maximum) UOsm was 1935 (420–2878) mosm/kg. The statistical analyses used only the more reliable parameters including median urea (1130.1 mmol/l; 71.9–1735.9), sodium (153.5 mmol/l; 87–202), potassium (11.2 mmol/l; 11.1–11.4) and glucose (4.45 mmol/l; 1.4–9.7). It resulted in the following formula (PC = .959):

$$\text{UOsm} = 1.2^{*}\text{urea} + 2^{*}\text{potassium} + 2^{*}\text{sodium} + 35^{*}\text{glucose}$$

In this population of healthy cats, UOsm is best estimated using the formula described. As UOsm is more accurate than USG, this formula can be used in clinical practice to help the veterinarian. Indeed, the practitioner doesn't need sophisticated osmometer but only standard biochemistry analyzers with adequate handling and dilution of urine to evaluate UOsm. The derived formula needs to be validated in future research.

Disclosures: No disclosures to report.

ESVNU-P-4

SYMMETRIC DIMETHYLARGININE (SDMA) AS KIDNEY BIOMARKER IN CANINE AND FELINE CANCER. M. Yerramilli[1], M. Yerramilli[1], G. Farace[1], J. Robertson[1], R. Relford[1], D. Jewell[2], J. Hall[3]. [1]IDEXX Laboratories, Westbrook, USA, [2]Hill's Pet Nutrition Inc, Topeka, USA, [3]Oregan State University veterinary School, Corvallis, USA

The risk of functional impairment of the kidney, CKD and AKI, is a common problem in cancer due to infiltration or nephrotoxic chemotherapeutics. While about 40% of human lymphoma patients are known to have compromised kidney function, only 20% of the affected patients are diagnosed by creatinine while the remaining 80% require biopsies for diagnostic accuracy. A study of 5000 human patients with a variety of solid tumors demonstrated that the prevalence of reduced GFR was about 52% and 12% had advanced CKD (stages 3–5). Given the increased incidence of cancer; new therapies are being developed at a frenetic pace leading to an increased need to identify kidney disease early and highlighting the demand for more effective and sensitive biomarkers. At this time such detailed information is nonexistent for veterinary patients, however there is no reason to think that it is any different.

Methylation of arginine is a signaling process with asymmetric methylation activating transcription and expression while symmetric methylation is a repressive signal. It's important to understand if increased protein turnover in malignancies will lead to increased production of dimethylarginines. In a human study that included different types of cancer, ADMA but not SDMA, was shown to have significantly increased in the cancer cohort compared to controls. The observed increase in SDMA is likely due to impaired kidneys and not cancer related increased production of SDMA; while the increase in ADMA is likely due to increased protein turnover as a result of transcriptional activation.

To look at the causes behind increased SDMA in veterinary patients with cancer, we have investigated SDMA in canine and feline patients using banked samples and correlated to histopathology. The study looked at a total of 19 patients (10 dogs and 9 cats) with a variety of malignancies including lymphoma, hemangiosarcoma, osteosarcoma, lymphosarcoma, pancreatic carcinoma, prostatic TCC, mammary tumors, colonic adenocarcinoma and hepatocellular carcinoma. SDMA concentrations ranged from 8–26 ug/dL with 7 patients having above reference limit (15–26 ug/dL). Necropsies were performed on all patients along with histopathology. The seven patients with increased SDMA had histopathology findings indicating kidney disease or neoplastic infiltration. No renal findings were reported for patients with normal SDMA. In a retrospective evaluation of 50 cats and dogs with neoplasia ~15% had increased SDMA while only 2% had elevated creatinine.

To conclude in patients with neoplasia, the increase in SDMA correlated with histopathologic findings that supported compromised kidneys.

Disclosures: Disclosures to report: Murthy Yerramilli, Mahalakshmi Yerramilli, Giosi Farace, Jane Robertson and Roberta Relford are all employees of IDEXX Laboratories Inc. Dennis Jewell is an employee of Hill's Pet Nutrition Inc.

ESVNU-P-5

ACUTE RENAL FAILURE SECONDARY TO LEPTOSPIROSIS IN 29 DOGS: IMPACT OF INTERMITTENT HEMODIALYSIS AND OTHER PRONOSTIC FACTORS ON SURVIVAL. F. Serres. ONCOVET, Villeneuve d'ascq, France

Despite progress in early diagnosis and recognition, acute renal failure attributable to leptospirosis remain a challenging condition. Intensive care and costly procedures, including renal replacement therapy are frequently recquirred.

A retrospective study focusing on dogs presenting for intermittent haemodialysis treatment, in which a diagnosis of acute renal failure secondary to confirmed leptospirosis was conducted.

Epidemiological, clinical and paraclinical datas a diagnosis were recorded. Survival at discharge and long term outcome was recorded.

A total of 29 dogs were included in this study over a 4 years period (mean weight 24 kg), with 22 differents breeds.

Dyspnoea was present at diagnosis in 28% of cases, whereas 2 dogs presented with neurological signs (seizure and coma). Mean

sérum urea and creatinine value were markedly elevalted at diagnosis (4.8 g/L and 102 mg/L respectively), 25% of dogs were initially oliguric to anuric.

Diagnosis of leptospirosis rely on MAT for 23/29 dogs and identify a prédominant reaction to the Australis serogroup in 16/23 dogs. In 6 dogs diagnosis of leptosirosis infection rely on PCR examination of blood and urine.

Five dogs died or were euthanazied during or shortly after the first dialysis treatment. Four dogs presented acute hemoptysis and one dog present persistent anuria with hyperkaliemia. Twenty of the 24 remaining dogs survived at discharge. However, three dogs presented chronic renal failure following initial acute crisis.

Polypnea at diagnosis, anuria and neurologic signs had a negative impact on survival, whereas urea and creatinine value did not.

Disclosures: No disclosures to report.

ESVNU-P-6
COMPARISON OF BACTERIAL CULTURES FROM THREE URINE COLLECTION METHODS AND EJACULATES IN HEALTHY DOGS. M. Oscarson, H.S. Lund, N. Ottesen, H. Sørum, A.V. Eggertsdóttir. Norwegian University of Life Sciences, Oslo, Norway

The aim of this prospective study was to compare three methods of urine sampling and ejaculates with regard to bacterial growth. The study was performed at the Norwegian University of Life Sciences between November 2012 and March 2013. Twenty healthy intact dogs aged 1–6 years (10 females, 10 males) were included in the study.

Three urine samples were collected within 48 hours and in the same order for each dog: (i) voided, (ii) voided after cleaning the external genitals (clean voided), (iii) cystocentesis. Each urine sample was analysed by urine dipstick, microscopy of sediment, and bacterial culture. After cleaning the prepuce, an ejaculate was also collected from each of the male dogs and cultured.

Nine of the dogs did not have bacterial growth from any of their samples (seven females, two males). Bacterial growth was found in 7/20 voided samples (three females, four males), and in 4/20 clean voided ones (one female, three males). No bacteria were cultured from any of the cystocentesis samples, but 7/10 ejaculates had bacterial growth.

Three females had bacterial growth from their voided urine, but only one of these remained positive after cleaning.

Of the four males with bacteria in the voided samples, one did not have any growth from the clean voided sample but growth from the ejaculate. Two of the dogs had a positive culture from both the clean voided sample and the ejaculate, while the fourth dog had no bacteria grown from either clean voided urine or the ejaculate.

Three male dogs had negative cultures from all three urine samples, but grew bacteria from the ejaculates. Further, one dog had a negative bacterial culture from the voided urine, but positive cultures from both the clean voided urine and the ejaculate. Two male dogs had negative cultures from all samples.

The bacteria grown from the different samples were: *Mycoplasma canis*, *Pasteurella* spp., *Pasteurella multocida*, *Enterococcus faecium,* and mixed floras.

This study shows a large proportion of negative cultures from voided urine samples. This is of clinical relevance since a negative culture is useful regardless of sampling method. There was no consistent pattern in the relationship between the culture results from the different sampling methods and ejaculates. Unexpectedly, the ejaculates showed a large proportion of positive cultures. These results could suggest a prostatic origin of some of the bacteria causing bacteriuria in voided samples from healthy intact dogs.

Disclosures: No disclosures to report.

ESVNU-P-7
PERFORMANCE EVALUATION OF TWO COMMERCIALLY AVAILABLE SYMMETRIC DIMETHYL ARGININE (SDMA) ASSAYS. P.A. Prusevich, J. Li, M. Yerramilli, J.A. Cross. IDEXX, Westbrook, USA

Chronic kidney disease is a condition characterized by a gradual loss of kidney function over time. SDMA has been demonstrated as a renal biomarker important for early diagnosis and accurate staging of CKD. The gold-standard methodology for SDMA quantitation is Liquid Chromatography-Mass Spectrometry (LC-MS).

Canine and feline serum samples were used to evaluate accuracy and precision of two commercially available SDMA assays, the IDEXX SDMAtm Test, which is veterinary validated against CLSI guidelines, and a non-veterinary validated, research use only, human SDMA-ELISA test.

All testing was conducted per manufacturer's standard procedures.

Samples were sourced from feline and canine serum submitted to IDEXX Reference Laboratories for general chemistry testing.

Accuracy was assessed by assaying thirty-seven feline and twenty-nine canine serum samples in duplicate for both SDMA assays and comparing mean results against the gold standard LC-MS SDMA result. Nineteen canine and twenty feline samples tested within the LC-MS reference range. All 19 canine and 18 of the 20 feline samples also tested normal on the IDEXX SDMAtm Test. The two feline discrepant samples were cut-off samples averaging 2.2 ug/dL higher than the LC-MS SDMA value. Twelve of those same 19 normal canine and all 20 of the feline normal samples returned elevated results on the SDMA-ELISA. The canine discrepant samples were an average of 7.3 ug/dL higher than the LC-MS value (range 1.9 to 12.9 ug/dL). The feline discrepant samples were an average of 10.4 ug/dL higher than the LC-MS value (range 4.0–18.2 ug/dL).

Precision was determined by assaying 40 replicates of both feline and canine normal serum pools using each SDMA assay. For the IDEXX SDMAtm Test, the canine and feline pool SDs were both 0.7, while the SDMA-ELISA SDs were 1.9 and 2.3, respectively.

The IDEXX SDMAtm Test shows superior accuracy and precision over the human SDMA-ELISA. The positive bias and poor precision of the SDMA-ELISA test severely limits its clinical utility for diagnosing and staging of CKD in dogs and cats.

Disclosures: Disclosures to report: There is a potential indirect disclosure to report. The authors all work for IDEXX, which runs a laboratory service that performs an assay that is discussed in the abstract.

ESVNU-P-8
THE EVALUATION OF ENZYMURIA AND MICROALBUMINURIA IN DOGS WITH LOWER URINARY TRACT DISORDERS. B. Dokuzeylül[1], F.A. Akdogan Kaymaz[2]. [1]Faculty of Veterinary Medicine, Istanbul University, Istanbul, Turkey, [2]Department of Internal Medicine, Faculty of Internal MedicineIstanbul University, Istanbul, Turkey

Upper and lower urinary tract disorders of small animals are commonly seen in our country. When 2/3 of the kidneys become dysfunctional, clinical signs are apparently present in the patient. In this study, enzymuria and microalbuminuria were evaluated in eighty dogs with the lower urinary tract symptoms (pollakiuria, dysuria-stranguria, hematuria, urinary incontinence, polyuria, polydipsia, excessive licking of the urogenital area) that were referred to Istanbul University, Veterinary Teaching and Research Hospital, Internal Medicine Clinics. Blood and urine samples were collected aseptically from each dog. The specific parameters that were detected in the study were; urine microalbumin concentration (Heska® E.R.D.-HealthScreen Canine Urine Test), urine protein creatinine ratio (UPC), urine culture and enzymes (urine N-acetyl-beta-D-glucosaminidase (NAG), Alkaline phosphatese (ALP), Gamma Glutamyl Transferase (GGT), Lactate Dehydrogenase (LDH), Alanin Aminopeptidase (AAP)). The blood pressure was measured with high definition oscillometric device (Memodiagnostic®). Statistical analysis "General Linear Model"was based on gender, age, nutrition, microalbuminuria and urinary tract disorders of the dogs. With the comparison of urine dipstick, urine protein-creatinine ratio and microalbuminuria test results, it was agreed that microalbuminuria test was the most trustable and the practical method in small animal practice. It was also determined that microalbuminuria levels could be affected from the many factors like age and nutrition. Except microalbuminuria, the enzymes especially NAG and AAP were markedly elevated in dogs with lower urinary tract disorders. Thus, it was approved that parameters that were controlled in this study, can be easily used in

routine veterinary practice. Thereby, with the early detection of proteinuria, it was aimed to notice fractional variations in the kidneys and increase the duration of life span and the life quality of dogs. The present work was supported by the Research Fund of Istanbul University Project No: T-55/15122006

Disclosures: This study was my doctorate thesis. It was funded by the Research Fund of Istanbul Universty, Project No: T-55/15122006

ESVNU-P-9

PLASMA SYMMETRIC DIMETHYLARGININE (SDMA) CONCENTRATION IN DOGS WITH ACUTE KIDNEY INJURY (AKI) AND CHRONIC KIDNEY DISEASE (CKD). D. Dahlem[1], R. Neiger[1], A. Schweighauser[2], T. Francey[2], M. Yerramilli[3], E. Obare[3], S. Steinbach[4]. [1]Small Animal Clinic, Justus-Liebig-University, Giessen, Giessen, Germany, [2]Small Animal Internal Medicine, Vetsuisse Faculty University of Bern, Bern, Switzerland, [3]R&D, IDEXX Laboratories Inc., Westbrook, ME, USA, [4]Purdue University, College of Veterinary Medicine, West Lafayette, IN, USA

SDMA is a biomarker for AKI in human medicine. The aim of this study was to investigate SDMA in dogs with AKI and to assess if SDMA discriminates AKI from CKD. Blood samples stored for a previous study to investigate renal biomarkers in dogs with AKI or CKD were analyzed for SDMA. Over a period of 1 year SDMA was measured in all dogs with renal azotemia (48 AKI, 29 CKD) and 18 healthy control dogs and SDMA/creatinine ratio was calculated.

Median (range) plasma creatinine concentration in healthy dogs, dogs with AKI, and dogs with CKD were 0.9 mg/dL (0.6–1.2 mg/dL), 7.3 mg/dL (2.3–23.0 mg/dL), and 3.6 mg/dL (1.0–13.2 mg/dL), respectively. Median plasma SDMA concentration were 8.5 µg/dL (6–12 µg/dL), 39.5 µg/dL (8 to >100 µg/dL), and 35 µg/dL (12 to >100 µg/dL), respectively. Median SDMA/creatinine ratio in dogs with AKI and CKD were 6.5 (1.7–20.9) and 10 (2.4–33.9), respectively. Plasma SDMA concentration was significantly higher in dogs with AKI ($P < 0.0001$) and CKD ($P < 0.0001$) in comparison to healthy dogs. SDMA concentration in dogs with AKI and CKD were similar ($P > 0.9999$). Although there was considerable overlap of the SDMA/creatinine ratio in dogs with AKI and CKD, it was significantly higher in dogs with CKD compared to dogs with AKI ($P = 0.0004$). SDMA is suitable for identifying dogs affected by AKI or CKD. Further research is necessary to investigate the usefulness of SDMA/creatinine ratio in AKI.

Disclosures: M. Yerramilli and E. Obare are employees of IDEXX Laboratories. Measurement of SDMA concentration was performed by IDEXX Laboratories free of charge.

ESVNU-P-10

MICROALBUMINURIA IN HEALTHY DOGS. F. Manczur, F.A. Falus, Z. Vizi. University of Veterinary Science, Budapest, Hungary

Microalbuminuria is a term used to describe urine albumin levels not detected by a dipstick test, i.e. lower than 30 mg/L. Similarly to urinary protein measurement, spot urine albumin concentration is usually normalized to the urinary creatinine values. The upper normal value of spot urinary albumin concentration has not been determined in dogs, thus laboratories often use the human reference value: 0.03 (mg urinary albumin/mg urinary creatinine). Some authors also quote the human reference value of 10 mg/l urinary albumin concentration as the upper normal level of albuminuria for healthy dogs. Whether this value is obtained with or without normalizing the urine concentration to 1010 specific gravity is not always clear from the description of the methods. Sighthounds are claimed to have higher arterial blood pressure and higher urinary albumin concentrations than other dog breeds.

The aim of the study was to determine urinary albumin concentration and albumin/creatinine ratio from spot urine samples of healthy dogs including sighthounds.

Client owned, non-lactating, non-pregnant dogs underwent complete physical exam, abdominal ultrasound, blood work and urinalysis (including sediment analysis, total protein, determination). Urine was obtained by cystocentesis and microalbumin was measured with commercial human immunoturbidimetric methods that had been formerly validated to be used in this species. The blood pressures of the greyhounds were measured on the tail with high definition oscillometric method. Exclusion criteria was history of current disease, hypertension, proteinuria (≥0.5 urinary prot/crea ratio), elevated creatinine level, abnormal findings during physical or ultrasound exams, elevated WBC, TP or CRP levels suggestive of inflammatory disease.

Originally sixty five dogs were recruited, but after laboratory data become available 4 dogs were excluded because of proteinuria. Thus the study eventually included 61 dogs (27 sight hounds and 34 non-sighthounds). There were no statistical differences between the age, bodyweight, degree of proteinuria or microalbuminuria between the two groups. Median microabuminuria was 5 mg/l (range 0–108 mg/l) and median urinary albumin/creatinine ratio was 0.002 (0–0.048).

Urine albumin concentration itself (without being normalized to specific gravity or creatinine level) is not suitable to identify dogs with albuminuria. The human reference value of urinary albumin/creatinine ratio (0.03) seems also appropriate to be used in dogs as there were only one clinically healthy dog above this value in this study.

Disclosures: No disclosures to report.

ESVNU-P-11

TRANSURETHRAL ULTRASOUND GUIDED BIOPSY OF URINARY BLADDER LESIONS IN MALE DOGS: SIX CASES. A. Cocci[1], A. Baio Dvm[2], P. Knafelz[2], V. Greci[2]. [1]Clinica Veterinaria Cà Bianca, Milano, Italy, [2]Ospedale Veterinario Gregorio VII, Piazza di Villa Carpegna 52, Roma, Italy

Urinary lesions of the urinary bladder are represented by tumours, polyps, eosinophilic cystitis and chronic urinary bladder inflammation which can resemble urinary bladder growth.

For definite diagnosis cytological and histopathological examination is required. Fine needle aspiration has been associated with metastatic tract along the needle path; brushing and traumatic catheterism have been used with variable results.

Cystoscopy and surgery are the most effective techniques for collecting samples of urinary bladder lesions. Both procedures can be expensive and cystoscopy is size limited in male dogs when compared to female dogs.

The aim of this work is to evaluate the effectiveness of transurethral ultrasound guided biopsy of urinary bladder lesions in male dogs. The authors hypothesized that the passage of an atraumatic flexible endoscopic biopsy forceps (1.6 mm diameter) through the urethra in male dogs would allow to collect suitable sized samples for cytological and histopathological diagnosis.

Six male dogs of different size diagnosed with a urinary bladder lesion were enrolled in the study.

One dog was a 33 kg Labrador retriever, one dog a 10 kg Welsh Terrier and the other four dogs were cross breed dogs weighing 9 kg, 17 kg, 30 kg and 50 kg respectively. Mean age was 9.2 years (7–12 years).

Five dogs exhibited recurrent haematuria of a mean duration of 4 weeks and one dog had a history of urinary incontinence of 12 weeks duration.

All dogs underwent general anaesthesia and local urethra anaesthesia; the endoscopic biopsy forceps was passed through the urethra and biopsies performed under ultrasound guidance. A minimum number of six biopsies was taken. Samples were submitted for both cytological and histopathological evaluation.

In five dogs there was full agreement between cytology and histopathology evaluation and diagnosis was transitional cell carcinoma (TCC); in one dog the procedure was repeated because of discordance between cytological and histopathological diagnosis on first sampling, being cytology consistent with a TCC and histopathology with an eosinophilic cystitis. On second sampling, histopathology was consistent with TCC. Two dogs were followed for a 6 months period and extension of the TCC along the urethra was not detected on subsequent controls.

Transurethral ultrasound guided biopsy of urinary bladder lesions in male dogs can represent an effective, minimal invasive and non-expensive procedure for the diagnosis of urinary bladder lesions in male dogs and allows to avoid the size limit. Further evaluation of a larger number of cases is recommended.

Disclosures: No disclosures to report.

ESVNU-P-12

EVALUATION OF A URINE DIPSTICK TEST AND URINE SPECIFIC GRAVITY TOGETHER FOR CONFIRMATION OR EXCLUSION OF PROTEINURIA IN CATS. J. Pérez-Accino Salgado[1], E. García Manzanilla[2], J. Puig[1]. [1]Hospital Ars Veterinaria, Barcelona, Spain, [2]TEAGASC, The Irish Food and Agriculture Authority, Cork, Ireland

Proteinuria in cats has been associated with the diagnosis, prognosis and monitoring of several conditions, including chronic kidney disease. The urine dipstick test (UDT) is the most common method used to assess proteinuria in practice, and the urine protein-to-creatinine ratio (UPCR) helps to confirm and quantify it. The purpose of this study was to assess a UDT together with the urine specific gravity (USG) as a possible predictor of the UPCR in cats. In the authors' knowledge this has been previously described for dogs, but it has not been studied in cats.

Records between January 2011 and March 2016 from a mixed first opinion and referral hospital were retrospectively reviewed. Sixty-eight normal colored urine samples obtained by cystocentesis were included. All had undergone a complete urinalysis including UDT; resulting in inactive sediment and a pH≤7.5. All statistical analyses were performed using a statistical package (SAS 9.2). A UPCR <0.2 was used to indicate the absence of proteinuria according to the IRIS classification scheme. Samples were grouped by USG (≤1.012 or >1.012; ≤1.035 or >1.035) and were analyzed comparing 0 + versus 0 + and traces+ as a negative result.

Agreement of the two methods measured as Cohen κ was not good. Only when 0 + and traces+ were considered dipstick-negative in samples with USG > 1.012 κ coefficient was 0.3 (0.05–0.54, $P = 0.02$). When data was analyzed considering 0 + as dipstick-negative regardless of the USG, the sensitivity was 81.8% (67.3–91.8%, $P < 0.001$) and the specificity was 25% (9.8–46.7, $P = 0.02$). A sensitivity of 91.4% (76.9–98.2, $P < 0.001$) was obtained considering 0 + as a negative result in samples with USG > 1.012. The specificity in this group was 25% (9.8–46.7, $P = 0.02$).

This study showed a poor correlation between the two assessed diagnostic methods. The results matched with the previously described high sensitivity and poor specificity for the diagnosis of proteinuria with UDT in cats. The higher sensitivity (91.4%) was achieved when considering only 0 + as a dipstick-negative result in samples with USG > 1.012, although a greater population would be needed to perform a more representative assessment.

The results showed a very poor agreement between these two tests in cats compared to a previous study performed in dogs. Despite this, it can be concluded that in cats, a 0 + result in the UDT in samples with USG > 1.012 has a high sensitivity to rule out proteinuria, classified as UPCR < 0.2.

Disclosures: No disclosures to report.

ESVNU-P-13

PRESENCE OF ACTIVE URINE SEDIMENT IN DOGS IS NOT ASSOCIATED WITH SIGNIFICANT CHANGES OF URINE PROTEIN-TO-CREATININE RATIO. R. Huvé, L. Plante, M. Diemer, F. Palanché, A. Geffré, C. Trumel, R. Lavoué. National veterinary school of Toulouse, Toulouse, France

Repeated urinalysis and quantification of proteinuria is of central importance for management of canine kidney disease. Although natural voiding doesn't affect urine protein-to-creatinine ratio (UPC) when sediment is inactive, cystocentesis is recommended to decrease contamination by genitourinary tract and reliably interpret UPC. This prospective study aimed to investigate influence of different collection techniques on the presence of inflammatory sediment and on UPC.

Dogs that were presented at the National Veterinary School of Toulouse and that needed urinalysis were included. Urine was collected from each dog within 3 hours, by free-catch (FC), free-catch after perineal cleaning (FCC) and cystocentesis (CYS), in that order. Urine sediment was examined within 1 hour of collection. UPC was determined within 72 hr on −80°C stored supernatants. Effect of collection technique on presence of inflammatory sediment (>5 , and/or >5 WBCs, and/or >5 epithelial cells/hpf) and on UPC was assessed by binary logistic regression and ANOVA, respectively. A P-value <0.05 was considered significant.

Twenty-seven dogs were included. Median delay between FC and CYS was 30 minutes. Inflammatory sediment was found in 15, 4 and 9 samples collected by FC, FCC and CYS, respectively. Presence of an active sediment was significantly associated with method of collection ($P = 0.01$). When urine was collected by FC rather than CYS, it increased the probability of observing inflammatory sediment by an odds-ratio of 18. UPC was not affected by method of collection ($P = 1$).

FC might be useful and reliable for the follow-up of proteinuria in dog, regardless of the presence of inflammation.

Disclosures: No disclosures to report.

ESVE – European Society of Veterinary Endocrinology

ESVE-P-1

VALIDATION OF AN IN-CLINIC POINT-OF-CARE IMMUNOASSAY FOR MEASUREMENT OF TOTAL THYROXINE (TT4) CONCENTRATION IN SERUM FROM EUTHYROID AND HYPERTHYROID CATS. M.E. Peterson[1], M. Rishniw[2], G.E. Bilbrough[3]. [1]Animal Endocrine Clinic, New york, NY, USA, [2]Cornell University, Ithaca, NY, USA, [3]IDEXX Laboratories, Westbrook, ME, USA

In veterinary practice, in-clinic measurement of total thyroxine (TT_4) is commonly done for both diagnosis and monitoring, although the accuracy of some analyzers for TT_4 quantification has been questioned. Recently, IDEXX Laboratories introduced a novel immunoassay method to measure TT_4 on the Catalyst One Chemistry Analyzer (C1), a point-of-care instrument previously validated for chemistry testing.

The purpose of this study was to validate the C1 method for TT_4 measurement by sampling cats with a wide range of values and comparing results obtained with this in-clinic method to those obtained by a veterinary reference laboratory (VRL; IDEXX). The VRL used an automated enzyme immunoassay method for TT_4 (DRI T_4, Microgenics Corporation), previously validated for use in cats.

A blood sample for TT_4 determination was obtained from 157 cats examined at the Animal Endocrine Clinic (AEC). Of these, 127 cats were hyperthyroid (high TT_4) and 30 were evaluated after ^{131}I treatment (normal or low TT_4). Each serum sample was first analyzed in-house using the Catalyst TT_4 slide on a C1 analyzer. An aliquot of each sample was submitted to the VRL on the same day; the lab was blinded to the C1 results.

The median serum TT_4 concentration reported by the VRL was 103 nmol/L (interquartile range [IQR], 63–136), with a total range of 8–290 nmol/L. For the C1, the median TT_4 was 106 nmol/L (IQR, 64–147), with a range of 10–238 nmol/L. No statistical difference existed between TT_4 values obtained by the 2 methods ($P = 0.68$; Mann-Whitney U test).

The Catalyst Total T_4 assay also showed an excellent correlation to the reference method ($r = 0.969$; $P < 0.0001$). The mean difference (Bland-Altman plot) was 2.5 nmol/L. Limits-of-agreement (LOA) plot showed no fixed or proportional bias, but increased variation at the higher end of the dynamic range, above the region for clinical decision; a LOA plot of normalized differences showed that the 95% LOA were approximately ± 30%.

For both TT_4 methods, each cat's serum TT_4 concentration was also classified as low (<13 nmol/L), high (>50 nmol/L), or within-reference-interval (13–50 nmol/L; established at AEC using 56 clinically-normal cats >7 years). There was strong agreement (150 samples, 95.5%) based on the classification of results into these 3 groups.

In conclusion, our results show that the Catalyst TT_4 assay provides accurate and reliable serum TT_4 concentrations over a wide, clinically useful range in cats, providing in-clinic results equivalent to those obtained by a veterinary reference laboratory.

Disclosures: Disclosures to report: The primary and second author have nothing to disclose. No form of direct financial support was given to the first author or his clinic for the work done on this research study. The only support for this study was that the reagents for the in-clinic TT4 test were supplied at no charge by Idexx laboratories, the manufacture of the testing kit. The third author is an employee of Idexx Laboratories, Inc, the company that makes the in-clinic test TT4 test evaluated in this study. None of the data analysis were performed by this individual, however, and the results were not modified in any way for the company's benefit (this arrangement was made prior to initiation of the study).

ESVE-P-2

THE CONTRIBUTION OF BASELINE CORTISOL MEASUREMENT IN THE INTERPRETATION OF THE ACTH STIMULATION TEST IN THE DIAGNOSIS OF CANINE SPONTANEOUS HYPERADRENOCORTICISM: A RETROSPECTIVE STUDY OF 73 CASES.

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The ACTH stimulation test (ACTHST) is commonly used to screen dogs for spontaneous hyperadrenocorticism (HAC). This study aimed to evaluate the contribution of baseline cortisol in the interpretation of ACTHST. The study included samples from 73 dogs, submitted to a referral laboratory for evaluation of HAC by ACTHST, and completed questionnaires about the referring veterinarians' (rDVMs) interpretation of the results. rDVMs reported whether the test results were considered confirmatory for HAC, how baseline and post-stimulation cortisol were interpreted, and their final decision whether the dog had HAC. Most rDVMs (77%) considered both baseline (B) and post-stimulation (P) cortisol in their interpretation, either their difference (P-B) or their ratio (P/B). Receiver operator characteristics (ROC) analyses were used to assess the predictive accuracy of baseline cortisol alone, post-stimulation cortisol alone, P-B and P/B. The areas under the ROC curve (AUC) for baseline cortisol, P/B, P-B, and post-stimulation cortisol were 0.61, 0.62, 0.84 and 0.89, respectively, when the outcome was a confirmatory result, and 0.63, 0.58, 0.77 and 0.85, respectively, when the outcome was a final diagnosis of HAC. Post-stimulation cortisol AUCs were significantly higher than all other AUCs, excluding P-B AUC, for predicting a confirmatory result of HAC. In conclusion, post-stimulation cortisol demonstrated good discriminatory ability for the interpretation of the ACTHST, and for the final diagnosis made by rDVMs. It was either superior or comparable to P-B while baseline cortisol and P/B were ineffective. Baseline cortisol has no additive value in interpreting ACTHST results and diagnosing HAC by rDVMs.

Disclosures: No disclosures to report.

ESVE-P-3

PREVALENCE OF AND RISK FACTORS FOR FELINE HYPERTHYROIDISM IN SOUTH AFRICA.

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Feline hyperthyroidism is an emerging metabolic disease of middle-aged to older cats that seems to have shown a marked increase in its world-wide incidence within the last three decades as well as a marked geographic variation in prevalence. The exact pathogenesis of the disease still remains obscure and despite a plethora of epidemiological studies, clear risk factors have not been identified.

The purpose of this study was to determine the prevalence of feline hyperthyroidism in South Africa and to identify potential risk factors associated with the disease in this geographic location.

Serum total thyroxine (tT4), cTSH and free thyroxine (fT4) were measured in 302 cats aged 9 years and older that were presented at various veterinary clinics in South Africa. At the time of blood sampling a questionnaire was completed regarding vaccination history, internal and external parasite control, diet and environment.

Univariable associations of potential risk factors were assessed using a two-tailed Fisher's exact test and a multiple logistic regression model was then used to estimate their effect on the risk of hyperthyroidism. Associations between presenting clinical signs and hyperthyroidism were assessed on a univariable level using a two-tailed Fisher's exact test.

The prevalence of hyperthyroidism (tT4 > 50 nmol/L or tT4 between 30–50 nmol/L with TSH < 0.03 ng/ml and fT4 > 50 pmol/L) within this population was 7.0% [95% CI: 4.4, 10] with no significant difference in prevalence between healthy (5.1% [1.9, 11]) and sick (8.2% [4.6, 13]) cats. Cats ≥ 12 years of age (OR = 4.3 [95% CI: 1.2, 15], $P = 0.02$) and cats with canned food in their diet (OR = 2.1 [95% CI: 0.8, 5.4], $P = 0.1$) were more likely to be diagnosed with hyperthyroidism. . No statistically significant relationship between vaccinations, parasite control or indoor environment and hyperthyroidism was observed. Hyperthyroid cats were more likely to present with weight loss (OR = 3.2 [95% CI: 1.2, 8.9], $P = 0.01$) and with a heart rate ≥ 200 bpm (OR = 5 [95% CI: 1.7, 16.1], $P = 0.01$) than cats without the disease.

The prevalence of feline hyperthyroidism in South Africa appears to be similar to that previously documented in cats in Japan and Portugal but less than that documented in cats in the United Kindgdom and Germany. Risk factors for hyperthyroidism, previously found in other epidemiological studies, specifically older age and the presence of canned food in the diet also appear to be present in this study population.

Disclosures: No disclosures to report.

ESVE-P-4

CLINICAL AND BIOLOGICAL EVALUATION OF 66 HYPERTHYROID CATS TREATED WITH IODINE-DEFICIENT DIET.

D. Rochel, C. Amato, A. Pavageau, P. Nguyen, L. Jaillardon. Oniris, Nantes Atlantic College of Veterinary Medicine, Food Science and Engine, Nantes, France

Feline hyperthyroidism is currently treated with anti-thyroid drugs, surgery and/or radiotherapy. Recently, an iodine-deficient diet (Hill's® Prescription diet® y/d®: "y/d") emerged as an alternative treatment, but limited data are available on therapeutic effects on a large cohort. Sixty-six cats were retrospectively included, based on a diagnosis of hyperthyroidism (clinical signs and free thyroxinemia "fT4" >40 pmol/L). All received the iodine-deficient diet as a first-line treatment and as exclusive food. We aimed to assess the clinical and biological efficiencies of this diet.

Forty-seven females (41 spayed) and 19 males (16 neutered), mainly Domestic Short Hair (88%) and ranged from 8 to 20 years (median 13.6 years), were retrospectively included in the study. The main clinical signs at diagnosis were weight loss (94%), polyuropolydipsia (74%), polyphagia (67%), tachycardia (56%), digestive signs (54%) and palpable thyroid nodule (31%). The main biological signs were high fT4 (median: 68 pmol/L, range [40;100]), uremia >3.6 mmol/L for 46% of the cats, creatininemia >159 µmol/L for 11% and ALT >80 U/L for 62%.

54.3% of the cats received dry y/d, 5.7% the canned form and 40.0% both. The majority of the cats (90%) accepted to eat y/d but only 1/3 accepted it spontaneously in a first place. At the first control (median time = 64 days), the clinical efficiency was considered by the practioners as satisfactory for 40% of the cats, partial for 40%, and poor for 20%. Body weight was not significantly changed after y/d (3.6 kg [1.8–5.8] versus 3.3 kg [2.0–5.9]; $P = 0.82$). fT4 significantly decreased (68 pmol/L before y/d and 39 pmol/L after y/d, $P < 0.001$) with 47.8% of the cats having a fT4 < 35 pmol/L after treatment. No significant change was observed concerning uremia (6.6 mmol/L [1.2–10.8] before y/d and 3.0 mmol/L [1.2–6.5] after y/d; $P = 0.20$), creatininemia (81.4 µmol/L [23.0–212.4] before y/d and 77.9 µmol/L [20.4–179.7] after y/d; $P = 0.17$) and ALT activity (107 U/L [18–758] before y/d and 90 U/L [10–800] after y/d; $P = 0.90$) after treatment.

The iodine-deficient diet Hill's® y/d® was associated with a satisfactory clinical improvement in 40% of the cats and a significant decrease in fT4 two months after the beginning of the treatment. A long-term follow-up study is currently conduced to assess y/d

palatability, clinical and biological changes (particularly creatininemia and ALT activity) and survival on this cohort.

Disclosures: No disclosures to report.

ESVE-P-5

URINARY TRACT INFECCTIONS IN DOGS WITH DIABETES MELLITUS AND/OR HYPERADRENOCORTICISM: FREQUENCY, TREATMENT AND FOLLOW UP. I. Clares Moral[1], P. García San José[1], C. Arenas Bermejo[2], S. García Diez-Ropero[1], M.D. Pérez Alenza[1]. [1]Veterinary Teaching Hospital Complutense Madrid, Madrid, Spain, [2]Queen´s Veterinary School Hospital, Cambridge, UK

Urinary tract infection (UTI) is commonly associated with Diabetes mellitus (DM) or hyperadrenocorticism (HAC), with a frequency of 20–37% (DM), 46% (HAC) and 50% (both diseases). Aims of this study were to identify the frequency of bacterial UTI in dogs with DM or/and HAC, characterize the causative microorganisms and their antimicrobial susceptibility and its relationship with the control of the endocrine disorder.

Medical records of all dogs presented to the Internal Medicine Service of the Veterinary Teaching Hospital Complutense Madrid between January 2013 and December 2015 diagnosed with DM, HAC or both were reviewed. Only cases in which a urine culture was performed were included ($n = 60$). Dogs were classified considering the type and the control of the endocrine disease. Dogs with UTI were treated with appropriated antibiotics based on culture sensitivity. Animals were followed up and response to treatment was evaluated with urine culture.

Dogs were classified as follows, Group1: 22 dogs diagnosed with DM (37%); Group2: 27 dogs with HAC (45%) and Group3: 11 dogs with both diseases (18%). UTI was observed in 13/60 dogs (22%). In Group1, UTI was presented in 4 (18%) dogs. In Group2, 6 dogs (22%) had UTI and in Group3, 3 dogs (27%) had UTI. There was no significant relationship between UTI and control of the endocrine diseases. *Escherichia coli* was the most common organism isolated (6/13).

Considering the antimicrobial agents (AA) tested in 60% of the urinary cultures, marbofloxacin and ciprofloxacin were the AA with the highest in vitro susceptibility (89%, 88% respectively), followed by trimethoprime-sulfamethoxazole (64%) and nitrofurantoin (55%). Amoxicillin-clavulanic acid and enrofloxacin were effective antimicrobials, but presented elevated percentages of bacterial resistance (46%, 38%) The AA with highest percentages of resistance were nalidixic acid (75%) and first-generation cephalosporins (50%).

Follow up was possible in 8/13 dogs. Three of them had a persistent UTI. All bacteria isolated in this second urine culture were resistant to the AA previously used. After appropriate treatment of the persistant UTI, new cultures were performed, which didn't grow any microorganisms.

Frequency of UTI in dogs with DM and/or HAC is lower than expected; however bacteria isolated tend to be resistant to the AA most commonly used. Fluoroquinolones are the most susceptible antibiotics, however enrofloxacin, commonly prescribed, has a higher percentage of resistance. This suggests that UTI in dogs with endocrine disorders are difficult to eliminate with traditional antimicrobial treatment, and fluoroquinolones might be useful in this cases.

Disclosures: No disclosures to report.

ESVE-P-6

USE OF SIMVASTATIN IN DOGS WITH HYPERLIPIDEMIA. S. Garcia, P. Garcia Sanjose, I. Clares Moral, A. Vicente Montaña, M.D. Perez Alenza. UCM, Segovia, Spain

The most commonly used drugs to reduce cholesterolemia in humans are statins, which reduce cholesterol biosynthesis, modify lipid metabolism and have antiatherosclerotic effects. Treatment of hyperlipidemia in dogs is based on the control of the underlying disease and dietary management. The effect of statins on reducing cholesterolemia in dogs has not been reported. Aims of this study were to know the efficacy of simvastatin in dogs with hypercholesterolemia that not respond to dietary management, to evaluate toxicity and the effects on quality of life considering underlying disorders (diabetes mellitus, hyperadrenocorticism and hypothyroidism).

Ten dogs with hyperlipidemia were prospectively included in the study with the owner´s consent. Dogs with kidney disease IRIS III, IV and/or cardiac disease C, D and/or severe hepatic or pancreatic diseases were excluded. After management for one month with a low fat diet and treatment of underlying disorder (diabetes mellitus, hyperadrenocorticism, hypothyroidism or combination), treatment with simvastatin was started at 1 mg/kg/day SID VO in dogs with cholesterol >300 mg/dl. Follow-up was performed at one, three and six months after simvastatin administration.

Age of dogs ranged from 7 to 15 years old and were of different breeds. Before treatment ($n = 10$), plasma cholesterol levels ranged from 300–725 mg/dl (mean ± SD: 405.4 ± 199.6). At one month of simvastatin treatment ($n = 10$), plasma cholesterol levels ranged from 185–462 mg/dl (268.6 ± 115.3) ($P < 0.05$). At three months ($n = 5$), plasma cholesterol levels ranged from 181–399 (298 ± 109.9). At this moment, only three dogs have been re-evaluated six months after treatment.

Mild and transitory adverse effects were observed in three dogs and were solved with gastric acid inhibitors. Adverse effects were vomiting ($n = 1$), soft feces ($n = 1$), reduced appetite ($n = 2$) and transitory increase in liver enzymes ($n = 1$). One additional dog with kidney disease IRIS II (15 years of age) died at two month of treatment due to acute kidney failure, but any other adverse effect was observed previously.

Statins have been used in experimental studies in dogs to evaluate toxicity at higher dosages. However, to achieve a lipid-lowering effect, statins might be used at lower dosages, similar to described in humans. In this preliminary study, the use of simvastatin might be useful to reduce cholesterol levels in dogs with hypercholesterolemia. Even though its use is safe in dogs, it should not be used in dogs with severe kidney disease. Further studies with a larger number of dogs are needed.

Disclosures: No disclosures to report.

ESVE-P-7

A SIDE-BY-SIDE COMPARISON OF TWO ASSAYS FOR MEASURING CANINE AND FELINE TOTAL THYROXINE (TT4). E. Wolff[1], G. Bilbrough[2], G. Moore[1], L. Lynn[1], R. Murphy[2], C. Scott-Moncrieff[1]. [1]Purdue University, West lafayette, Iindiana, USA, [2]IDEXX Laboratories Inc., Westbrook, ME, USA

Numerous assays are available for measurement of TT4 in dogs and cats but there is no accepted 'gold standard'. The aim of this study was to compare results of a new total thyroxine assay with the Microgenics DRI® assay. We hypothesized that a new TT4 assay (IDEXX Catalyst® Total T4) would have acceptable correlation with the Microgenics DRI® TT4 assay with minimal bias.

Canine and feline serum samples were selected from samples sent to a reference laboratory for testing. TT4 concentration was measured using the Microgenics DRI® TT4 assay and the samples thereby assigned to four concentration ranges for each species to ensure a dynamic spread across the range. The samples were then stored at −80°C until assay. TT4 of each sample was then measured using both assay methods by technicians that were blinded to the group assignment. Pairwise Pearson correlation, linear regression and Bland-Altman method for agreement were performed on Stata™.

There were 181 canine and 332 feline samples. For canine samples (range 5.79–159.58 nmol/L), the r-value was 0.96, $r^2 = 0.93$, proportional bias range 7.6%–13.7% at 95% CI, mean difference and standard deviation of Bland-Altman difference = −4.37 nmol/L and 0.70 respectively. For feline samples (range 6.82–257.40 nmol/L), the r-value was 0.97, $r^2 = 0.94$, proportional bias = range 5.8%–9.5% at 95% CI, mean difference and SD of Bland-Altman difference = 0.49 nmol/L and 1.22 respectively.

There was strong correlation between assays with a bias for both canine and feline samples. The significance of this bias is unknown in the absence of a gold standard.

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ESVE-P-8

PREVALENCE OF HYPERTENSION IN DOGS WITH HYPERADRENOCORTICISM AT DIAGNOSIS. P. García San José[1], C. Arenas Bermejo[2], I. Clares Moral[1], S. García Díaz-Ropero[1], M.D. Pérez Alenza[1]. [1]Complutense University of Madrid, Madrid, Spain, [2]Queen's Veterinary School Hospital, University of Cambridge, Cambridge, UK

Systemic hypertension is common in dogs with hyperadrenocorticism (HAC), however its prevalence and factors associated have not been frequently reported. The aims of this study were to determine prevalence and severity of hypertension in dogs with HAC at the time of diagnosis and the potential relation between systolic blood pressure (SBP) and different parameters (age, sex, reproductive status, duration of clinical signs before diagnosis, body condition score, concurrent diseases, type of HAC and ACTH stimulation test results).

Forty-three dogs with newly diagnosed HAC at the Veterinary Teaching Hospital Complutense Madrid between January 2013 and December 2015 were evaluated.. Blood pressure was measured using Doppler ultrasonography. The SBP was calculated as the average of 5 consecutive readings. Hypertension was defined as a SBP >150 mm Hg and sub-classified according to the risk of target organ damage (RTOD) (ACVIM guidelines). Dogs with concurrent diseases knowing to affect SBP (chronic kidney disease IRIS 3/4, or cardiac disease stage C/D) at diagnosis were excluded. Significant values were considered for $P < 0.1$.

Forty dogs with HAC were included, 35 with pituitary HAC and 5 with adrenal HAC. Age ranged from 6 to 15 years, 15 dogs were intact and 25 dogs were neutered. Twenty eight dogs (70%) were hypertensive and 18/40 (45%) at severe RTOD (>180 mmHg). Higher prevalence of hypertension and higher mean values of SBP were observed in intact dogs (87%; 183.3 ± 30.2 mm Hg) than in neutered (60%; 165.3 ± 35.7 mm Hg) (*P = 0.074; P = 0.078*). Higher prevalence of severe RTOD was also observed in intact dogs (67% versus 32%) (*P = 0.033*). Positive correlation between SBP and duration of clinical signs before diagnosis was observed (*P = 0.063*). Dogs at severe RTOD had clinical signs for a longer period of time before diagnosis (10.5 ± 5.6 months) than animals with moderate/mild RTOD or normotensive (7.68 ± 5.6 months) (*P = 0.084*). No significant correlation was observed between SBP and the rest of the variables listed above.

Prevalence of hypertension among untreated dogs with HAC is high, similar than previously reported (59 to 86%). Prevalence of severe RTOD was similar to previously reported (42%), but different to observed by others (11% and 70%) probably reflecting differences in the population studied. Therefore blood pressure measurement should be performed as part of the initial investigations in dogs with suspected HAC.

The Relationship between reproductive status and SBP has been previously reported in experimental studies with rats showing higher blood pressures in intact rats than neutered.

Disclosures: No disclosures to report.

ESVE-P-9

EVALUATION OF THE EFFICACY AND SAFETY OF A NEW FORMULATION OF DESOXYCORTONE PIVALATE (DOCP) FOR TREATING PRIMARY HYPOADRENOCORTICISM (PH) IN CLIENT-OWNED DOGS. B. Mason, H. Farr, S. Longhofer. Dechra Ltd, Overland Park, USA

DOCP is replacement therapy for mineralocorticoid deficiency in dogs in hypoadrenocortical crisis and as chronic mineralocorticoid replacement.

This multi-centre randomised clinical trial compared the safety and efficacy of a new prolonged-release suspension of DOCP (Zycortal, Dechra Ltd) to a US-approved control product (Percorten-V, Elanco Animal Health) for the treatment of PH in dogs.

PH was diagnosed by the presence of clinical signs consistent with PH, Na^+/K^+ ratio ≤ 27, and basal and post ACTH-stimulation test cortisol concentrations ≤ 55.2 nmol/L. Client-owned dogs ($n = 152$) with PH were randomised in a 3:1 ratio, and treated at an initial dose of 2.2 mg/kg body weight with either Zycortal (subcutaneously) or Percorten-V (intramuscularly). Subsequent doses were administered approximately monthly for up to 5 months; adjustments to dose and dosage regimen were permitted.

Dogs were evaluated monthly with a physical examination, clinical assessment and evaluation of serum Na^+ and K^+ concentrations and Na^+/K^+ ratio. Haematology and chemistry were evaluated on Days 25, 90 and 180. At the primary endpoint on Day 90, treatment success occurred when the veterinarian assessed the case as improved or unchanged (if not new cases of PH) compared to baseline (Day 0) (veterinarian-assessed improvement), and Na^+, K^+ or the Na^+/K^+ ratio were within the reference range. Non-inferiority of treatment success of Zycortal compared to Percorten-V was calculated using a two-sided 95% confidence interval using GLIMMIX procedure in SAS (SAS Institute). Field safety was assessed by review of abnormal clinical signs.

At Day 90, both groups had veterinarian-assessed improvement in >99% dogs; Na^+/K^+ ratio was between 27–32 in <21% of dogs but the Na^+ and K^+ concentrations were within reference range for >89 and 94% dogs in the Zycortal and Percorten-V groups, respectively. Zycortal and Percorten-V treatment success was 86.24 and 85.13% respectively. Zycortal was non-inferior to Percorten-V.

The abnormal clinical signs reported most frequently in both groups were polydipsia, polyuria, vomiting, polyphagia and diarrhoea; the majority of signs were mild and transient.

The new formulation of DOCP, Zycortal, is well tolerated and effective for use as replacement therapy for mineralocorticoid deficiency in dogs with PH when compared to the control product, Percorten-V.

Disclosures: All authors are employees of Dechra Ltd, the manufacturer of Zycortal. The study was funded by Dechra.

ESVE-P-10

FIRST-LINE THERAPEUTIC CHOICE AND ONE-YEAR FOLLOW UP OF 74 FRENCH NEWLY DIAGNOSED HYPERTHYROID CATS IN PRIVATE PRACTICE: A PROSPECTIVE STUDY. B.E. Rannou, B.E. Mingotaud, M. Hugonnard. VetAgro Sup, Campus Vétérinaire de Lyon, Marcy l'étoile, France

Therapeutic options for feline hyperthyroidism are antithyroid drugs, thyroidectomy, radio-iodine therapy and an iodine-restricted diet. A prospective study was conducted in France to analyse first-line therapeutic choice in private practice for feline hyperthyroidism. Biological and clinical efficacy, safety and owner compliance were followed for one year after treatment setting.

Between September 2013 and June 2014, 74 cats from private practice with a clinical suspicion of hyperthyroidism and a total thyroxine (TT4) concentration superior to 55 nmol/L measured in the same veterinary laboratory were recruited. For each patient, the practitioner received a survey with closed questions about therapeutic options discussed with the owner, final therapeutic choice and reasons for this choice. Repeated TT4 monitoring was freely proposed on a voluntary basis at 3, 6, 9 and 12 weeks after treatment setting and then every 3 months until one year. One year after treatment setting, a satisfaction survey was sent to owners regarding clinical efficacy of treatment.

The 74 cats (36% males, 74% females) were 13 ± 2.5 years old. TT4 concentration at the time of diagnosis varied between 57 and 193 nmol/L (140 nmol/L ± 49). At inclusion, the veterinarian survey was fulfilled for 34 (46%) cats. For 12/34 (35%), a sole therapeutic option (antithyroid drug in 94% of cases) was proposed. For 15/34 (44%) cats, two therapeutic options were proposed. In this case, antithyroid drug and an iodine-restricted diet were proposed in 100% and 87% of cases, respectively. In total, an iodine-restricted diet was proposed for 21/34 (62%) cats and finally chosen for 4 (19%) cats. Prescribing habits and medication convenience were the reasons most commonly cited. A partial or

complete TT4 follow-up for one year was available for 50 (67%) cats, 42/50 receiving antithyroid drugs and 8/50 eating an iodine-restricted diet. Euthyroidism appeared more rapidly achieved (4 versus 9 weeks) but less stable in cats receiving antithyroid drugs compared to cats eating a specialized diet, even for outdoor cats. Side effects were uncommon (16% and 0% with medicinal and dietetic treatment, respectively). After one year, 37 (50%) owner surveys were available. Most owners (35/37) were satisfied or very satisfied with the treatment issue.

In this study, reversible treatment options for feline hyperthyroidism were largely preferred but irreversible options were rarely proposed. Efficacy, safety and owner compliance were high for dietetic and medicinal options. Iodine-restricted diet, although less popular than antithyroid drug, provided promising comparative results.

Disclosures: No disclosures to report.

ESVE-P-11

CUSHING'S SYNDROME – AN EPIDEMIOLOGICAL STUDY BASED ON AN ITALIAN CANINE POPULATION OF 21,281 DOGS. E. Malerba[1], G. Carotenuto[1], C. Dolfini[1], F. Brugnoli[2], P. Giannuzzi[3], G. Semprini[4], P. Tosolini[5], F. Fracassi[1]. [1]University of Bologna, Ozzano dell'emilia, Bologna, Italy, [2]Ospedale Veterinario I Portoni Rossi, Bologna, Italy, [3]Ospedale Veterinario Pingry, Bari, Italy, [4]Centro Veterinario Bolognese, Bologna, Italy, [5]Ambulatorio Veterinario Schiavi, Udine, Italy

Cushing's syndrome (CS) is one of the most commonly recognized endocrine disorders in dogs. To our knowledge, there is only one epidemiological study published in 1982 that evaluated the incidence of the disease. In studies on canine CS it is frequently reported an apparent predisposition for the female gender, but none of such studies can prove it because of the lack of a control population.

The aim of this multicenter retrospective study was to investigate the epidemiological characteristics of CS in an Italian canine population.

Data were derived from 21,281 client-owned dogs selected from electronic databases of 5 veterinary clinics, scattered throughout the Italian territory and evaluated between September 2012 and September 2014.

For the calculation of the prevalence, the dog population of one center (university reference center for CS) was evaluated separately from the population of the four clinics that were not reference centers for CS.

In total 104 dogs were identified with CS on the basis of history, clinical and laboratory findings and positivity to LDDS test and/or ACTH stimulation test. The prevalence in the 4 clinics was 0.20% (95%CI, 0.13–0.27) and was significantly different compared to the reference center (1.46%; 95%CI , 1.12–1.80).

Mean (SD) age for dogs with CS was 9.8 ($\pm$ 2.5) years, and only 5/104 dogs (5.5%) were $\leq$ 5 years. Of 104 dogs with CS, 19.2% (95%CI, 11.6–26.8) were intact females, 43.3% (95%CI, 33.8–52.8) were neutered females, 29.8% (95%CI, 21.01–38.60) were intact males and 7.7% (95%CI, 2.58–12.82) were neutered males. Females had higher risk of CS compared to males (O.R. 1.84; 95%CI, 1.46–2.03); neutered dogs had higher risk then uncastrated dogs (O.R.2.54; 95%CI, 2.32–2.76) and neutered females had higher risk compared to intact females (O.R.2.61; 95%CI, 2.28–2.94).

Using the mixed breed dogs as a control population (OR: 1) the risk of developing CS was significantly higher in the standard Schnauzer (OR: 58.1; $P < 0.0001$), Fox Terrier (OR: 20.33; $P < 0.0001$), Cavalier King Charles Spaniel (OR: 8.02; $P < 0.0001$), Boxer (OR: 7.67; $P < 0.0001$), Shih-tzu (OR: 6.56; $P = 0.0033$), Bolognese (OR: 6.30; $P < 0.0001$), Pit bull (OR: 5.98; $P = 0.0009$), Jack Russel Terrier (OR: 5.65; $P = 0.0081$), Maltese (OR: 4.89; $P = 0.001$), miniature Dachshund (OR: 3.51; $P = 0.0027$), miniature Poodle (OR: 3.44; $P = 0.0033$) and Yorkshire Terrier (OR: 3.42; $P = 0.0018$).

The results of this study have identify a prevalence of 0.2% of CS in an Italian canine population. The data support the existence of sex predisposition in developing CS with the highest risk for neutered females. As observed in other studies, some breeds are more predisposed to develop CS.

Disclosures: No disclosures to report.

ESVE-P-12

ELUCIDATING RISK FACTORS FOR FELINE DIABETES MELLITUS. T. Öhlund[1], A. Egenvall[1], T. Fall[2], H. Hamlin[1], H. Röcklinsberg[1], B. Ström Holst[1]. [1]Swedish University of Agricultural Sciences, Uppsala, Sweden, [2]Uppsala University, Uppsala, Sweden

Diabetes is a common endocrinopathy in cats and resembles type 2 diabetes in humans. The etiology and pathogenesis of feline diabetes is not fully understood, but a combination of genetic and environmental factors is believed to contribute. Obesity is reported as an important risk factor for diabetes in both cats and humans.

The aim of the study was to assess the associations of environmental risk factors with feline diabetes through a web-based questionnaire in a large case-control study.

A letter of invitation to participate in the web survey was sent out by mail to 6822 owners to cats with a previous or ongoing insurance in Agria Animal Insurance. The study population included cats with a diagnosis of diabetes during the years 2009–2013 ($n = 1369$) and a control group of cats ($n = 5363$) without the diagnosis, matched on birth year with the diabetic cats. The web survey contained questions on e.g. the signalment of the cat, environment, activity level, access to the outdoors, feeding regime, type of diet, eating habits, body condition, health, medications, vaccination status, other animals in the household, or if other changes had occurred in the cat's life before the diagnosis of diabetes.

A total of 2171 complete replies were acquired, of which 481 from diabetic cats and 1690 control cats (answering frequency 35% and 32%, respectively). Results from a multivariable logistic regression showed significant associations between a diagnosis of diabetes and several of the responses in the questionnaire. Burmese breed, being male, being an indoor cat, having a greedy eating habit, and being overweight were all independently associated with increased odds of diabetes.

Our results, from the so far largest case-control study of diabetic cats, verify previous reports on being overweight and living indoors as important risk factors for diabetes in cats. Being a greedy eater is a new potential risk factor for diabetes in cats.

Disclosures: No disclosures to report.

ESVE-P-13

EVOLUTION OF SYSTOLIC BLOOD PRESSURE IN DOGS WITH HYPERADRENOCORTICISM DURING THE FIRST SIX MONTHS OF TREATMENT WITH TRILOSTANE. P. García San José[1], C. Arenas Bermejo[2], S. García Díaz-Ropero[1], I. Clares Moral[1], M.D. Pérez Alenza[1]. [1]Complutense University of Madrid, Madrid, Spain, [2]Queen's Veterinary School Hospital, University of Cambridge, Cambridge, UK

Hypertension is frequent in dogs with hyperadrenocorticism (HAC) even when adequate control of HAC is achieved. The aim of this study was to evaluate systolic blood pressure (SBP) before and during the first 6 months of trilostane treatment in dogs with newly diagnosed HAC and to determine whether there is association with the control of the disease.

Forty-three client-owned dogs were diagnosed with HAC at the Veterinary Teaching Hospital Complutense Madrid between January 2013 and December 2015 following the ACVIM consensus guidelines. Trilostane treatment was initiated at a starting dose of 0.5–1.5 mg/kg BID. Dogs were evaluated at one ($n = 26$), three ($n = 19$) and six ($n = 15$) months after treatment (MAT). History, physical exam, hematology, biochemistry, ACTH stimulation and blood pressure using Doppler ultrasonography were assessed in every visit. Dogs with chronic kidney or cardiac diseases (stages C/D) or receiving antihypertensive medication at diagnosis were excluded. Hypertension was defined as a SBP $\geq$150 mm Hg. Following the ACVIM guidelines, hypertensive animals were sub-classified according to the risk of target organ damage (RTOD) and antihypertensive treatment (benazepril and/or amlodipine) was administered if deemed appropriate.

Twenty-six dogs were included, 15 females and 9 males. Ages ranged from 7 to 15 years. Twenty dogs (77%) were hypertensive at diagnosis and 15/26 (58%) were at severe RTOD. Prevalence of hypertension was similar throughout the study (73% 1-MAT, 84%

3-MAT, 80% 6-MAT) whilst the percentage of hypertensive animals at severe RTOD decreased (75% before treatment; 63% 1-MAT, 31% 3-MAT and 42% 6-MAT; but not significantly). Of the normotensive dogs at diagnosis, 2/5 (40%) remained normotensive 6-MAT and 3/5 (60%) became hypertensive at mild RTOD (150–159 mm Hg). Of the hypertensive dogs at diagnosis, 9/10 (90%) remained hypertensive 6-MAT being 5/10 (50%) at severe RTOD (≥180 mmHg).

There was no significant correlation between good control of HAC and good control of SBP (SBP≤150 mmHg or decreasing in the RTOD classification; from severe to moderate/moderate to mild) at 1, 3 and 6-MAT.

Prevalence of hypertension in dogs with HAC did not decrease during the first 6 months of treatment with trilostane, which has also been reported in people. A slight increase in SBP is observed in normotensive patients once treatment is started. Control of HAC with trilostane is not correlated with control of blood pressure and hypertensive dogs should be monitored closely. Hyperadrenocorticism is a progressive disease and treatment may not completely normalize the deleterious effects of hypercortisolism.

Disclosures: No disclosures to report.

ESVE-P-14
USE OF HYDROCORTISONE IN A COHORT OF DOGS IN THE MANAGEMENT OF ADDISONIAN CRISIS. A. Leobon, M. Seth. Animal Health Trust, Newmarket, UK

Canine Addisonian crisis occurs due to a deficiency in cortisol, typically associated with a concurrent deficiency in aldosterone. The glucocorticoid dexamethasone is most commonly used for emergency parenteral treatment in a crisis but this drug has negligible mineralocorticoid activity. The use of hydrocortisone sodium succinate (HSS) is described in human medicine. Besides its glucocorticoid activity, it has potent mineralocorticoid activity potentially making it superior to dexamethasone for treatment of Addisonian crisis.

Our aims were to describe treatment of Addisonian crisis using HSS in a cohort of dogs. Furthermore, we compared this therapy to dogs treated with dexamethasone over the same period. Records from a single referral hospital were searched between 2007 and 2015, identifying 15 dogs diagnosed with an Addisonian crisis (serum cortisol concentration <55 nmol/L after administration of tetracosactrin, requiring hospitalization for emergency stabilisation). Dogs were excluded if they had already received any glucocorticoid and/or mineralocorticoid therapy prior to admission, or had incomplete data concerning treatment, laboratory tests or outcomes. Seven dogs were treated with HSS continuous rate infusions ranging from 0.3 to 0.625 mg/kg/h (Group A). Eight dogs were treated with intravenous dexamethasone doses ranging from 0.05 to 0.3 mg/kg (group B). None of the dogs in group A required treatment with dexamethasone and none of the dogs in group B received HSS at any stage during treatment. Both HSS and dexamethasone were associated with adequate management of the acute adrenocortical insufficiency in every case with all patients surviving to discharge.

No significant differences were found between the two groups regarding age, weight, gender, admission Na+ and K+ concentrations, length and median cost of hospitalisation, median time for K+ concentration to normalise, time to spontaneously eat or amount of crystalloid and colloid fluids used.

The median time for Na+ concentration to normalise was significantly shorter in group A compared to group B ($P = 0.0424$). One dog in group B was treated with a vasopressor (dopamine) whereas none of the dogs in group A were treated with vasopressors.

These results suggest that HSS is effective in managing canine Addisonian crisis. Prospective studies on a larger cohort of dogs are warranted to further assess the potential benefits of HSS compared to dexamethasone.

Disclosures: No disclosures to report.

ESCG – European Society of Comparative Gastroenterology

ESCG-P-1
PRIMARY GASTRO-INTESTINAL DISEASE IN CATS AND DOGS WITH GASTRO-INTESTINAL FOREIGN BODIES: 28 CASES. R. Lobetti[1], E. Lindquist[2], J. Frank[2], J. Mclean[1]. [1]Bryanston Veterinary Hospital, Bryanston, South Africa, [2]SonoPath, New jersey, USA

Gastro-intestinal (GI) foreign bodies are not unusual in either cats or dogs of all ages. The diagnosis is often suspected on history, physical examination findings, radiographs, and ultrasonography; with the diagnosis being confirmed on laparotomy. A recent study showed that a gastric foreign body was a significant risk factor for the development of gastric dilatation and volvulus in dogs.

The purpose of this study was to correlate if cats or dogs with a GI foreign body had underlying GI disease. The hypothesis was that cats or dogs with a GI foreign body have primary underlying gastro-intestinal disease resulting in pica and the subsequent ingestion of a foreign body.

The records of 28 privately owned cats or dogs that had been diagnosed with a gastro-intestinal foreign body and had histopathology done of the gastro-intestinal tract were retrospectively evaluated. Inclusion criteria were a diagnosis of a GI foreign body together with histopathology of the GI tract from biopsies taken at the time of surgical removal of the foreign body.

Of the 28 cases, there were 11 cats and 17 dogs. The mean age of the cats was 9.2 years (range 4–15) and that of the dogs 9.1 years (range 2–14). All cats were classified as DSH and the dog breeds were varied. There were 5 males and 6 females within the cat group and 8 males and 9 females within the dog group. Histopathology diagnosis in the cats was lymphoplasmacytic enteritis (4), lymphoma (5), and carcinoma (2); whereas in dogs the histopathology diagnosis was lymphoplasmacytic enteritis (7), lymphoma (3), necrotic enteritis (3), carcinoma (2), and eosinophilic enteritis (2).

These findings indicate that cats or dogs with a GI foreign body can have underlying primary GI disease and that the presence of a foreign body may thus be an indicator of more serious GI disease. Therefore, in cats or dogs with a GI foreign body, biopsies of the gastro-intestinal should be done at the time of surgery to ensure that underlying disease is identified and correctly managed.

Disclosures: No disclosures to report.

ESCG-P-2
FECAL MICROBIOME AND PREDICTED GENE FUNCTION IN CZECHOSLOVAKIAN WOLFDOGS FED WITH EITHER A BONE AND RAW FOOD DIET OR A COMMERCIAL DIET. M. Cerquetella[1], S. Silvi[1], M.C. Verdenelli[2], M.M. Coman[2], A. Spaterna[1], J.M. Steiner[3], G. Rossi[1], J. Suchodolski[3]. [1]University of Camerino, Matelica, Italy, [2]Synbiotec S.r.l., Spin-off of University of Camerino, Camerino, Italy, [3]College of Veterinary Medicine and Biomedical Sciences, Texas A&M University, College station, USA

The mammalian intestine is inhabited by a set of microorganisms (i.e., bacteria, viruses, fungi, archaea), named microbiota. Various different conditions can influence the microbiota with one of those being diet. The present study investigated the effect of a BARF diet on the fecal microbiome and on fecal functional gene content predictions comparing two groups of four Czechoslovakian Wolfdogs each, fed with either a BARF or a commercial diet.

BARF diet dogs were fed with kibble from about 6 months, and the group was composed of 4 dogs, 2 males (A2, A4) and 2 females (A1, A3); the commercial diet group was composed of 4 dogs, 1 male (B1) and 3 females (B2, B3, B4). A1, A2, and A4 were all puppies from the same litter, A3 was the mother of those puppies; within the BARF group, B1 and B4 were the parents of B3; and B1 was also the father of B2. Living environments were different between and within groups. DNA was extracted using a commercial kit and analyzed by next generation sequencing of 16S rRNA genes. The data was analyzed using the freeware QIIME.

PICRUSt was used to predict the functional gene content. Linear discriminant analysis (LDA) effect size (LEfSe) was used to identify significantly altered bacterial taxa.

LefSe analysis showed that being fed the BARF diet was associated with higher proportions of Fusobacteria, Epsilon-Proteobacteria, *Carnobacterium*, and genera within *Clostridiaceae*, while being fed the commercial diet was associated with increased proportions of various bacterial groups, including *Bifidobacterium*, Lactobacillales, and *Turicibacter*. *Lactobacillus* was more prevalent in dogs of the commercial diet group ($P = 0.03$, adjusted q-value not significant), while *Fusobacterium* had a significantly higher abundance in the BARF group ($P = 0.03$, adjusted q-value not significant). Rarefaction analysis indicated that the BARF group had a significant lower microbial diversity than the other group (Chao1 $P < 0.05$). LEfSe analysis of the functional gene content prediction revealed a total of 6 differentially enriched bacterial functions between the two groups.

Our results suggest that a bone and raw food diet could influence the canine fecal microbiome, similarly to other factors, such as age, genetic relatedness, and could also result in a different abundance of functional genes. Further studies in a larger group of unrelated dogs are needed to better characterize these influences.

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ESCG-P-3

GRANULOMATOUS COLITIS: MORE THAN A CANINE DISEASE?. R.O. Oliveira Leal[1], K. Simpson[2], J. Hernandez[1]. [1]Centre Hospitalier Vétérinaire Fregis, Arcueil, France, [2]College of Veterinary Medicine – Cornell University, Ithaca, USA

Granulomatous Colitis (GC) is a rare form of inflammatory bowel disease (IBD) predominantly diagnosed in young Boxers and French Bulldogs. It is usually associated with mucosally invasive E.coli that are able to persist in macrophages. Eradication of invasive E.coli correlates with remission of clinical signs and histopathological abnormalities. Genetic analysis of affected dogs has implicated a region on chromosome 38 that is involved sensing and killing of E.coli in other species. Thus it is emerging that E.coli associated GC in Boxers and French bulldogs is likely a heritable genetic defect sensing or killing of intracellular E.coli. E.coli associated Granulomatous colitis has not been documented in cats.

A 4 years old male neutered cat was referred for chronic intermittent hematochezia and fecal incontinence of 7 months duration. No weight loss was reported and the cat was keeping a good appetite. Symptomatic treatments (including deworming, metronidazole and hypoallergenic diet) have been tried without clinical improvement. Physical examination, Complete Blood Count and biochemistry panel (including folate and cobalamin) were within normal limits. Fecal flotation, PCR for Tritrichomonas and Giardia was negative. Abdominal sonography revealed a colonic wall thickness. Colonoscopy showed an irregular and thickened colonic wall with multiple erosions, compatible with ulcerative colitis or infiltrative neoplasia. Histopathologic analysis revealed a multi-focal ulceration of epithelium, with marked PAS positive cell and a moderate diffuse lympho-plasmacytic infiltration of the lamina propria. Toluidine-blue and Fite-Faraco stains did not show mast cell infiltration or mycobacteria-like bacteria, respectively. Rectal wall culture was positive for E.Coli and negative for Salmonella, Yersinia and Campylobacter. Antimicrobial susceptibility testing was broadly positive. Fluorescence In Situ Hibridization of colonic biopsies revealed multifocal clusters of intracellular E.Coli. Treatment with enrofloxacin (5 mg/kg SID for 6 weeks) led to the complete resolution of clinical signs with remission sustained for 4 months to date.

Our findings reveal that E.coli associated GC can also affect cats and should be considered on the differential diagnosis of chronic hematochezia. Further studies are needed to assess molecular, genetic and immune pathways beneath intracellular invasion by E.coli in cats with GC.

Disclosures: No disclosures to report.

ESCG-P-4

BREED ASSOCIATION OF ENDOSCOPICALLY DIAGNOSED GASTRIC NEOPLASIA AND METAPLASIA IN PUREBRED DOGS – A RETROSPECTIVE STUDY. M.V. Candido, S. Pernilla, S. Kilpinen, T. Spillmann. University of Helsinki, Helsinki, Finland

Gastric cancer is a rare pathologic finding, corresponding to one percent of all neoplasias identified in dogs. Previous studies have shown breed predisposition for Tervuren, Bouvier des Flandres, Groenendael, Collie, Poodle and Norwegian Elkhound. This study aimed at investigating which pure breeds are most commonly subject to gastroduodenoscopy (GDS) in a referral hospital, and their probability to be diagnosed with gastric neoplasia or metaplasia. For the retrospective analysis, a computerized database search was performed for dogs meeting the following inclusion criteria: subject to GDS; belonging to a pure breed with a minimum of five GDS patients in the records.

Between 2006 and 2015, 44915 canine patients were presented, of which 338 dogs underwent GDS. The inclusion criteria were achieved in 19 pure breeds accounting for 150 dogs (44% of all GDS). Six of these dogs (4%) had gastric carcinoma, including Tervuren (3), Rough Collie, Labrador Retriever and Rottweiler. Gastric metaplasia was diagnosed in six dogs of other breeds: Smooth Collie (2), Wire-haired Dachshund, Shetland Sheepdog, Hovawart, and Siberian Husky. Logistic regression analysis revealed significantly higher odds ratio (OR) to undergo GDS for Wire-haired Dachshund with 2.42 (95% confidence interval: lower 1.14–higher 5.15), Smooth Collie with 2.36 (1.04–5.32), and Rough Collie with 1.72 (1.05–2.81). The OR for gastric neoplasia was 70.98 (8.49–593.32) for Tervuren. The ORs for metaplasia were non-significant. When a log-binomial model was used, also the risk ratio for neoplasia was significantly higher in Tervuren (RR = 29; 7.68–109.54).

The low prevalence of cancer in this study is in accordance with previous studies using cancer and pathology registers. Except for the Collies, breeds predisposed for gastric cancer were not more often subject to GDS than others. Like in previous studies, Tervuren undergoing GDS were found at much higher risk to have gastric carcinoma. The high OR for Wire-haired Dachshund and Collies to undergo GDS might indicate a higher prevalence of gastrointestinal disorders beside neoplasia, warranting further studies. Gastric metaplasia was as rare as gastric cancer and no breed predisposition was found. Nonetheless, metaplasia can present as discrete, flat changes that are easily overlooked and possibly underdiagnosed considering the limitations of current white light endoscopy techniques and non-directed sampling procedures. Future prospective studies in predisposed breeds should aim at applying more advanced endoscopic approaches to improve the knowledge about prevalence and breed predisposition of metaplasia and its possible association to canine gastric cancer.

Disclosures: Marcus Vinicius Candido (first author).
Employee/salary: No conflict. Marcus Vinicius Candido has worked in zoos in southern Brazil, having researched on various topics (2000–2010). He has been a teacher of anatomy and exotic animal medicine in FURB, Brazil (2009–2012). He has worked as a private practitioner with companion animal endoscopy in southern Brazil since 2012. He is currently a PhD student funded by Brazilian program Ciencias sem Fronteiras/CNPq, researching with endoscopy and also treating patients at the exotic animal clinic at the Small Animal Hospital at University of Helsinki.

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Syrjä Pernilla (co-author): Employee/salary: Syrjä is employed by University of Helsinki, Faculty of Veterinary Medicine, Section of

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Other, including indirect benefits: None.

Thomas Spillmann (supervising author): Employee/salary: Thomas Spillmann was Hill's professor of small animal clinical nutrition at the Veterinary University, Hannover, Germany from 2004–2005. Since 2005 he has been employed as professor of small animal internal medicine at the Veterinary Faculty, University of Helsinki, Finland.
Grants/research: Thomas Spillmann has received research grants from the German Research Society, the Finnish Foundation of Veterinary Research, and the Finnish Veterinary Foundation. His PhD students received grants from the Doctoral Program – Clinical Veterinary Sciences, University of Helsinki, Finland; the Center of International Mobility (CIMO)/Finland; the Finnish Foundation of Veterinary Research; the Finnish Veterinary Foundation; the Finnish Culture Foundation; the Emil Aaltonen Foundation/Finland; the Alfred Kordelin Foundation/Finland; Agria/Sweden; the Swedish Kennel Club Research Foundation; the Ulla Yard Foundation/Sweden; Ciencia Sem Fronteiras/Brazil; and the Archimedes Foundation/Estonia.
Speaking & consultancies: Thomas Spillmann has been a consultant for IPSAT, Finland. He has given lectures on behalf of Royal Canin, Hill's, Iams, Purina, Triolab/Finland, zoetis/Finland, the Finnish Association of Veterinary Practitioners, the German Small Animal Veterinary Association, the British Small Animal Veterinary Association, the Estonian Small Animal Veterinary Association, the World Small Animal Veterinary Association, the Federation of European Companion Animal Veterinary Associations, and the European College of Small Animal Internal Medicine – Companion Animals.
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ESCG-P-5
IS F-PL VALUE ASSOCIATED WITH MORTALITY IN FELINE CHRONIC PANCREATITIS? A RETROSPECTIVE COHORT OF 19 CASES.

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Diagnosis of feline chronic pancreatitis (CP) remains challenging because clinical signs are non specific. Necropsic studies suggest a high prevalence of feline CP and histological examination is the gold standard for diagnosis but focal inflammatory lesions can be missed on biopsies. Measurement of specific feline pancreatic lipase (f-PL) and abdominal ultrasonography improved the diagnosis of moderate to severe pancreatitis in cats. The aim of the study was to investigate the association between f-PL value and survival time (ST) in cats with CP.

During the study period (2014–2016), cats were included if they had at least two clinical signs consistent with CP (weight loss, dysorexia, vomiting and diarrhea) for more than 3 weeks and f-PL value above 5.3 µg/L and consistent abdominal ultrasonographic findings (hypoechoic pancreas, peripancreatic steatitis, left limb thickening, local effusion) at initial presentation. Histopathology was performed when accepted by the owner. Associated conditions at initial presentation were listed. Values are expressed as medians [inter-quartile range]. The associations between age, weight, and clinical signs duration and survival were investigated by using Kaplan-Meier survival curves.

Nineteen cats (13 males and 6 females) were included. Domestic shorthair was the most commonly affected breed (13/19). The median age was 12 years [9;14] and the median weight was 5.1 kg [3.5;5.9]. Median duration of clinical signs before inclusion was 61 days [30;365]. The median f-PL value was 7.9 µg/L [7.2;23.0]. The overall median ST was 634 days. Survival curves did not differ between cats with f-PL values under *versus* over 7.9 µg/l (p-logrank = 0.76). The median ST in cats with f-PL value >7.9 µg/L was 579 days while it was not reached at the end of the study in cats with f-PL value <7.9 µg/L. Eleven out of 19 cases are still alive after initial presentation (range: 275–820 days). Presence of weight loss (n = 9), dysorexia (n = 9), vomiting (n = 10) and diarrhea (n = 8) at presentation was not significantly associated with a shorter ST. Concurrent cholangitis or chronic enteritis were often suggested by ultrasonographic findings (14/19) and were histologically confirmed in 5 out of 14 cases. CP was confirmed histologically in three cases.

In conclusion cats with CP may have a long survival time. A f-PL value above 7.9 µg/L at initial presentation was not associated with mortality and none of the clinical signs present at the time of admission could predict mortality. These preliminary findings should be confirmed by a prospective study.

Disclosures: No disclosures to report.

ESCG-P-6
AGREEMENT OF FELINE AND CANINE PANCREAS-SPECIFIC LIPASE WITH PANCREATIC ULTRASONOGRAPHIC FINDINGS IN 62 CATS AND 54 DOGS WITH SUSPICION OF PANCREATITIS: A RETROSPECTIVE STUDY (2007–2013).

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The diagnosis of pancreatitis is based on history, physical exam, pancreas-specific lipase assay and ultrasonography. This retrospective study analyses the agreement between feline and canine pancreas-specific lipase with pancreatic ultrasonographic findings in dogs and cats with a clinical suspicion of pancreatitis. It also assesses the sensitivity (Se) and specificity (Sp) of ultrasonographic parameters useful for the diagnosis of pancreatitis.

Between 2007 and 2013, 62 cats and 54 dogs with a clinical suspicion of pancreatitis and who were presented at a veterinary teaching hospital underwent a quantitative (Spec cPL® or Spec fPL® ; cut-offs: 5.4 µg/l for cat, 400 µg/l for dog) or qualitative (SNAP cPL®) assessment of pancreas-specific lipase combined with an abdominal ultrasonography. The Cohen's kappa was used to compare agreement between pancreatic lipase and ultrasonography. The sensitivity and specificity of ultrasonographic parameters (size, echogenicity and margins of the pancreas, peri-pancreatic fluid, increased echogenicity around pancreas) to diagnose pancreatitis were determined, using pancreas-specific lipase as the gold standard.

The 62 cats (63% males, 37% females) were 8.1 ± 4.5 years old. Among them, 19 (31%) had a pancreatic lipase suggestive of pancreatitis and 46 (74%) had an ultrasonographic diagnosis of pancreatitis. The 54 dogs (49% males, 51% females) were 8.6 ± 4.1 years old. Among them, 22 (41%) had a pancreatic lipase suggestive of pancreatitis and 31 (57%) had an ultrasonographic diagnosis of pancreatitis. Agreement between pancreatic lipase and ultrasonography was very low for cat (k = 0.11) and

low for dog ($k = 0.28$). Increased size of the pancreas was the most sensitive parameter for detecting pancreatitis in cats and dogs (Se = 94% and 100%, respectively). Increased echogenicity around the pancreas was the most specific parameter for detecting pancreatitis in cats and dogs (Sp = 60% and 83%, respectively).

In case of clinical suspicion of pancreatitis, low agreement between pancreatic lipase and ultrasonography of the pancreas observed in this study was in accordance with conclusions of two recent studies using the same cut off values for lipase. This could be due to false positive results on ultrasonography, related to anterior bouts of pancreatitis, subclinical chronic pancreatitis and anatomical changes related to age not associated with pancreatic enzymes release. Ultrasonographic data should therefore be considered with caution in case of clinical suspicion of pancreatitis in dogs and cats.

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ESCG-P-7
INFLAMMATORY BOWEL DISEASE IN DOGS: PROGNOSTIC FACTORS FOR THERAPEUTIC RESPONSE. F. Bresciani, S. Licarini, F. Ostanello, F. Fracassi, M. Pietra. University of Bologna, Ozzano dell'Emilia (BO), Italy

In dogs with idiopathic inflammatory bowel disease (IBD) the response to treatment influences the dog's quality of life, time of survival, economic impact on owners and, sometimes, the decision for euthanasia. The aim of this retrospective single-center study was to evaluate prognostic factors able to influence the response to treatment in dogs with IBD. Dogs with a diagnosis of idiopathic IBD, treated with immunosuppressive drugs, were enrolled. History about drugs and diet previously employed, clinical signs, laboratory findings, treatment, and follow-up, were recorded. Data from September 2004 to December 2014 were reviewed. Group 1, were defined as dogs that had responded to treatment, in which immunosuppressive drugs and antibiotic treatment was discontinued without relapses. Group 2, were defined as dogs that responded to treatment with immunosuppressive drugs but the disease relapsed after interruption of treatment. Group 3, were defined as dogs that did not respond to diet, antibiotic and immunosuppressive drugs. Kaplan-Meier survival curves were obtained for groups 1, 2 and 3; the survival curves for these groups were compared using the log-rank test. A two stage-analysis was also applied. In the first univariate stage, the variables were screened using x^2 test. In the second stage, factors that screened through $P < 0.15$ were evaluated using multivariate logistic regression, The odds ratio (OR) and 95% confidence intervals (95% CI) were calculated from the final model. One hundred and four dogs met the inclusion criteria. Dogs of group 1 and 2 had a median survival longer than dogs of group 3, 1250 days (range 210–4380) and 913 days (range 61–3100) versus 210 days (range 30–2005), respectively. At univariate regression analysis, a statistical difference in dogs of group 3 with respect to dogs of group 1 and 2 in following variables, were observed: previous treatment with steroids; weight loss; prevalence of small bowel diarrhoea; decreased haematocrit, serum albumin, total protein, creatinine, cholesterol; increased concentration of aspartate amino transferase (AST) and alanine aminotransferase (ALT); and received treatment with other immunosuppressive drugs than steroids at diagnosis. In multivariable model analysis previous treatment with steroids (OR = 5.47; 95%CI 1.86–16.11; $P = 0.001$) and decreased total proteins (OR = 12.5; 95%CI 3.62–41.75; $P = 0.016$) were independent variables associated with belonging to group 3.

In conclusion response to treatment in dogs with IBD is correlated with time of survival; and previous treatment with steroids along with decrease total proteins are negative prognostic factors because are associated with a lack of response to treatment.

Disclosures: No disclosures to report.

ESCG-P-8
EXPRESSION OF CYCLOOXIGENASE 2 IN THE SMALL INTESTINAL EPITHELIUM OF CATS WITH INFLAMMATORY BOWEL DISEASE AND LOW GRADE ALIMENTARY LYMPHOMA. J. Castro-López[1], A. Ramis[2], M. Planellas[1], J. Pastor[1]. [1]Hospital Clínic Veterinari – Universitat Autònoma de Barcelona, Barcelona, Spain, [2]Facultat de Veterinària, Universidad Autònoma de Barcelona, Barcelona, Spain

Cyclooxigenase 2 (COX-2) is an inducible isoform by cellular activation, proinflammatory cytokines, growth factors, tumour promoters, and COX-2 mediates prostaglandins generation and resistance to apoptosis. Only one feline report showed not detection of COX-2 immunoexpression in alimentary lymphoma (AL) but tumour grading was not specified. .

The aims of the study were to evaluate the epithelial and lamina propria (LP) immunoexpression of COX-2 in feline inflammatory bowel disease (IBD) and low grade AL (LGAL), and to correlate with clinical signs and histopathological scoring.

Cats diagnosed with IBD ($n = 11$) and LGAL ($n = 9$) between 2007 and 2013 were included. The feline chronic enteropathy activity index (FCEAI) was calculated for all cases. Control group was composed by 3 healthy indoor cats and 5 sick cats died or euthanized (non-gastrointestinal illness). Diagnosis and classification of IBD and LGAL was established according to WSAVA gastrointestinal standardization group template and the National Cancer Institute formulation, respectively. Furthermore, a modified WSAVA template (villous stunting, epithelial injury, crypt distension and lacteal dilation) was applied for LGAL evaluation.

Immunolabeling for COX-2 (polyclonal rabbit anti-murine COX-2 antibody) was performed. Epithelial and LP (inflammatory or neoplastic cells) COX-2 immunolabelling was calculated according to the grade [0 (negative), 1 (<10% of cells staining positive), 2 (10–30%), 3 (31–60%), 4 (>60%)] and intensity [0 (negative), 1 (weak staining), 2 (moderate), 3 (marked)]. Positive control was feline foetal macula densa. The most representative segment scored of each patient by WSAVA and modified WSAVA were used for statistical analysis, non-parametric tests where used.

COX-2 immunoreactivity about epithelial cells intensity showed significant difference between control and IBD group as well as LGAL group, but not between IBD and LGAL group. Most cats from all groups presented >60% of immunoreaction of epithelial cell thereby no differences were found. No difference was found about COX-2 immunoexpression intensity and percentage of cells at the LP between groups. However, 3 cats from LGAL group showed moderate and marked intensity with <10% of positive neoplastic cells at the LP. There were not correlations between epithelial or LP COX-2 expression and FCEAI and histological alterations. In conclusion, increased COX-2 intensity of the epithelial cells founded in IBD and LGAL group might be likely for an inflammatory response though a role in intestinal reparation might not be excluded. Conclusions about COX-2 expression at the LP of LGAL could not be obtained for the low number of patients with positive expression.

Disclosures: No disclosures to report.

ESCG-P-9
EXPRESSION OF SELECTED CYTOKINES AND CCL28 IN COLONIC MUCOSA AND MUCUS AND CORRELATION WITH CLINICAL AND ENDOSCOPIC ACTIVITY IN CANINE LYMPHOCYTIC-PLASMACYTIC COLITIS. A.O. Konstantinidis, K.K. Adamama-Moraitou, D. Pardali, G.D. Brellou, T. Papadopoulos, C.I. Dovas, T.S. Rallis. Aristotle University of Thessaloniki, Thessaloniki, Greece

IBD pathogenesis remains poorly defined, although it is hypothesized to be influenced by immunological, environmental and genetic factors. In canine lymphocytic-plasmacytic colitis (cLPC) a form of IBD, mucosal cytokines seem to be involved in the disease's pathogenesis, however sufficient data are lacking. The aim of the current study was to evaluate the mRNA expression levels of proinflammatory cytokines interleukin (IL)-1beta, IL-2, IL-23, TNF-alpha and mucosa associated epithelial chemokine

(CCL28) in the colonic mucosa and mucus from dogs with cLPC and their correlation with canine IBD activity index (CIBDAI) and endoscopic activity score (quantitative and qualitative) for canine IBD.

Colonic mucosa and mucus from 17 dogs with cLPC (histological diagnosis) and from 4 healthy dogs were obtained by endoscopic biopsy and cytology brush, respectively. Total RNA was extracted from colonic mucosa and mucus and cDNA was synthesized. The mRNA of IL-1beta, IL-2, IL-23, TNF-alpha and CCL28 were measured using real-time quantitative reverse transcriptase polymerase chain reaction (real-time qRT-PCR). Results were normalized using GAPDH as a housekeeper gene.

The IL-2, IL-23, TNF-alpha and CCL28 mRNA expression in the colonic mucosa from cLPC didn't differ significally from the control dogs. The IL-1beta mRNA expression was statistically significantly increased in the colonic mucosa compared to the control dogs. In the colonic mucus the mRNA expression of the above cytokines and CCL28 from cLPC dogs didn't differ from control dogs. IL-1beta, IL-2, IL-23, TNF-alpha and CCL28 mRNA expression in the colonic mucosa didn't differ significally among the different CIBDAI groups (normal, mild, moderate and severe). In contrast, the IL-2 mRNA expression levels in the colonic mucus differed statistically among the different CIBDAI groups. The levels of IL-1beta, IL-2, IL-23, TNF-alpha and CCL28 mRNA expression didn't differ significally among the different groups of endoscopic activity score (quantitative and qualitative) both in the colonic mucosa and mucus.

This study indicates that cLPC dogs have significant increase in IL-1beta mRNA expression in the colonic mucosa. However, IL-1beta expression levels are not correlated with cLPC clinical and endoscopic severity. Larger number of dogs are required to further clarify the role of IL-1beta in cLPC dogs and investigate it's significance in the cLPC pathogenesis and severity.

Disclosures: No disclosures to report.

ESCG-P-10
EFFECT OF ANTACID THERAPY AND BIOLOGICAL VARIATION OF SERUM GASTRIN CONCENTRATIONS IN DOGS WITH CHRONIC ENTEROPATHY. R.M. Heilmann[1], N. Berghoff[1], N. Grützner[2], N.K. Parnell[3], J. Suchodolski[1], J.M. Steiner[1]. [1]Texas A&M University, College station, USA, [2]Farm Animal Clinic, Vetsuisse Faculty, University of Bern, Bern, Switzerland, [3]College of Veterinary Medicine, Purdue University, Lafayette, USA

Gastrin is a peptide hormone, produced by gastric and duodenal G cells, which stimulates gastric acid secretion and exerts trophic effects on the gastric mucosa. Hypergastrinemia is suggested to be useful for diagnosing canine gastrinomas if increases are >10 × the upper reference limit (URL), but hypergastrinemia can also be caused by antacid therapy or lymphoplasmacytic enteritis. The effect of antacid therapy on hypergastrinemia in dogs with chronic enteropathy (CE) and the biological variation (BV) of serum gastrin concentrations are unknown. Aims of the current study were to evaluate serum gastrin concentrations in antacid-treated or antacid-naïve CE dogs, test for an association between serum gastrin concentrations and microscopic findings in the stomach/duodenum, and evaluate the BV of serum gastrin concentrations in CE dogs.

Serum samples were collected from 251 dogs undergoing routine diagnostic evaluation of chronic gastrointestinal signs and being diagnosed with CE. Serum gastrin concentrations were measured by a chemiluminescence (Immulite® 2000 Gastrin) assay, and the severity of gastric/duodenal histologic lesions was assessed. BV of serum gastrin concentrations was evaluated using serial samples from 45 CE dogs. Statistical analyses included non-parametric group comparisons, likelihood ratio and Spearman correlation tests, and a nested ANOVA.

Serum gastrin concentrations were significantly higher in antacid-treated than antacid-naïve CE dogs ($P = 0.008$), with significantly higher gastrin levels in proton pump inhibitor (PPI)-compared to H_2-antihistamine-treated dogs ($P = 0.011$). Antacid therapy was associated with hypergastrinemia ($P = 0.003$) and the frequency of gastrin concentrations >10 × the URL ($P = 0.032$), with more PPI- than H_2-antihistamine-treated dogs having gastrin concentrations above ($P = 0.011$), but not >10 × the URL. Serum gastrin concentrations were numerically higher in dogs with moderate/severe gastric/duodenal lesions than those with mild/no lesions, but the differences did not reach significance. Gastrin concentrations correlated with the severity of gastric antral epithelial injury ($P = 0.002$) and duodenal lesions ($P = 0.036$), but not with the presence/numbers of spiral bacteria in gastric biopsies. Intra-/inter-individual BV for serum gastrin concentrations were 43.4/21.6% (antacid-naïve) and 58.8/44.3% (antacid-treated); with an individuality index of 2.1 and 1.4, and a critical difference of 29.5 ng/L and 62.7 ng/L, respectively.

These results suggest an additive effect of antacid (particularly PPI) treatment on the hypergastrinemia seen in CE dogs, especially dogs with more severe gastric/duodenal lesions. Also, the hypergastrinemia associated with CE and antacid therapy is unlikely to compromise a diagnosis of gastrinoma in dogs. Use of a population-based URL for serum gastrin and the currently used URL in dogs (≤27.8 ng/L) are appropriate.

Disclosures: No disclosures to report.

ESVIM – European Society of Veterinary Internal Medicine

ESVIM-P-1
C-REACTIVE PROTEIN CONCENTRATIONS IN NOVA SCOTIA DUCK TOLLING RETRIEVERS WITH AN SLE-RELATED DISEASE. H.D. Bremer, A. Hillström, M. Kånåhols, R. Hagman, H.D. Hansson-Hamlin. Swedish University of Agricultural Sciences, Uppsala, Sweden

Nova Scotia Duck Tolling Retriever (NSDTR) dogs are predisposed to immune-mediated disorders and particularly to a disorder characterized by chronic stiffness and pain from multiple joints, indicative of non-erosive polyarthritis. Dogs affected by this disorder, called immune-mediated rheumatic disease (IMRD), commonly display antinuclear antibodies (ANA) on indirect immunofluorescence (IIF). Non-erosive polyarthritis and ANA are commonly present in systemic lupus erythematosus (SLE) and in other systemic rheumatic diseases, in humans as well as in dogs. IMRD may be described as an SLE-related disease. Diagnosis and monitoring of IMRD are primarily based on clinical signs and presence of ANA, and an objective, quick and cost-effective test would be highly valuable. The acute phase protein C-reactive protein (CRP) is used for diagnosing and monitoring systemic inflammation in both humans and dogs. It is considered to be a quantitative marker of inflammation in most diseases, but in human SLE, CRP concentrations are mildly to moderately increased and not correlated to the degree of inflammation. The aim of the study was to investigate CRP concentrations in NSDTRs with IMRD. The hypothesis was that CRP concentrations would be mildly to moderately increased in IMRD compared to healthy dogs, similar to what has been reported in humans with SLE. Serum CRP concentrations were measured in 18 IMRD affected NSDTRs (9 IIF-ANA positive and 9 IIF-ANA negative) and 19 healthy control NSDTRs using two canine-specific immunoturbidimetric assays (Gentian cCRP assay and high-sensitivity CRP assay, Gentian AS, Moss, Norway). None of the dogs were treated with anti-inflammatory medication at the time of sampling. Dogs with IMRD had higher CRP concentrations compared to control dogs (Welch two sample *t*-test with log-transformation of data, $P = 0.003$) but no difference was observed between the groups of IMRD dogs with and without positive IIF-ANA, respectively ($P = 0.6$). The median CRP concentration was 10.3 mg/L in the IMRD dogs and 2.1 mg/L in the control dogs. The CRP concentration was low to moderately increased in a majority of IMRD dogs, as is seen in humans with SLE. The CRP concentration was lower than observed in, for example, studies of immune-mediated polyarthritis in other dog breeds but higher than in canine osteoarthritis, two disorders that can resemble IMRD. The potential clinical value of CRP in dogs with IMRD warrants further investigations.

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ESVIM-P-2
CANINE STORED WHOLE BLOOD UNITS: WHICH IS THE REAL EXTENT OF BACTERIAL CONTAMINATION RISK?.
A. Miglio, V. Stefanetti, M. Antognoni, K. Capelli, S. Capomaccio, F. Passamonti. University of Perugia, Perugia, Italy

Actual reports of bacterial contamination of blood units has emerged as a cause of morbidity and mortality in human transfusion medicine, but they are rare in veterinary literature. An underestimation of the extent of the risk of the bacterial contamination of blood units could be expected.

This study aims to detect and quantify bacterial microorganisms in 49 canine whole blood (WB) units during their shelf-life and to estimate the bacterial contamination rate during collection, processing and storage of blood units.

Forty-nine WB units were included in the study. The blood was collected from healthy animals according to the guidelines and immediately refrigerated at 4 °C, where it can be stored up to 35 days. Eight sterile samples from each units were tested for bacterial culture on days 0 (T0), 1(T*), 7 (T1), 14 (T2), 21(T3), 28 (T4), 35 (T5), 42 (T6). Moreover, after DNA extraction, a real-time qPCR assay was performed on T0, T3, T5 according to Nakardini et al. procedure. Obtained sequences were submitted to a BLAST analysis with the GenBank reference database to reveal the amplification source genera.

On bacterial culture, 47/49 samples were negative for all the time points. One sample was positive for *Enterococcus* spp at T0 and at T* and 1 for *E.coli* at T5. After the PCR analysis, 26/49 samples were positive in at least one time point. Sequences were assigned to *Propionobacterium* spp., *Corynebacterium* spp., *Caulobacter* spp., *Hypomicorbium* spp., *Pseudomonas* spp., *Enterococcus* spp., *Serratia* spp. and *Leucobacter* spp.

The unique *E.coli* growth as a contaminant by laboratory techniques since the same sample resulted negative to PCR assay.

In one case both blood culture and PCR assay identified *Enterococcus* spp. and the species of bacteria was the same for both the assays.

The process of bacterial culture is slow, as there is need for the microorganism to grow and reach an appreciable number of cells, and a low quantity of bacteria can also not be detected with bacterial culture. That could explain the difference between culture methods and molecular detection. Most of the organisms detected by qPCR assay tend to be skin-associated or widespread bacteria (soil and water) not usually implicated in transfusion reactions.

With qPCR assay, bacterial load varied from 4 to 80 Equivalent Genome/mmc, and we can state that bacterial contamination of blood units resulted very low. Moreover, these results could include the detection of dead or degraded bacterial DNA.

Disclosures: No disclosures to report.

ESVIM-P-3
QUANTIFICATIONAL ASSESSMENT OF VENTILATORY FUNCTION IN CATS WITH RESPIRATORY DISTRESS.
C.H. Lin[1], P.Y. Lo[1], H.D. Wu[2]. [1]National Taiwan University Veterinary Hospital, Taipei, Taiwan, [2]National Taiwan University Hospital, Taipei, Taiwan

Cats in severe respiratory distress may be too unstable to receive many clinical manipulations. The aims of this study were to non-invasively quantify tidal breathing status in cats present with respiratory distress, and to compare the difference in ventilatory function between cats with respiratory distress and healthy cats. We hypothesized that ventilatory parameters such as respiratory rate and volumes will be elevated in cats experiencing significant labored breathing because of respiratory diseases and increase in ventilatory demand. Twelve cats present in NTUVH with persistently increased respiratory effort due to various etiologies (lung parenchymal disease, pleural space disease, upper airway obstruction, or lower airway disease) were enrolled in the study, and the informed consents were obtained from the owners. The cat was placed in a transparent Plexiglas chamber of the barometric whole body plethysmography (BWBP) system without restraint for recording tidal breathing signals, and the breathing status of the cat could be observed easily by the clinicians at the same time without causing disturbance or stress to the cat. Compared with 14 cats without respiratory signs or historic respiratory diseases, cats in respiratory distress had significantly higher minute volume/body weight (MV/BW) (531.6 versus 234.5 mL/kg; $P < 0.001$), tidal volume/BW (TV/BW) (7.55 versus 5.46 mL/kg; $P = 0.026$), peak inspiratory flow/BW (PIF/BW) (29.2 versus 13.8 mL/s/kg; $P < 0.001$), peak expiratory flow/BW (PEF/BW) (35.2 versus 12.9 mL/s/kg; $P < 0.001$), enhanced pause (1.60 versus 1.00; $P = 0.003$), and significantly lower relaxation time (0.17 versus 0.36 s; $P = 0.010$). Among cats with respiratory distress, 5 cats that eventually died with respiratory failure had statistically higher MV/BW than 5 cats that survived and became stable over at least 3 months (639.0 versus 390.1; mL/kg) ($P = 0.028$). Interestingly, respiratory rate was neither significantly different between cats in respiratory distress and control cats, nor between cats that died and cats that survived. In conclusion, ventilatory function could be non-invasively and non-harmfully assessed in cats with respiratory distress by BWBP method. Elevation of MV/BW under natural breathing implies the increase in ventilatory demand and might be a poor prognostic indicator or severity index in cats with labored breathing. Furthermore, respiratory rate might not be reliable for identifying increased respiratory effort or disease severity. Care should be taken when the assessment relies on respiratory rate alone.

Disclosures: No disclosures to report.

ESVIM-P-4
PLEURAL EFFUSION IN CATS: 465 CASES (2009–2014).
M. Dominguez Ruiz, F. Vessières, G. Ragetly, J.L. Hernandez. CHV Frégis, Arcueil, France

Many causes of pleural effusion (PE) are known in cats, but little is known about their frequency and potential indicative factors at the time of diagnosis. This study aimed to identify the aetiologies that lead to PE in cats, along with clinical signs, treatments and outcomes associated with this condition. We hypothesized that the major causes of PE in cats would be congestive heart failure (CHF) and neoplasia; and also that cats suffering from CHF would have a lower rectal temperatures (RTs) than cats with non-cardiogenic PE.

The medical records of a total of 465 client-owned cats with PE were reviewed. Cases were selected based on their complete demographic data, a physical examination and the presence of PE. Several procedures were performed to investigate the underlying aetiology: infectious diseases screening, clinical pathology analysis, diagnostic imaging examinations and surgical interventions.

CHF and neoplasia were the most common causes of PE in cats (36.7% and 35.8%, respectively). Other causes included pyothorax (13.0%), idiopathic chylothorax (4.0%), trauma (3.8%), feline infectious peritonitis (2.8%) and diaphragmatic hernia (1.9%). Cats with CHF were younger (10 ± 4.7 years old) than those with neoplasia (11 ± 4.1 years old, $P < 0.001$). Cats with lymphoma (8.8 ± 3.8 years old) were younger than those with carcinoma (12 ± 2.3 years old, $P < 0.001$). Cats with CHF had significantly lower RTs at admission than those with PE due to other causes (36.9 ± 1.1°C versus 38.0 ± 1.0°C, respectively, $P < 0.001$). Male cats were significantly overrepresented in the CHF group (72.3%). A quarter of the global population (117/465) died or was euthanized within 3 days following the diagnosis.

In conclusion, CHF and neoplasia were the most prevalent causes of PE in cats. Younger age, being a male cat, and low RT at admission were indicators of CHF. Cats with PEs have a poor prognosis. Additional studies are necessary to determinate whether rectal temperature at admission is correlated negatively with survival in cats with PEs associated with CHF, as reported in humans with CHF and in cats with arterial thromboembolism.

Disclosures: No disclosures to report.

ESVIM-P-5

CLINICAL EVALUATION AND PHARMACODYNAMICS OF HEALTHY CATS AFTER MULTI-DAY INTRAVENOUS DOSING OF MYCOPHENOLATE MOFETIL. J.E. Slovak, J. Hwang, S. Rivera, M.H. Court, N. Villarino. Washington State University College of Veterinary Medicine, Pullman, USA

Cats suffer from multiple auto-immune diseases. Some of these diseases are fatal in cats when corticosteroids are not effective controlling immune responses, requiring alternative immune-suppressive therapies. Mycophenolate mofetil may be an alternate immunosuppressant that should be considered for use in cats because of its documented efficacy in controlling autoimmune diseases in humans and dogs.

Mycophenolate mofetil is the pro-drug of the active compound mycophenolic acid (MPA). It is a selective non-competitive inhibitor of inosine-5'-monophosphate dehydrogenase, which is expressed in many cells. MPA induces lymphocyte cytotoxicity, reduces monocyte recruitment, and suppresses dendritic cell maturation, making it useful in treating immune mediated and inflammatory diseases. Diarrhea is a side effect of MPA in humans and dogs, and occurs in up to 20% of patients. This side effect has not been observed in cats. We proposed that MPA could be used successfully in cats with minimal side effects after multi-day intravenous dosing. Five clinically healthy adult cats were voluntarily enrolled. Baseline laboratory testing was performed in all cats prior to the start of the study to rule out systemic disease. All cats were administered 10 mg/kg of mycophenolate mofetil (CellCept®) intravenously over 2 hours BID for 3 days. The cats' body weights, appetite, attitude, and stools were monitored pre (7 days), during (3 days) and post (7 days) infusions. All participant cats maintained their body weights throughout the study. Attitudes remained bright and alert and no cats showed any gastrointestinal side effects (normal appetites, no vomiting, and formed stool). Total lymphocyte numbers were obtained at pre-dose, 24, 48, and 72 hours after infusion initiation. The numbers were reduced in four cats by 25.9% ± 15.8 and 26.7% ± 19.3 at 24 and 48 hours after infusion. At 72 hours after infusion, the number was slightly reduced by 14.7% ± 8.4. Interestingly, one of the cats showed 11 to 67% increases in the number of lymphocytes. A serum chemistry and complete blood count were repeated in all cats 1 day after the final MPA administration revealing no adverse effects.

Our preliminary results suggest that MPA can rapidly and reversibly reduce lymphocyte numbers during medication administration and that there are minimal to no side effects when giving a short course of intravenous MPA therapy to healthy cats. Future studies will further evaluate the effects of MPA on feline lymphocytes after short term and long term oral dosing and the effects of MPA on clinical cases.

Disclosures: No disclosures to report.

ESVIM-P-6

PRIMARY IMMUNE-MEDIATED HEMOLYTIC ANEMIA: A RETROSPECTIVE STUDY OF 52 DOGS FROM TWO VETERINARY TEACHING HOSPITALS. A. Gavazza[1], S.M. Levi[1], V. Marchetti[1], A.A. Medina Valentin[1], I. Aroch[2], G. Lubas[1]. [1]University of Pisa, San Piero a Grado, Pisa, Italy, [2]Hebrew Univ. VTH, Koret School Vet. Med., Jerusalem, Israel

Primary immune-mediated hemolytic anemia (pIMHA) is a type II hypersensitivity (antibody-dependent cytotoxicity), and is the most common immune-hematologic disorder in dogs. It leads mostly to moderate to severe anemia, with subsequent hypoxemia, hypercoagulability, and often fatal outcomes.

This retrospective study (2009–2015) examined the clinical and laboratory findings at the presentation visit in dogs with pIMHA, in two veterinary teaching hospitals (Pisa, Italy; Koret, Israel).

The study included 52 dogs (Pisa $n = 30$; Koret $n = 22$) presented with hematocrit <30%, combined with ≥1 of the following: spherocytosis, positive osmotic fragility test, autoagglutination, positive Coombs' test or positive flow cytometry for RBC-bound IgG and/or IgM. Cases were excluded if positive to tick-borne disease or other infections, based on serology or PCR assay, or if diagnosed with systemic neoplasia. Data retrieved from medical records included the signalment, clinical and laboratory findings. Data regarding gender and breed in the Pisa group was compared with a control population, which included all dogs presented to the Pisa hospital during the study period ($n = 19{,}647$). The findings in Pisa and Koret groups were compared.

Dogs with pIMHA were mainly middle-aged to elderly dogs, presented with no seasonal pattern. In the Pisa group, neutered females ($P = 0.021$), as well as Cocker-Spaniel and Maltese dogs ($P = 0.025$ and $P = 0.012$, respectively) were overrepresented compared to the control population. The most frequent clinical signs included pale mucous membranes and lethargy (88% each), anorexia (65%), tachycardia (42%), tachypnea (38%), and pigmenturia (35%). The Koret dogs were significantly more icteric, tachycardic and tachypneic compared to the Pisa dogs ($P = 0.048$, $P = 0.017$ and $P = 0.001$, respectively). Anemia was classified as macrocytic-hypochromic (43%), macrocytic-normochromic (27%), macrocytic-hyperchromic (12%), normocytic-normochromic (10%), normocytic hypochromic and normocytic-hyperchromic (4% each). The Koret group had significantly more dogs with anemia classified as hyperchromic ($P = 0.001$), suggesting higher frequency of hemoglobinemia due to intravascular hemolysis. The common morphological cellular blood anomalies included polychromasia (94%), anisocytosis and metarubricytosis (82% each), spherocytosis and leukocytosis (80% each), neutrophilia (69%), Howell-Jolly bodies and left-shift (49% each), macrothrombocythemia (45%), thrombocytopenia (35%), monocytosis (31%), autoagglutination (27%), hypochromia (16%), poikilocytosis (16%), and schistocytosis (14%).

This study confirms previous findings regarding the signalment, clinical and laboratory characteristics of pIMHA in dogs. The microscopic evaluation of the blood smear is a valuable tool in the diagnosis of pIMHA. The Koret group was characterized by a more severe presentation of the disease, likely because this hospital admits more emergency primary care cases.

Disclosures: No disclosures to report.

ESVIM-P-7

CLINICAL EFFICACY OF AUTOLOGOUS PLATELET-RICH PLASMA (PRP) IN CANINE PERIANAL FISTULAS AND AURAL HEMATOMAS. R. Perego, D. Proverbio, L. Baggiani, E. Moneta, E. Spada. Università degli Studi di Milano, Milano, Italy

Platelet-rich plasma (PRP) derived from whole blood, is characterized by platelet concentrations above baseline in a small volume of plasma that leads to increased concentration of platelet-derived growth factors which can stimulate cell proliferation and decrease the inflammatory reaction accelerating the healing process.

The aim of this study was to report the clinical efficacy of autologous PRP obtained with a double centrifugation validated method [1] in the treatment of canine aural hematoma and perianal fistula. Dog 1: German shepherd, 11 years old, female, with multiple perianal fistulas, treated with systemic antibiotics and local disinfections without improvement for two months. The dog had 5 perineal fistulas, three of which confluent with each other, with erythema, serum/hematic exudate and dyschezia. Dog 2: Rhodesian ridgeback, 7 years old, female, with monolateral aural hematoma caused by accidental trauma, appeared 21 days before, treated with centesis and corticosteroids therapy, with initial improvement, but subsequent relapse. The dog had an unorganized right aural hematoma, size 4.5 × 5 cm, 2 cm thickness. Dog 3: Maltese, 4 years old, male, with monolateral aural hematoma, caused by intense head shaking for bilateral bacterial otitis, appeared 10 days before, treated with centesis and compression bandage, without any improvement. The dog had a partially organized right aural hematoma, size 6 × 5 cm, 3 cm thickness, with 2 areas of necrosis with purulent exudate on the edges of ear pinna, erythema and pain.

Procedures and follow up: a medium volume of 0.5 ml of PRP was obtained from a blood sample of 8 ml following a protocol previously described [1]. The autologous PRP was injected 2 times directly into fistulas (0.1 ml for each fistula), while for the aural hematomas it was injected only once after a complete centesis of liquid using the same hole of the drainage inlet. The dogs were checked every 3 days for two week and then two times a month for 2 months to evaluate the improvement with a clinical score

and photographic documentation. All dogs have a complete healing of the lesions after one month of treatment with PRP, without using other drugs other then antibiotics. No recurrences were observed in one month follow up.

Autologous PRP obtained with a in-house double centrifugation method appears to be an effective, minimally invasive therapy in the treatment of perianal fistulas and aural hematoma in dogs.

Disclosures: No disclosures to report.

Reference: 1. Perego R., *et al. EC Veterinary Science* 2.3 (2015): 126–132.

ESVIM-P-8

IMMUNOGLOBULIN A IN NOVA SCOTIA DUCK TOLLING RETRIEVERS WITH IMMUNE MEDIATED DISORDERS. H. Hansson-Hamlin, H.D. Bremer. Swedish University of Agricultural Sciences, Uppsala, Sweden

Dogs of the breed Nova Scotia duck tolling retriever (NSDTR) are affected by several immune-mediated diseases, in particular steroid-responsive meningitis-arteritis (SRMA) and an immune-mediated rheumatic disease (IMRD).

The typical, acute form of SRMA is often characterized by cervical rigidity, pain and pyrexia.

IMRD is a systemic lupus erythematosus (SLE)-related disease characterized by chronic stiffness and pain in several joints. Initial signs of IMRD are usually shown between 2–6 years of age, while acute forms of SRMA often are seen between 6–18 months.

Several studies have shown that dogs with SRMA often display elevation of immunoglobulin A (IgA) concentrations in both serum and cerebrospinal fluid. Another study identified NSDTRs as a breed with generally low serum IgA levels. In dogs, IgA production has been reported to be age-dependent and has been assumed to be stabilized at around one year of age.

The aim of this study was to investigate serum IgA levels in NSDTRs affected by SRMA, IMRD and healthy controls.
Serum IgA was measured by ELISA (dog ELISA Set, Nordic BioSite, Sweden).

Dogs included in the study were 12 NSDTRs with acute SRMA (before treatment), 10 NSDTRs with SRMA (after treatment, no clinical signs), 6 NSDTRs with IMRD, 10 healthy NSDTRs and 10 healthy dogs (representing 10 other different breeds). There was a slight elevation of the mean IgA in NSDTRs with acute SRMA (2.1 g/L with SD = 1.2) and IMRD (1.9 g/L with SD = 1.4) as compared to NSDTRs after treatment (1.4 g/L with SD = 0.5) and healthy NSDTRs (1.4 g/L with SD = 0.3). The mean IgA in healthy dogs from other breeds was 1.6 g/L (SD = 0.7).

The changes in NSDTRs with SRMA were minor as compared to studies of other breeds with SRMA. Maybe SRMA in NSDTRs is influenced by other etiologic factors such as other genetic background. We have earlier shown that there may be a genetic locus shared between SRMA and IMRD in NSDTRs. Moreover, NSDTRs in the group with acute SRMA were younger than the dogs in the other groups, with 67% being under one year. Thus, the low age may in the present study have influenced the IgA values negatively.

In conclusion, this study did not show a clear elevation of serum IgA in NSDTRs with SRMA as shown for other breeds with this disease. Healthy NSDTRs did not display lower values of serum IgA as compared to healthy dogs of other breeds.

Disclosures: No disclosures to report.

ESVIM-P-9

INVESTIGATION OF THE COAGULATION SYSTEM IN CANINE IDIOPATHIC PULMONARY FIBROSIS. E. Roels[1], N. Bauer[2], C. Lecut[1], F. Billen[1], C. Soete[1], A. Moritz[2], A. Gothot[1], C. Clercx[1]. [1]University of Liège, Liège, Belgium, [2]Justus-Liebig-Universität, Giessen, Germany

Canine idiopathic pulmonary fibrosis (CIPF) is a progressive interstitial lung disease mainly affecting old West Highland white terriers (WHWTs). CIPF shares several clinical and pathological features with human IPF. An imbalance between thrombosis and fibrinolysis has been demonstrated in human IPF patients favouring a local and systemic prothrombotic state which correlates with disease severity and outcome. The aim of the present study was to investigate the coagulation and fibrinolysis systems in CIPF. For this purpose, coagulation profile and thromboelastography data were collected and compared between WHWTs affected with CIPF and unaffected WHWTs (CTRL). Coagulation times (PT, aPTT), plasmatic concentrations of fibrinogen, D dimers, antithrombin III, Protein S and Protein C activities, anti-factor Xa activity (FXa), and activated Protein C ratio (APCR) were retrospectively measured using the STA Compact automated coagulation analyzer from previously stored (−80°C) plasma samples obtained from 20 CTRL and 14 CIPF WHWTs. Point-of-care rotational thromboelastometer (ROTEM) was employed to prospectively measure clotting-time, α-angle, amplitude at 10/20/30 min, maximal clot firmness, lysis after 30/60 min, and maximum lysis on whole-citrated blood sampled from 15 CTRL and 9 CIPF WHWTs. Satistical analyses were perfomed with a commercially available software using Student-*t* test or Mann-Withney test for continuous variables, and Fisher's exact test for categorical variables. Statistical significance was set at $P \leq 0.05$. Compared with CTRL, WHWTs affected with CIPF demonstrated a longer aPTT (mean ± SD) (12.2 ± 0.9 sec versus 11.5 ± 0.7, $P = 0.028$), whereas results obtained in both groups were all within reference ranges. A trend for an increased fibrinogen concentration (4.1 ± 1.8 g/L versus 3.1 ± 1.1, $P = 0.067$) and for a decreased APCR (median, range) (25.6, 21.9–27.7 versus 26.8, 23.8–64.4) in WHWTs affected with CIPF was observed, while there was no siginificant difference between groups for the other factors assessed. FXa was found above the upper limit of the reference range in 3 WHWTs affected with CIPF, but in none of the controls ($P = 0.075$). ROTEM results demonstrated no significant difference between groups for any of the parameters studied. Results of the present study provide no clear evidence for a hypercoagulable state in WHWTs affected with CIPF. High fibrinogen concentrations found in CIPF WHWTs tend to suggest a proinflammatory state which may be a risk factor for thrombosis, but this finding should be confirmed by further investigation in larger cohorts of dogs.

Disclosures: No disclosures to report.

ESVIM-P-10

REFERENCES INTERVALS IN SHETLAND SHEEPDOGS: IS PRIMARY HYPERLIPIDEMIA A REAL FEATURE IN THIS BREED?. B. Ruggerone, P. Scarpa, M. Giraldi, S. Paltrinieri. Università degli Studi di Milano, Milano, Italy

Clinical decisions are often based on the comparison of patient's laboratory results with reference intervals (RI). Several breeds have physiological peculiarities that induce variations in RI compared to the general canine population. However, no information is available about the need to establish breed-specific RI for Shetland Sheepdogs, a breed reported to be potentially affected by physiological hyperlipidemia.

The aim of this study is to determine whether RI referred to the general canine population may be applied to Shetland Sheepdogs from Italy, and to determine breed-specific RI, when the general RI were not validated.

To this aim, 60 clinically healthy fasted Shetland Sheepdogs (24 males, 1 neutered male, 31 females and 3 spayed females, age 1–8 years, Median 3.5), that represent the 36% of the Italian population registered at the National Breed association, were examined. Dogs with clinical signs of disease, receiving medications (except antiparasitic treatments) and pregnant females were excluded.

Routine haematology was performed using a laser based cell counter (Sysmex XT-2000iV; Sysmex). An extended panel of biochemical analytes was determined on serum using an automated spectrophotometer (Cobas Mira, Roche Diagnostics). The transference method was used to compare the results of Shetland Sheepdogs with the RI of the general canine population. If more than 25% of values were outside the claimed RI, new RI were calculated according to the ASVCP guidelines, using an Excel spreadsheet with the Reference Value Advisor (2.0) set of macroinstructions after removal of far outliers. Based on data distribution, a non-parametric method or the Robust method were used to define the RI with 90% confidence interval.

Differences of all haematological and biochemical records in dogs of different sex, age and aptitude (companion versus agility dogs) were investigated by linear regression or U Mann Withney test.

The transference method validated 16 haematological and 14 biochemical reference intervals. For 6 parameters, differences from our laboratory RI could be due to pre-analytical or analytical errors whereas for glucose and total cholesterol new RI are required, even if all the dogs presented cholesterol levels <500 mg/dL, which is considered as a clinically relevant value. Differences associated with aptitude or sex were consistent with those of other breeds. A weak and probably not biologically significant correlation was found between cholesterolemia and age (−0.026 – $P = 0.045$).

This study suggests that breed-specific reference intervals may be used for glucose and total cholesterol in Shetland Sheepdogs to reduce the misinterpretation of laboratory results.

Disclosures: No disclosures to report.

ESVIM-P-11

A NOVEL ENDOSCOPIC LARYNGEAL FINDING RELATED TO BRONCHIAL FOREIGN BODIES-RETROSPECTIVE STUDY ON 227 DOGS. C.C. Timpano, M.C. Marchesi, V.M. Rosoni, A. Catanzaro, S. Busechian, F. Rueca. University of Perugia, Perugia, Italy

Bronchial vegetal foreign bodies are a common problem in dogs in Europe, especially during the summer season. Foxtails are usually inhaled/aspirated during exercise and then deepen their position into the bronchial tree. These torpedo shaped awns may become irreversibly lodged into the bronchi or even migrate through the pulmonary parenchyma to other regions (ex. paravertebral muscles, pleural space).

Bronchoscopy is the gold standard technique for localization and often removal of airway foreign bodies (AFB). An early diagnosis and treatment is important to avoid respiratory and sometimes neurological complications due to foreign body migration and local infection.

The aim of this study is to describe and evaluate the correlation between laryngeal lesions and the presence of foreign bodies inside the bronchial tree. This laryngeal findings may be helpful to facilitate an early diagnosis, since their presence could be related to that one of AFB.

We reviewed bronchoscopic exams of 227 dogs referred to Perugia Veterinary Teaching Hospital for respiratory symptoms during the last 5 years. Then, we defined as "puddle" the presence of purulent exudate into the ventral part of larynx, both vocal cords and/or first tracheal tract. Among these 227 dogs 136 were hunting dogs and 91 non-hunting dogs, based on FCI breed classification. Of all our cases, 88 dogs were positive for AFB. Whenever a foreign body was not found, a BAL with bacteriological exam was performed (139 total of BAL).

Results about higher frequency of AFB in hunting dogs (78%) and Right Lung localization (72%) were in agreement with previous studies.

Among the dogs presenting with an AFB, 83% of them were positive for the "puddle" sign. Moreover, in the BAL positive group, 80% of dogs did not present the "puddle"sign. These last results suggest that the laryngeal sign we are evaluating is specifically related to the presence of AFB and not to all kinds of bacterial lower respiratory tract infections. Grass awns carry many bacterial agents that perpetuate a continuos and highly suppurative bronchial infection. Then the strong expulsive effort of cough, tends to remove this purulent exudate that remains trapped into the ventral part of the larynx, probably due to the conformation of the canine upper respiratory tract.

Therefore, the "puddle"sign could be helpful in directing an early diagnosis and treatment of AFB.

Disclosures: No disclosures to report.

ESVONC – European Society of Veterinary Oncology

ESVONC-P-1

ELECTROCHEMOTHERAPY: EFFICACY OF BLEOMYCIN PLUS DOXORUBICIN PROTOCOL IN DOGS WITH SQUAMOUS CELL CARCINOMA. S.G. Calazans[1], M.L. Costa[1], D.S. Anjos[1], C.R. Paula[1], C.M. Bueno[2], L.F. Magalhães[1], C.H.M. Brunner[3], G. Magalhães[1]. [1]Universidade de Franca, Franca, Brazil, [2]Universidade Estadual Paulista, Jaboticabal, Brazil, [3]Universidade Paulista, São Paulo, Brazil

Based on the current knowledge, electrochemotherapy (ECT) is used in dogs with squamous cell carcinomas (SCC) promoting substantial tumor remissions. The aim of this study was to evaluate the effect of ECT on tumor volume, mitotic index and microscopic necrosis in canine cutaneous squamous cell carcinomas (SCC). This study included nine dogs referred to a veterinary hospital. Five patients had one lesion, three had two lesions, and one had four lesions. All the fifteen lesions were assessed. Tumor samples were taken before ECT (D0) and 21 days later (D21). ECT was accomplished by using the electroporator LC® BK-100 model in association with intravenous bleomycin (15 UI/m²) plus doxorubicin (30 mg/m²) protocol. Tumor volume was calculated according to formula: length (cm) × width (cm) × height (cm) × 3.14/6. The mitotic index was determined by the number of mitotic figures in ten selected 40 × high-power fields. Microscopic necrosis was classified as "absent", grade I (less than 50%) or grade II (over 50%), as previously described. After testing for normality, the paired *t*-test or the Mann-Whitney test was applied to make the comparisons. The most common site of tumors was the abdomen ($n = 10$) and thorax ($n = 3$). One tumor occurred on the prepuce, and one was located on pelvic limb. After treatment, thirteen tumors presented clinical remission. One tumor progressed, and one remained stable in size. The mean of tumor volume in D0 (26.66 ± 36.98) was higher than in D21 (18.07 ± 33.06) ($P = 0.0134$). The mitotic index decreased in twelve lesions and increased in other three lesions. The mean of mitotic index in D0 (9 ± 6.8) did not significantly differ from D21 (7.42 ± 5.23) ($P > 0.05$). Before treatment, necrosis was classified as grade I in ten lesions and as grade II in four lesions. Necrosis was absent in one tumor. After ECT, the grade of necrosis did not change in most tumors ($n = 12$). One lesion decreased necrosis grade from II to I while other lesion decreased from I to "absent". One tumor that presented absence of necrosis in D0 was classified as grade I in D21. There was no significant difference between D0 and D21 for necrosis ($P > 0.05$). Although substantial tumor remissions, ECT does not significantly decreases mitotic index in SCC in dogs. Moreover, ECT does not influence the intensity of microscopic necrosis after 21 days from this procedure.

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Disclosures: No disclosures to report.

ESVONC-P-2

CELLULAR PATHWAY ANALYSIS OF A TURMERIC AND ROSEMARY EXTRACT COMBINATION TREATMENT ON CANINE NEOPLASTIC CELL LINES. C.B. Levine[1], J. Bayle[2], V. Biourge[2], J. Wakshlag[1]. [1]Cornell University College of Veterinary Medicine, Ithaca, USA, [2]Royal Canin Research Center, Aimargues, France

Adjunctive use of nutraceuticals to treat human cancers has shown promise, but little work has been done in canine neoplasia. Specifically, the multi-modal effects of polyphenols and carotenoids have been established in human cell lines and rodent models, with limited work in canine cells. We have previously identified two natural ingredients, turmeric extract (TE) and rosemary extract (RE), which worked synergistically to reduce neoplastic cell growth, and had no cytotoxic effect on normal dermal fibroblasts. This combination had an additive or synergistic effect when used with the chemotherapeutic agents toceranib or doxorubicin hydrochloride. The purpose of this in-vitro study was to examine mechanisms of action of this cocktail. Three canine

neoplastic cell lines representing a variety of tumors were used: C2 (mastocytoma), CMT-12 (mammary gland carcinoma), and D17 (osteosarcoma). Apoptosis was determined using Annexin V staining and by a commercially available caspase-3/7 cleavage assay. Cell cycle changes using propidium iodide staining, generation of reactive oxygen species using Dihydrorhodamine123, modulation of cellular efflux pumps, and cellular accumulation of curcumin were analyzed by flow cytometry. Perturbation of various cell signaling pathways was assessed after 12 and 24 hours of incubation by western blotting. Cells were treated with 6.3 μg/mL of extract individually, a combination (3.1 μg/mL of each extract), or vehicle control. Comparisions between these four treatment groups were analyzed using a one-way ANOVA followed by Tukey's post-hoc analyses. The combination treatment induced apoptosis in all cell lines, beyond the effects of TE alone, after 36 hours of incubation. Both extracts had a significant antioxidant effect ($P < 0.05$). CMT-12 cells were the most susceptible to treatment (40% Annexin V positive; 5-fold increase in caspase cleavage). The presence of RE significantly increased the cellular accumulation of TE as indicated by an increase in fluorescence, with the CMT-12 cell line showing the greatest accumulation. Western blotting showed an increase in the amount of activated c-jun N-terminal kinase (JNK), although the differences varied across cell lines. TE and RE interact synergistically to induce apoptosis in-vitro; mechanisms may include RE increasing cellular accumulation of TE and activation of JNK. Considering the doses used in-vitro may be physiologically achievable, in-vivo studies are warranted to determine the pharmacokinetics and efficacy of this dual treatment.

Disclosures: The research leading to these results was supported by Royal Canin SAS. Royal Canin participated in writing the protocol, analyzing the data, contributing compounds, revising the manuscript for publication, and giving their final approval of the version to be published and agreed to be accountable for all aspects of the work. JB and VB are employed by Royal Canin. JW receives honoraria from and is on the advisory council for Nestle Purina and Mars Inc.

ESVONC-P-3

IDENTIFICATION OF GERM-LINE GENETIC RISK FACTORS FOR DEVELOPMENT OF MAST CELL TUMORS IN GOLDEN RETRIEVERS. M.L. Arendt[1], M. Starkey[2], K. Lindblad-Toh[1]. [1]Uppsala University, Uppsala, Sweden, [2]Animal Health Trust, Newmarket, UK

The golden retriever is a dog breed with a relatively high risk of developing cancer compared to other breeds. This suggests that germ-line genetic risk factors contribute to disease development in this breed.

Genome wide association studies have proven to be an effective method for identifying genetic risk factors even in complex disease. By taking advantage of the historical genetic bottlenecks within dog breeds these studies can be done with smaller numbers of cases and controls compared to human studies.

We conducted a genome wide association study to investigate germ-line risk factors implicated in the development of mast cell tumours in golden retrievers. We collected DNA from healthy geriatric golden retrievers and golden retrievers affected by mast cell tumours in both Europe and the United States. All individuals were genotyped using the Illumina 170 k genotyping array.

We found an association to two different loci in the American and European populations. Each of these loci contained three of the six hyaluronidase genes suggesting that hyaluronan turnover could play a role in the development of mast cell tumours. Targeted sequencing and subsequent fine mapping identified a mutation in the GNAI2 gene introducing an alternative splice form present in mainly European golden retrievers. We are conducting further work to characterize the role of the hyaluronidase genes and GNAI2 in disease development.

We hope that our findings will shed light not only on the development of cancer in golden retrievers but also have a comparative value to help understanding human cancer.

Disclosures: A patent application has been filed related to this work patent application number B1195.70019US00.

ESVONC-P-4

PHAGOCYTIC ACTIVITY AND METASTATIC POTENTIAL OF PRIMARY CANINE ORAL MELANOMA CELL LINES. F. Schmid[1], D. Brodesser[1], M. Kleiter[2], S. Brandt[1], B. Pratscher[1]. [1]Research Group Oncology, Vienna, Austria, [2]Radiooncology and Nuclear Medicine Platform, Vienna, Austria

Malignant melanoma is the most common oral tumour type in dogs and has high metastatic potential. The latter is thought to be associated with active phagocytosis. In this study we aimed at analysing the phagocytic behaviour of explanted canine oral melanoma cell lines.

To address this issue, we established cell lines from primary and metastatic canine oral melanomas and screened them for cellular melanoma markers. Whilst lesions tested Melan A-positive by immunohistochemistry, flow cytometric analysis scored negative for this marker, although cells clearly expressed Vimentin and S100. The phagocytic activity of melanoma cell lines was addressed by flow cytometric staining for macrophage-specific surface antigens CD68 and CD163, and the melanoma-associated antigen CD146, as well as for incorporation of fluorochrome-labelled latex beads. All established melanoma cell lines clearly showed phagocytic activity (30 and 60% of cells) in correlation with strong co-expression of CD146, but not with expression of macrophage markers CD68 and CD163, although the latter are thought to be involved in recognition and phagocytosis of apoptotic cells in other tumour types.

CD146 was initially identified as a progression marker for melanoma. More recently, it has been recognized as a marker for epithelial-to-mesenchymal transition and transendothelial migration. In addition, phagocytic-like activity of tumour cells has been reported to be associated with invasiveness. Therefore, expression of CD146 and phagocytic activity of canine melanoma cells may represent a valuable indicator for malignity of canine oral melanoma and on-going metastatic processes.

Disclosures: No disclosures to report.

ESVONC-P-6

ASSESSMENT OF THE COAGULATION PROFILE IN CANINE MULTIPLE MYELOMA: A COHORT INVESTIGATION IN 234 DOGS. M. Caldin[1], M. Campigli[1], A. Zoia[1], G. Lubas[2], A. Zanella[1], G. Bertolini[1], T. Furlanello[3]. [1]San Marco Veterinary Clinic, Padova, Italy, [2]Dipartimento Scienze Veterinarie, San Piero a Grado, Pisa, Italy, [3]Laboratorio d'Analisi Veterinarie San Marco, Padova, Italy

Hypercoagulability in canine multiple myeloma (MM) as described in humans has not been reported and prognostic factors related to hemostasis have not been investigated.

Aims of this study were: to describe the haemostatic profile in dogs with MM, to detect a possible hypercoagulable state, and to assess whether coagulation parameters have prognostic value. Haemostatic alteration at the initial visit of dogs affected by MM (Group 1, $n = 78$) were retrieved from the electronic data-base (P.O.A. System-Plus 9.0®) of the San Marco Veterinary Clinic, between 2002–2015. Dogs with MM met the following criteria: bone marrow plasma cells ≥15%, osteolytic lesions, serum monobiclonal gammopathy and extensive coagulation profile including platelet count, aPTT, PT, fibrinogen, thrombin time (TT), FPDs, D-Dimer and antithrombin (AT). Two groups of dogs individually matched for age, breed, and sex were used as controls: healthy dogs (Group 2, $n = 78$) and sick dogs without MM (Group 3, $n = 78$). In addition, the hemostatic profile between clinical bleeding (B-MM, $n = 45$) (e.g., gum bleedind, epistaxis) and no-clinical bleeding (NB-MM, $n = 33$) dogs with MM was evaluated.

Kruskal-Wallis and Wilcoxon-Mann-Whitney tests were used to compare groups. Risk to death at 90 days after diagnosis within B-MM and NB-MM dogs was evaluated by Pearson's X^2 test. ROC curves were used to identify the best analyte to predict death.

Prothrombin time and aPTT were increased ($P = 0.001$) in Group 1 versus groups 2 and 3, TT was increased ($P = 0.001$) in Group 1 versus 3. The platelet count and AT concentration were decreased in Group 1 versus groups 2 and 3 ($P = 0.001$). Fibrinogen concentration was decreased in Group 1 versus 3 ($P = 0.01$).

No differences between Groups 1 versus groups 2 and 3 for FDPs and D-dimer were observed. Platelet count and AT concentrations were decreased in B-MM versus NB-MM ($P = 0.04$; $P = 0.026$); PT and aPTT and were increased in B-MM versus NB-MM ($P = 0.026$; $P = 0.03$). No differences between B-MM and NB-MM were observed for TT, FDPs, D-Dimer. B-MM dogs showed lower mortality rate in respect to NB-MM patient ($P < 0.028$). The TT resulted the best haemostatic analyte in predicting death in dogs affected with MM ($P < 0.04$; AUC 64%; 95% CI = 0.48–0.82).

Primary and secondary haemostasis are compromised in dogs with MM while tertiary haemostasis appears unaffected. The hypercoagulable state, opposite to humans, is unlikely in dogs with MM. Surprisingly, dogs with MM and clinical bleeding apparently have protective effect against death. The prediction of mortality in canine MM was related to TT.

Disclosures: No disclosures to report.

ESVCN – European Society of Veterinary Clinical Nutrition

ESVCN-P-1
A SURVEY ON THE BODY CONDITION SCORE MODEL FOR DOG TO CLINICAL VETERINARIANS AND DOG OWNERS.

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Body condition score (BCS) is a method that is commonly used in the diagnosis of nutritional status in small animals. However, clinical veterinarians recognize that BCS assessment has an error to some extent. This is because that BCS is an assessment of the subjective method based on ocular inspection and the palpation. Therefore we built a BCS model for the BCS assessment in dogs and examined its accuracy. We reported that variability of BCS value was less when the BCS model was used in nutritional assessment of the dog [1]. In this study, a survey was conducted to make clear usefulness of the BCS model in clinical veterinarians and dog owners.

The BCS model was developed with resin molded artificial ribs. Polychloroprene sponge sheet and natural rubber sheet were laminated to fit the palpation feeling of each BCS. A survey was carried out for both clinical veterinarians ($n = 23$) and dog owners ($n = 46$). The main questions were as follows: actual use of BCS in clinic, perception of using the BCS model and application of the BCS model in the clinic for clinical veterinarians, and awareness of the BCS and BCS assessment of own dog for dog owners.

Most of the clinical veterinarians used BCS for the nutritional assessment in dog. Many clinical veterinarians answered as follows: (i) palpation sensation between actual dog and the BCS model were consistent. (ii) description of nutritional status in dog to dog owner has become easier. On the other hand, most of the dog owners did not know the BCS. Many dog owners answered that the nutrition status of own dog could grasp using the BCS model.

The results suggest that the recognition of nutritional status for dog between veterinarian and dog owner matches by using the BCS model, as the result, this BCS model is a useful device to introduce weight loss program for obese dogs.

Disclosures: No disclosures to report.

Reference: 1. Otsuji K, Koizumi A, Mitsuhashi S, Kaneko T, Kobayashi N, Kobayashi T. Efficacy of the body condition score model in the nutritional diagnosis in dogs. ECVIM-ca Congress Lisboan Portugal Proceeding, p. 167, 2015

ESVCN-P-2
THE NEW BODY FAT INDEX CHART AS AN ALTERNATIVE, NON-INVASIVE METHOD TO ESTIMATE PERCENT BODY FAT COMPARED TO DEXA DURING WEIGHT LOSS AND WEIGHT MAINTENANCE IN OBESE CATS.

I. Paetau-Robinson, C.A. Stiers, P.A. Burris. Hill's Pet Nutrition, Inc., Topeka, USA

Approximately 58% of cats in the United States are considered overweight or obese. Many pet owners struggle with reducing their cat's body weight. A critical component of a successful weight loss regimen is a good estimate of body composition as the starting point to calculate an appropriate food amount for weight loss. The newly developed method called the Body Fat Index (BFI) differentiates between levels of obesity and establishes a link between the BFI and an ideal body weight. Dual-Energy X-ray Absorptiometry (DEXA) provides the most accurate way of measuring percent body fat; however, it is not readily available to the general practitioner. The current study compares percent body fat determined from the BFI chart and DEXA scan for a group of obese cats during weight loss and weight maintenance fed a food specifically formulated for helping cats achieve a healthy weight containing 11 g protein, 3.5 g fat, 3.6 g insoluble fiber, 0.6 g soluble fiber, and 14.9 mg L-carnitine per 100 kilocalories. The protocol and procedures were approved by the institutional animal care and use committee.

Twelve obese cats were fed for weight loss until they achieved their ideal body weight (IBW), followed by a 6-month weight maintenance phase. All cats were group housed in rooms with natural light and access to sunrooms. Three animal care technicians independently determined the BFI for each cat once per month; an average BFI was calculated. The BFI Chart included images and descriptors that were used to determine the cat's percent body fat. The cats underwent a monthly DEXA scan during the weight loss phase and every two months during the weight maintenance phase.

The values for percent body fat determined by BFI and DEXA showed good correlation ($r = 0.70$) across a range of body weights and body fat of cats undergoing weight loss. The BFI slightly underestimated the percent body fat during the initial phase of the study but showed excellent agreement with DEXA results during the weight maintenance phase.

The purpose of this study was to evaluate the usefulness of the new BFI Risk Chart to repeatedly estimate percent body fat in overweight cats during weight loss and during a period of stable, normal body weight. The results show that the new method is an excellent tool for the determination of body fat when a DEXA instrument is not available and would be practical to use in the veterinary clinic.

Disclosures: Disclosures to report: The presenter and co-authors are employees of Hill's Pet Nutrition. The body fat index chart used in this study was developed by Hill's Pet Nutrition.

VBPS – Veterinary Blood Pressure Society

VBPS-P-1
COMPARISON OF HIGH-DEFINITION OSCILLOMETRIC AND WRIST BLOOD PRESSURE MONITORS FOR ARTERIAL BLOOD PRESSURE MEASUREMENTS IN DOGS.

E. Martinelli[1], A.M. Zanaboni[2], R. Toschi Corneliani[1], R. Ferriani[1], C. Locatelli[3]. [1]San Francesco Veterinary Hospital, Milan, Italy, [2]Computer Science Department, University of Milan, Milan, Italy, [3]Department of Veterinary Medicine, University of Milan, Milan, Italy

Home blood pressure (BP) monitoring has a great potential to improve hypertension control in both human and dogs. The aim of this prospective study was to assess the level of agreement between the high-definition oscillometric method (vet HDO Monitor, S&B medVet GmbH) and a wrist blood pressure measuring device (WBP-DigiColor – Microlife Corporationn) monitor in dogs.

This study was carried out between January 2016 and March 2016. Hospitalized dogs weighing more than 10 kg and aged over 7 months were recruited. All BP measurements were obtained according to the ACVIM (American College of Veterinary Internal

Medicine) consensus statement. Measurements were taken on the nondependent front leg with the dog placed in lateral recumbency. Cuffs of both oscillometric devices were placed on the proximal pelvic limb, just above the hock. Limb circumference was measured. The HDO's cuff provided by the manufacturer was selected according to the animal's limb circumference and to the manufacturer's instructions. Systolic and diastolic pressures were recorded for each device.

Statistical analysis was performed using IBM SPSS Statistics 20 (P value significant if <0.05). Data was examined using the Shapiro-wilk test of normality and the Bland-Altman method.
Good agreement was defined as a bias and limits of agreement (LOA) within 15 mmHg.

Twenty-three dogs (13 female and 10 male) were included among the eligible population (age 69.4 ± 57.1 months, weight 26.8 ± 9.0 kg, 15.6 ± 2.3 cm of limb circumference). Reasons for hospitalization included: ovariohysterectomy, neoplasia, gastroenteritis, spinal pathologies, hemolytic anemia and orthopedic surgery. Systolic pressure with HDO and WBP method was 150.0 ± 15.3 and 125.3 ± 11.4 mmHg respectively; diastolic pressure was 90.0 ± 16.4 and 79.7 ± 13.2 mmHg respectively. WBP monitor failed to measure BP in 4/23 dogs probably due to a non-appropriate limb's morphology. Correlation between HDO and WBP methods in dogs was moderate (systolic pressure $r = 0.47$, $P = 0.04$; diastolic pressure $r = 0.4$, $P > 0.05$). Systolic pressure agreement analysis demonstrated a bias of 22.3 mmHg and LAO 49.4 to −4.9. Diastolic pressure agreement analysis demonstrated a bias of 9.1 mmHg and LAO 42.0 to −23.9. Correlation between HDO-WBP agreement and limb circumference ($r = -0.46$, $P = 0.047$) was moderate.

In this study, we compared HDO with a human oscillometric device and found a lack of agreement between the 2 methods. In the authors' opinion, WBP monitor underestimates BP because of an inadequate size of the cuff. However, the authors believe that the lack of giant breeds and the small number of cases included in this study represents a great limit of their study.

Disclosures: No disclosures to report.