

Reading list Nephrology / Urology 2013

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Am J Vet Res. 2013 Jan;74(1):70-7. doi: 10.2460/ajvr.74.1.70.

Use of quantitative contrast-enhanced ultrasonography to detect diffuse renal changes in Beagles with iatrogenic hypercortisolism.

Haers H, Daminet S, Smets PM, Duchateau L, Aresu L, Saunders JH.

Objective-To determine the feasibility of quantitative contrast-enhanced ultrasonography (CEUS) for detection of changes in renal blood flow in dogs before and after hydrocortisone administration. **Animals-**11 Beagles **Procedure-**Dogs were randomly assigned to 2 treatment groups: oral administration of hydrocortisone (9.6 mg/kg; n = 6) or a placebo (5; control group) twice a day for 4 months, after which the dose was tapered until treatment cessation at 6 months. Before treatment began and at 1, 4, and 6 months after, CEUS of the left kidney was performed by IV injection of ultrasonography microbubbles. Images were digitized, and time-intensity curves were generated from regions of interest in the renal cortex and medulla. Changes in blood flow were determined as measured via contrast agent (baseline [background] intensity, peak intensity, area under the curve, arrival time of contrast agent, time-to-peak intensity, and speed of contrast agent transport). **Results-**Significant increases in peak intensity, compared with that in control dogs, were observed in the renal cortex and medulla of hydrocortisone-treated dogs 1 and 4 months after treatment began. Baseline intensity changed similarly. A significant increase from control values was also apparent in area under the curve for the renal cortex 4 months after hydrocortisone treatment began and in the renal medulla 1 and 4 months after treatment began. A significant time effect with typical time course was observed, corresponding with the period during which hydrocortisone was administered. No difference was evident in the other variables between treated and control dogs. **Conclusions and Clinical Relevance-**Quantitative CEUS allowed detection of differences in certain markers of renal blood flow between dogs treated orally with and without hydrocortisone. Additional studies are needed to investigate the usefulness of quantitative CEUS in the diagnosis of diffuse renal lesions.

Am J Vet Res. 2013 Jan;74(1):144-7. doi: 10.2460/ajvr.74.1.144.

Effects of interstitial cystitis on the acoustic startle reflex in cats.

Hague DW, Stella JL, Buffington CA.

Objective-To compare acoustic startle reflexes (ASRs) of healthy cats and cats with interstitial cystitis (IC). **Animals-**28 healthy cats (11 males and 17 females) and 20 cats with IC (13 males and 7 females). **Procedures-**To evaluate the effect of neutering on ASRs, ASRs in neutered and unneutered healthy cats were measured. To evaluate the effect of housing facility acclimation on ASRs in cats with IC, ASRs were measured in cats with IC within 1 month after arrival at the housing facility and again 2 to 3 months after arrival. To evaluate the effect of the environment on ASRs, ASRs were evaluated in all cats with and without IC after acclimation but before and then after environmental enrichment. **Results-**Neutering led to a significant decrease in overall ASR in the healthy cats. Habituation to the housing facility resulted in a significant decrease in overall ASR of female but not male cats with IC. Environmental enrichment led to a significant decrease in ASR in cats with IC but not in healthy cats. **Conclusions and Clinical Relevance-**The magnitude of the ASR appeared to be sensitive to environmental conditions and affected by sex, both in healthy cats and cats with IC. It was also higher in cats with IC versus healthy cats, except when cats were housed in a highly enriched environment. **Impact for Human Medicine-**Treatment approaches that include reduction of a patient's perception of environmental unpredictability may benefit humans with IC.

Am J Vet Res. 2013 Feb;74(2):333-42. doi: 10.2460/ajvr.74.2.333.

Evaluation of mass spectrometry of urinary proteins and peptides as biomarkers for cats at risk of developing azotemia.

Jepson RE, Coulton GR, Cowan ML, Markwell P, Syme HM, Elliott J.

Objective-To evaluate proteomic delineation of feline urine by mass spectrometry as a method for identifying biomarkers in cats at risk of developing azotemia. **Samples-**Urine samples from geriatric cats (> 9 years old) with chronic kidney disease and nonazotemic cats that either remained nonazotemic (n = 10) or developed azotemia (10) within 1 year. **Procedures-**Optimization studies with pooled urine were performed to facilitate the use of surface enhanced laser desorption-ionization time-of-flight mass spectrometry (SELDI-TOF-MS) for analysis of the urinary proteome of cats. Urine samples from nonazotemic cats at entry to the study were analyzed via SELDI-TOF-MS with weak cation exchange and strong anion exchange arrays. Spectral data were compared to identify biomarkers for development of azotemia. **Results-**Low protein concentration in feline urine precluded direct application to array surfaces, and a buffer exchange and concentration step was required prior to SELDI-TOF-MS analysis. Three preparation conditions by use of weak cation and strong anion exchange arrays were selected on the basis of optimization studies for detection of biomarkers. Eight potential biomarkers with an m/z of 2,822, 9,886, 10,033, 10,151, 10,234, 11,653, 4,421, and 9,505 were delineated. **Conclusions and Clinical Relevance-**SELDI-TOF-MS can be used to detect urinary low-molecular weight peptides and proteins that may represent biomarkers for early detection of renal damage. Further study is required to purify and identify potential biomarkers before their use in a clinical setting.

Am J Vet Res. 2013 Apr;74(4):589-97. doi: 10.2460/ajvr.74.4.589.

Comparison of inferred fractions of n-3 and n-6 polyunsaturated fatty acids in feral domestic cat diets with those in commercial feline extruded diets.

Backus RC, Thomas DG, Fritsche KL.

Objective-To compare presumed fatty acid content in natural diets of feral domestic cats (inferred from body fat polyunsaturated fatty acids content) with polyunsaturated fatty acid content of commercial feline extruded diets. **Sample-**Subcutaneous and intra-abdominal adipose tissue samples (approx 1 g) from previously frozen cadavers of 7 adult feral domestic cats trapped in habitats remote from human activity and triplicate samples (200 g each) of 7 commercial extruded diets representing 68% of market share obtained from retail stores. **Procedures-**Lipid, triacylglycerol, and phospholipid fractions in adipose tissue samples and ether extracts of diet samples were determined by gas chromatography of methyl esters. Triacylglycerol and phospholipid fractions in the adipose tissue were isolated by thin-layer chromatography. Diet samples were also analyzed for proximate contents. **Results-**For the adipose tissue samples, with few exceptions, fatty acids fractions varied only moderately with lipid fraction and site from which tissue samples were obtained. Linoleic, α -linolenic, arachidonic, eicosapentaenoic, and docosahexaenoic acid fractions were 15.0% to 28.2%, 4.5% to 18.7%, 0.9% to 5.0%, < 0.1% to 0.2%, and 0.6% to 1.7%, respectively. As inferred from the adipose findings, dietary fractions of docosahexaenoic and α -linolenic acid were significantly greater than those in the commercial feline diets, but those for linoleic and eicosapentaenoic acids were not significantly different. **Conclusions and Clinical Relevance-**The fatty acid content of commercial extruded feline diets differed from the inferred content of natural feral cat diets, in which dietary n-3 and possibly n-6 polyunsaturated fatty acids were more abundant. The impact of this difference on the health of pet cats is not known.

Am J Vet Res. 2013 Apr;74(4):648-51. doi: 10.2460/ajvr.74.4.648.

Evaluation of glomerular filtration rate in cats with reduced renal mass and administered meloxicam and acetylsalicylic acid.

Surdyk KK, Brown CA, Brown SA.

Objective-To determine whether administration of meloxicam or acetylsalicylic acid alters glomerular filtration rate (GFR) in cats with renal azotemia. **Animals-**6 young adult cats. **Procedures-**3 sexually

intact male cats and 3 sexually intact female cats had surgically reduced renal mass and azotemia comparable to International Renal Interest Society chronic kidney disease stages 2 and 3. Renal function was evaluated by measurement of serum creatinine concentration, urinary clearance of exogenously administered creatinine, and the urine protein-to-creatinine concentration ratio (UP:C). Measurements taken in cats receiving placebo at the beginning and end of the study were compared with results obtained at the end of 7 days of treatment with either meloxicam (0.2 mg/kg, SC, on day 1; 0.1 mg/kg, SC, on days 2 to 7) or acetylsalicylic acid (20 mg/kg, PO, on days 1, 4, and 7). Results-No significant treatment effects on urinary clearance of exogenously administered creatinine, serum creatinine concentration, or UP:C were detected. Mean \pm SEM serum creatinine concentration and urinary clearance of exogenously administered creatinine measurements following 7 days of treatment with meloxicam (serum creatinine concentration, 2.67 ± 0.17 mg/dL; urinary clearance of exogenously administered creatinine, 1.34 ± 0.08 mL/min/kg) and acetylsalicylic acid (serum creatinine concentration, 2.62 ± 0.12 mg/dL; urinary clearance of exogenously administered creatinine, 1.35 ± 0.07 mL/min/kg) were not significantly different from the mean baseline values for these variables (serum creatinine concentration, 2.77 ± 0.14 mg/dL; urinary clearance of exogenously administered creatinine, 1.36 ± 0.07 mL/min/kg). Conclusions and Clinical Relevance-Neither meloxicam nor acetylsalicylic acid had a measurable effect on urinary clearance of exogenously administered creatinine, serum creatinine concentration, or UP:C. These results are consistent with the hypothesis that GFR of euvoletic cats with normal or reduced renal function is not dependent on cyclooxygenase function.

Am J Vet Res. 2013 Jun;74(6):939-44. doi: 10.2460/ajvr.74.6.939.

Acute and chronic effects of tepoxalin on kidney function in dogs with chronic kidney disease and osteoarthritis.

Lomas AL, Lyon SD, Sanderson MW, Grauer GF.

Objective-To determine whether tepoxalin alters kidney function in dogs with chronic kidney disease (CKD). Animals-16 dogs with CKD (International Renal Interest Society stage 2 or 3) and osteoarthritis. Procedures-Kidney function was assessed via serum biochemical analysis, urinalysis, urine protein-to-creatinine concentration ratio, urine γ -glutamyl transpeptidase-to-creatinine concentration ratio, iohexol plasma clearance, and indirect blood pressure measurement twice before treatment. Dogs received tepoxalin (10 mg/kg, PO, q 24 h) for 28 days (acute phase; n = 16) and an additional 6 months (chronic phase; 10). Recheck examinations were performed weekly (acute phase) and at 1, 3, and 6 months (chronic phase). Kidney function variables were analyzed via repeated-measures ANOVA. Results-There was no difference over time for any variables in dogs completing both phases of the study. Adverse drug events (ADEs) resulting in discontinuation of tepoxalin administration included increased serum creatinine concentration (1 dog; week 1), collapse (1 dog; week 1), increased liver enzyme activities (1 dog; week 4), vomiting and diarrhea (1 dog; week 8), hematochezia (1 dog; week 24), and gastrointestinal ulceration or perforation (1 dog; week 26). Preexisting medical conditions and concomitant drug use may have contributed to ADEs. Kidney function was not affected in the latter 5 dogs. Discontinuation of tepoxalin administration stabilized kidney function in the former dog and resolved the ADEs in 4 of the 5 latter dogs. Conclusions and Clinical Relevance-Tepoxalin may be used, with appropriate monitoring, in dogs with International Renal Interest Society stage 2 or 3 CKD and osteoarthritis.

Am J Vet Res. 2013 Aug;74(8):1084-90. doi: 10.2460/ajvr.74.8.1084.

Effect of furosemide and high-dosage pimobendan administration on the renin-angiotensin-aldosterone system in dogs.

Ames MK, Atkins CE, Lantis AC, Werre SR.

Objective-To determine whether a high dosage of pimobendan, when administered concurrently with moderate-dosage furosemide to healthy dogs, would activate the renin-angiotensin-aldosterone

system (RAAS) more than furosemide alone. Animals-12 healthy dogs. Procedures-6 dogs received furosemide (2.0 mg/kg, PO, q 12 h) only, as an RAAS activator, for 10 days. The other 6 dogs received furosemide (2.0 mg/kg, PO, q 12 h) and pimobendan (0.6 mg/kg, PO, q 12 h) for 10 days. The effect of these drugs on the RAAS was determined by measurement of the aldosterone-to-creatinine ratio (A:C) in urine collected in the morning and evening of study days -2, -1, 1, 5, and 10. Results-Although there was an increase in the urine A:C during the study period in both groups, it was significant only for dogs that received both drugs. The urine A:C only differed significantly between groups on day 1, at which time A:C was greater in the group that received both drugs. Conclusions and Clinical Relevance-High-dosage pimobendan administration neither substantially suppressed nor potentiated the RAAS when administered with furosemide in healthy dogs.

Am J Vet Res. 2013 Oct;74(10):1347-52. doi: 10.2460/ajvr.74.10.1347.

Influence of acidifying or alkalinizing diets on bone mineral density and urine relative supersaturation with calcium oxalate and struvite in healthy cats.

Bartges JW, Kirk CA, Cox SK, Moyers TD.

Objective-To evaluate the influence of acidifying or alkalinizing diets on bone mineral density and urine relative supersaturation (URSS) with calcium oxalate and struvite in healthy cats. Animals-6 castrated male and 6 spayed female cats. Procedures-3 groups of 4 cats each were fed diets for 12 months that differed only in acidifying or alkalinizing properties (alkalinizing, neutral, and acidifying). Body composition was estimated by use of dual energy x-ray absorptiometry, and 48-hour urine samples were collected for URSS determination. Results-Urine pH differed significantly among diet groups, with the lowest urine pH values in the acidifying diet group and the highest values in the alkalinizing diet group. Differences were not observed in other variables except urinary ammonia excretion, which was significantly higher in the neutral diet group. Calcium oxalate URSS was highest in the acidifying diet group and lowest in the alkalinizing diet group; struvite URSS was not different among groups. Diet was not significantly associated with bone mineral content or density. Conclusions and Clinical Relevance-Urinary undersaturation with calcium oxalate was achieved by inducing alkaluria. Feeding an alkalinizing diet was not associated with URSS with struvite. Bone mineral density and calcium content were not adversely affected by diet; therefore, release of calcium from bone caused by feeding an acidifying diet may not occur in healthy cats.

Am J Vet Res. 2013 Dec;74(12):1542-5. doi: 10.2460/ajvr.74.12.1542.

Association between urine osmolality and specific gravity in dogs and the effect of commonly measured urine solutes on that association.

Ayoub JA, Beaufrere H, Acierno MJ.

OBJECTIVE: To determine the association between urine osmolality and specific gravity (USG) in dogs and to evaluate the effect of commonly measured urine solutes on that association.

ANIMALS: 60 dogs evaluated by an internal medicine service.

PROCEDURES: From each dog, urine was obtained by cystocentesis and USG was determined with a refractometer. The sample was divided, and one aliquot was sent to a diagnostic laboratory for urinalysis and the other was frozen at -80°C until osmolality was determined. Urine samples were thawed and osmolality was measured in duplicate with a freezing-point depression osmometer. The correlation between mean urine osmolality and USG was determined; the effect of pH, proteinuria, glucosuria, ketonuria, bilirubinuria, and hemoglobinuria on this relationship was investigated with multiple regression analysis.

RESULTS: The Pearson correlation coefficient between urine osmolality and USG was 0.87. The final multivariable regression model for urine osmolality included USG and the presence of ketones; ketonuria had a small negative association with urine osmolality.

CONCLUSIONS AND CLINICAL RELEVANCE: Results indicated a strong linear correlation between osmolality and USG in urine samples obtained from dogs with various pathological conditions, and ketonuria had a small negative effect on that correlation.

Aust Vet J. 2013 May;91(5):171-8. doi: 10.1111/avj.12044.

In vitro susceptibilities of feline and canine Escherichia coli and Pseudomonas spp. isolates to ticarcillin and ticarcillin-clavulanic acid.

Bennett AB, Martin PA, Gottlieb SA, Govendir M.

OBJECTIVES: To investigate in vitro susceptibilities of canine and feline Escherichia coli and canine Pseudomonas spp. isolates to ticarcillin and ticarcillin-clavulanic acid (T/C).

DESIGN: In vitro susceptibility testing of bacterial isolates collected from infections.

METHODS: We tested 148 (83 canine and 65 feline) E. coli and 61 canine Pseudomonas spp. isolates for susceptibility to T/C using both disc diffusion and Epsilon meter tests (E-tests). Additionally, susceptibilities of 96 E. coli and 23 canine Pseudomonas spp. isolates were tested via disc diffusion to ticarcillin alone.

RESULTS: Of the E. coli isolates obtained from canine and feline urine, 92% by disc diffusion and 91% by E-tests were susceptible to T/C. Of the canine Pseudomonas isolates, 90% by disc diffusion and 82% by E-tests were susceptible to T/C. Of the Pseudomonas spp. isolates from the canine ear canal or tympanic bullae, 12% of isolates tested via disc diffusion and 23% via E-tests were found to be resistant to T/C. The 50% minimum inhibitory concentration of T/C for all feline E. coli isolates was significantly lower than that for all canine E. coli isolates ($P = 0.0031$). The addition of clavulanic acid significantly increased the efficacy of ticarcillin against E. coli ($P < 0.0001$), but had negligible effect against canine Pseudomonas spp. isolates.

CONCLUSION: Ticarcillin-clavulanic acid has reasonable in vitro efficacy against canine and feline E. coli, and canine Pseudomonas spp. isolates. However, decisions to use this drug therapeutically must be made on prudent considerations to minimise selection for bacterial resistance.

Aust Vet J. 2013 Sep;91(9):368-373. doi: 10.1111/avj.12100.

Acquired proximal renal tubulopathy in dogs exposed to a common dried chicken treat: retrospective study of 108 cases (2007-2009).

Thompson M, Fleeman L, Kessell A, Steenhard L, Foster S.

Proximal renal tubulopathy was reported in Australian dogs with markedly increased frequency from September 2007.

Two veterinarian-completed surveys were launched in response to an increased incidence of acquired proximal renal tubulopathy in dogs. The selection criterion for inclusion was glucosuria with blood glucose < 10 mmol/L. Data collected included signalment, presenting signs, history of feeding treats, results of urinalysis and blood tests, treatment and time to resolution of clinical signs.

A total of 108 affected dogs were studied. All had been fed the same brand of dried chicken treats, made in China, for a median of 12 weeks (range, 0.3-78 weeks). Small breeds (< 10 kg) accounted for 88% of cases. Common presenting signs included polyuria/polydipsia (76%), lethargy (73%), inappetence (65%) and vomiting (54%). Common biochemical findings included euglycaemia (74%; 71/96), hypoglycaemia (23%; 22/96), acidosis (77%; 20/26), hypokalaemia (45%; 38/84), hypophosphataemia (37%; 28/75) and azotaemia (27%; 23/85). In addition to discontinuation of treats, 64 dogs received medical treatment, including intravenous fluids (52%) and oral electrolyte, amino acid or vitamin supplements. Six dogs died or were euthanased. Two dogs were necropsied. Histopathological findings consisted of proximal tubular necrosis accompanied by regeneration. Time to resolution of clinical signs in 35 survivors available for follow-up was < 2 weeks ($n = 8$), 2-4 weeks ($n = 2$), 5-7 weeks ($n = 5$) and 2-6 months ($n = 10$).

Of the 108 dogs with acquired proximal renal tubulopathy contemporaneous with chicken treat consumption, most survived but many required aggressive supportive care. The treats likely contained a toxin targeting the proximal renal tubules. Diet history and urinalysis were vital for diagnosis.

Unusual presentation of alveolar echinococcosis as prostatic and paraprostatic cysts in a dog.

Geigy CA, Kühn K, Rütten M, Howard J, Grimm F, Rohrer Bley C.

Alveolar echinococcosis (AE) is caused by the larval stage (metacestode) of *Echinococcus multilocularis*. The domestic dog can act as a definitive host and harbor adult cestodes in its small intestine or become an aberrant intermediate host carrying larval stages that may cause severe lesions in the liver, lungs and other organs with clinical signs similar to AE in humans.

A case of canine AE, affecting the liver and prostate with development of multilocular hydatid paraprostatic cysts and possible lung involvement is described in an 8-year-old neutered male Labrador retriever dog. The dog presented with progressive weight loss, acute constipation, stranguria and a suspected soft tissue mass in the sublumbar region. Further evaluation included computed tomography of the thorax and abdomen, which revealed cystic changes in the prostate, a paraprostatic cyst, as well as lesions in the liver and lungs. Cytological examination of fine-needle aspirates of the liver, prostate and paraprostatic cyst revealed parasitic hyaline membranes typical of an *Echinococcus* infection and the presence of *E. multilocularis*-DNA was confirmed by PCR. The dog was treated with albendazole and debulking surgery was considered in case there was a good response to antiparasitic treatment. Constipation and stranguria resolved completely. Six months after the definitive diagnosis, the dog was euthanized due to treatment-resistant ascites and acute anorexia and lethargy.

To the authors' knowledge, this is the first publication of an *E. multilocularis* infection in a dog causing prostatic and paraprostatic cysts. Although rare, *E. multilocularis* infection should be considered as an extended differential diagnosis in dogs presenting with prostatic and paraprostatic disease, especially in areas where *E. multilocularis* is endemic.

Urodynamic investigation by telemetry in Beagle dogs: validation and effects of oral administration of current urological drugs: a pilot study.

Noël S, Massart L, Hamaide A.

Vesico-urethral function may be evaluated in humans and dogs by conventional urodynamic testing (cystometry and urethral pressure profilometry) or by electromyography. These techniques are performed under general anaesthesia in dogs. However, anaesthesia can depress bladder and urethral pressures and inhibit the micturition reflex. The primary objective of this pilot study was to evaluate the use of telemetry for urodynamic investigation in dogs. We also aimed to determine the applicability of telemetry to toxicologic studies by assessing the repeatability of telemetric recordings.

Conventional diuresis cystometry was performed in six continent adult female Beagle dogs prior to surgical implantation of telemetric and electromyographic devices. In the first phase of the telemetric study, continuous recordings were performed over 8 days and nights. Abdominal, intravesical and detrusor threshold pressures (Pdet th), voided volume (Vv), urethral smooth muscle electrical activity and involuntary detrusor contractions (IDC) were measured during the bladder filling phase and during micturition episodes. Vv recorded during telemetry was significantly lower than bladder volume obtained by diuresis cystometry. Repeatability of telemetric measurements was greater for observations recorded at night. IDC frequency and Pdet th were both lower and Vv was higher at night compared to values recorded during daytime. In the second phase of the telemetric study, phenylpropanolamine, oestriol, bethanechol, oxybutynin or duloxetine were administered orally for 15 days. For each drug, continuous recordings were performed overnight for 12 hours on days 0, 1, 8 and 15. Electromyographic urethral activity was significantly increased 8 days after oestriol or duloxetine administration. No significant changes in bladder function were observed at any time point.

In dogs, the high repeatability of nocturnal telemetric recordings indicates that this technique could provide more informative results for urologic research. Urethral smooth muscle electrical activity appears to be modified by administration of drugs with urethral tropism. In this pilot telemetric study, bladder function was not affected by oral administration of urological drugs at their recommended clinical dosages. Experimental studies, (pharmacokinetic and pharmacodynamic) and clinical studies are warranted to further define the effects of these drugs on vesico-urethral function in dogs.

BMC Vet Res. 2013 Oct 24;9(1):218. [Epub ahead of print]

A clinical study of canine collagen type III glomerulopathy.

Rørtveit R, Eggertsdóttir AV, Thomassen R, Lingaas F, Jansen JH.

Collagen type III glomerulopathy (Col3GP), also known as collagenofibrotic glomerulonephropathy, is a rare renal disease with unknown pathogenesis that occurs in animals and humans. We recently described a naturally occurring canine autosomal recessive model of Col3GP, and the aim of the present work was to study the clinical features of canine Col3GP and compare with the human phenotype. In humans two different clinical syndromes with different age at onset (child- or adulthood) have been observed. In children a more aggressive course with familial occurrence is described, characterized by progressively increasing proteinuria, nephrotic syndrome, hypertension and chronic renal failure. A markedly increased serum level of the aminoterminal propeptide of type III procollagen (PIIINP) is considered a useful marker for the disease. Since Col3GP and concurrent hypocomplementemia have been observed in humans, we also aimed to investigate if hypocomplementemia was present in Col3GP affected dogs. A litter consisting of seven puppies, four Col3GP affected and three healthy unaffected, was observed from the day of birth until the affected puppies developed a mild or moderate renal azotemia.

During the period of observation growth retardation, increasing blood pressure, progressive proteinuria, azotemia, hypoalbuminemia, hypercholesterolemia and increased serum PIIINP were observed in all the affected dogs. Hypocomplementemia was not detected. Affected dogs were euthanized between 109 and 144 days of age, and pathological examinations revealed ascites and massive glomerular accumulations of collagen type III, consistent with Col3GP.

Dogs with Col3GP develop juvenile chronic renal failure, preceded by nephrotic syndrome, elevated serum PIIINP and hypertension, thus have similar clinical features as the juvenile Col3GP in humans. Further studies of this naturally occurring canine phenotype may provide more information on the pathogenesis and genetics of Col3GP in both animals and humans.

BMC Vet Res. 2013 Dec 1;9(1):237. doi: 10.1186/1746-6148-9-237.

The panorama of animal leptospirosis in Rio de Janeiro, Brazil, regarding the seroepidemiology of the infection in tropical regions.

Martins G, Lilenbaum W.

BACKGROUND: Leptospirosis is an important disease caused by various serovars of *Leptospira* sp. It can affect humans as well as domestic and wild animals; therefore, it has importance for public health, animal production, and wild species. The aim of this paper is to discuss the epidemiology of animal leptospirosis in Rio de Janeiro, Brazil, as a possible model for other tropical regions. In several studies conducted in the last 20 years, a total of 47 rats, 120 dogs, 875 cows, 695 horses, 1,343 goats, 308 sheep and 351 pigs from all regions of the state, in addition to 107 wild mammals and 73 golden-lion tamarins were tested (MAT) for anti-*Leptospira* antibodies.

RESULTS: Seroreactivity was frequent in all studied species, confirming that the infection is endemic in Rio de Janeiro. Serogroups Icterohaemorrhagiae and Sejroe were the most prevalent in urban and rural scenarios, respectively. This paper reviews the current knowledge on animal leptospirosis in Rio de Janeiro and describes important differences between urban versus rural cycles of the infection in various species.

CONCLUSION: Identification of the prevailing serogroups and their reservoirs is essential for understanding agent-host-environment interactions under tropical conditions.

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Can Vet J. 2012 Nov;53(11):1187-90.

Ultrasound-guided percutaneous antegrade pyelography with computed tomography for the diagnosis of spontaneous partial ureteral rupture in a dog.

Specchi S, Lacava G, d'Anjou MA, Zini E, Auriemma E.

A 10-year-old spayed female dalmatian dog developed acute vomiting and abdominal pain. Ultrasound examination of the abdomen showed right hydronephrosis and proximal ureter dilation with mild retroperitoneal free fluid. Computed tomography (CT) of the abdomen confirmed the ultrasonographic findings and revealed, additionally, a right ureteral stone. Spontaneous rupture of the right ureter was confirmed with CT post ultrasound-guided percutaneous antegrade pyelography. Pyeloureteral rupture and the presence of a ureteral stone were confirmed at surgery.

Can Vet J. 2012 Nov;53(11):1195-8.

An unusual case of urinary incontinence in an intersex West Highland white terrier.

Connery NA, Spotswood T.

A 5-year-old neutered female West Highland white terrier dog was presented with a history of congenital urinary incontinence that had become refractory to medical management. Complex urogenital anomalies including urethrovestibular and vestibuloperineal fistulae with low vulvar position along with a penoclititoris were present. Vaginectomy with perineal urethral reconstruction resolved the incontinence.

Can Vet J. 2013 Jan;54(1):36-41.

Laparoscopic-assisted cystotomy for urolith removal in dogs and cats - 23 cases.

Pinel CB, Monnet E, Reems MR.

This report describes the outcomes of a modified laparoscopic-assisted cystotomy for urolith removal in dogs and cats. Modifications of the original techniques included a temporary cystopexy to the abdominal wall, utilization of a laparoscope instead of cystoscope, and retrograde flow of saline in the bladder with pressurized saline. The medical records of 23 client-owned animals for which laparoscopic-assisted cystotomy was used for urolith extraction were reviewed. Twenty-six procedures were performed in 23 animals. There were intraoperative complications in 19.2% of cases leading to open conversion in 11.5%. Rate of complications directly related to the procedure was 11.5%. Four cases had documented urolith recurrence with a mean time to recurrence of 335 days.

Can Vet J. 2013 Feb;54(2):179-81.

Renal adenoma in a 5-year-old Labrador retriever: Big is not always bad.

Lillakas K.

A 5-year-old Labrador retriever was presented with anorexia, hematuria, and a 3-week history of mild lethargy, periodic inappetence, and weight loss. A firm mass in the cranial abdomen was discovered on physical examination. Following clinical work-up the owners elected euthanasia. On postmortem examination, histopathology determined that the mass was a benign renal adenoma.

Can Vet J. 2013 Apr;54(4):392-396.

Protein-losing nephropathy associated with *Borrelia burgdorferi* seropositivity in a soft-coated wheaten terrier: Response to therapy.

Horney BS, Stojanovic V.

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A soft-coated wheaten terrier was examined for lameness with subsequent identification of protein-losing nephropathy, hypoalbuminemia, hyperglobulinemia, and seroconversion to *Borrelia burgdorferi*. Following doxycycline therapy, the urine protein loss decreased significantly and serum albumin concentration remained close to or within the reference interval for over 3 years, contrary to the reported poor prognosis for renal disease associated with *B. burgdorferi* or protein-losing nephropathy of soft-coated wheaten terriers.

Can Vet J. 2013 May;54(5):497-9.

Feline leptospirosis serosurvey from a Quebec referral hospital.

Lapointe C, Plamondon I, Dunn M.

Epidemiologic studies have linked interactions with cats as a risk factor for human leptospirosis, but serosurveys of feline *Leptospira* spp. infection are scarce in the veterinary literature. The objective of this study was to conduct a serosurvey of *Leptospira* spp. infection in cats presenting to an eastern Canadian veterinary teaching hospital (VTH). All serum samples collected from cats presented to the VTH were tested by the microscopic agglutination test (MAT) for the *Leptospira* serovars Canicola, Grippotyphosa, Icterohaemorrhagiae, Bratislava, Pomona, and Autumnalis. Ten of 40 cats [25%; 95% confidence interval (CI): 12.7% to 41.2%] tested had positive antibody titers ($\geq 1:100$). All 10 cats with positive titers were positive for Bratislava and 2 were also positive for Autumnalis. This high incidence of seropositivity for *Leptospira* spp. may suggest that the disease could be of more clinical importance than previously recognized.

Can Vet J. 2013 Jul;54(7):675-8.

Anuria due to inadvertent prostatectomy during cryptorchidectomy.

Vititoe K, Pack L.

This report describes an 8-month-old male Labrador retriever dog that was evaluated for a 2-day history of anuria and vomiting following a suspected inadvertent prostatectomy during a cryptorchidectomy. A positive contrast urethrogram was performed to definitively diagnose the absence of a patent prostatic urethra and necropsy confirmed inadvertent prostatectomy.

Can Vet J. 2013 Jul;54(7):683-6.

Renal nephroblastoma in a 3-month-old golden retriever.

Montinaro V, Boston SE, Stevens B.

Nephrectomy was performed in a 3-month-old intact female golden retriever dog for a renal nephroblastoma. The dog has remained disease-free for 19 months with nephrectomy alone. The adoption of human Wilms' tumor grading criteria may be useful in determining clinical stage, adjuvant treatment options, and prognosis in this rare disease.

Can Vet J. 2013 Aug;54(8):761-4.

Management of bilateral idiopathic renal hematuria in a dog with silver nitrate.

Di Cicco MF, Fetzer T, Secoura PL, Jermyn K, Hill T, Chaloub S, Vaden S.

Renal hematuria has limited treatment options. This report describes management of bilateral idiopathic renal hematuria in a dog with surgically assisted installation of 0.5% silver nitrate solution. Initial treatment resulted in freedom from clinical signs or recurrent anemia for 10 months; however, recurrence of bleeding following a nephrectomy resulted in euthanasia.

Can Vet J. 2013 Nov;54(11):1061-6.

Comparison of wet-mount, Wright-Giemsa and Gram-stained urine sediment for predicting bacteriuria in dogs and cats.

O'Neil E, Horney B, Burton S, Lewis PJ, MacKenzie A, Stryhn H.

This study assessed the standard urinalysis technique and sediment stain techniques as predictors of bacterial culture results for canine and feline urine. Canine (n = 111) and feline (n = 79) urine samples were evaluated using unstained wet-mount and air-dried Gram and Wright-Giemsa stained sediment; results were compared to aerobic bacterial culture. Eleven canine and 7 feline urine samples were culture positive. Unstained wet-mount and stained sediment had sensitivities of 89% and 83% and specificities of 91% and 99%, respectively. The specificity of using either stain was higher ($P < 0.01$) than wet-mount examination for detecting bacteriuria. There were significant differences among 3 technologists in detecting true positives ($P < 0.01$). Association of sediment and culture results used 112 canine and 81 feline samples. There was a negative association ($P < 0.01$) between lipid detection and wet-mount identification of bacteria.

Compendium : continuing education for veterinarians

Compend Contin Educ Vet. 2013 Jan;35(1):E1.

New alternatives for minimally invasive management of uroliths: lower urinary tract uroliths.

Defarges A, Dunn M, Berent A.

In small animals, removal is indicated for lower urinary tract calculi that are not amenable to medical dissolution and are causing, or may cause, urinary tract obstruction, inflammation, or recurrent infection. Surgical removal of lower urinary tract uroliths by cystotomy or urethrotomy has been the traditional method. The current standard of care for human urinary tract stones involves the use of lithotripsy and is minimally invasive. This article reviews the current literature on the various minimally invasive options available for managing lower urinary tract stones in small animal veterinary patients. Options for managing nephroliths and ureteroliths will be presented in forthcoming companion articles.

Compend Contin Educ Vet. 2013;35(2):E1-7.

New alternatives for minimally invasive management of uroliths: nephroliths.

Defarges A, Berent A, Dunn M.

Urolithiasis is a common clinical problem in small animal veterinary patients. Management of upper urinary tract calculi can be particularly challenging in small animals, as traditional surgical removal can be associated with significant morbidity. In humans, minimally invasive treatment options have replaced traditional surgical removal in many cases. This article reviews the current literature on the various types of lithotripsy and some of the newer minimally invasive options available for management of nephrolithiasis in small animal veterinary patients. An article in the January 2013 issue addressed management of lower urinary tract uroliths; a future article will discuss current management strategies for ureteroliths.

Compend Contin Educ Vet. 2013;35(3):E1-7.

New alternatives for minimally invasive management of uroliths: ureteroliths.

Defarges A, Berent A, Dunn M.

Ureterolithiasis is a serious clinical problem in small animal veterinary medicine, and management can be challenging and frustrating. Various traditional surgical treatment options exist but are associated with significant morbidity and mortality. In humans, minimally invasive treatment options have overtaken traditional surgical removal. This article reviews the current literature on the management of ureteral stone disease, including various types of lithotripsy, and discusses some of the newer minimally invasive options available for small animal veterinary patients. It is important to realize that much of the data in this article is only published in abstract form and is largely one institution's experience with these novel techniques. Articles on minimally invasive management of lower urinary tract uroliths and nephroliths were published in the January 2013 and February 2013 issues, respectively.

Compend Contin Educ Vet. 2013;35(5):E1-6.

Treatment of systemic hypertension associated with kidney disease.

Buoncompagni S, Bowles MH.

Systemic hypertension is an increasingly diagnosed disorder in dogs and cats and frequently occurs secondary to chronic kidney disease. Prevention of damage to organs such as the kidneys, brain, heart, and eyes is one of the primary concerns in the management of veterinary patients with hypertension. This article reviews the guidelines for antihypertensive therapy in patients with, or at risk for, kidney disease, including the initiation of treatment and currently recommended medications.

Compend Contin Educ Vet. 2013 Jul;35(7):E2.

Hidden dangers in the kitchen: common foods toxic to dogs and cats.

Gugler K, Piscitelli C, Dennis J.

Many foods and food additives that are safe for human consumption can be extremely toxic to pets. Recognizing the clinical signs and clinicopathologic changes associated with these toxins allows prompt initiation of appropriate therapy. As with many other toxins, decontamination and supportive care are the mainstays of therapy for food toxicosis. Educating owners about foods and food additives that are unsafe for dogs and cats can help prevent toxicosis.

Compend Contin Educ Vet. 2013;35(8):E1-8.

Canine struvite urolithiasis.

Palma D, Langston C, Gisselman K, McCue J.

Struvite calculi, composed of magnesium ammonium phosphate, have existed for thousands of years in human medicine and are a leading cause of calculi in companion animals. Struvite stones have also been called urease, infection-induced, phosphatic, and triple phosphate stones. They are the most common uroliths in dogs, in which most cases of struvite urolithiasis are associated with infection. Management of struvite urolithiasis requires a multimodal approach that addresses the presence of the urolith(s) and associated infection while identifying risk factors that predispose to the development of infection.

Compend Contin Educ Vet. 2013 Aug;35(8):E1; quiz E1.

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In Practice

In Practice 2013;35:253-264 doi:10.1136/inp.f2868

Acute kidney injury in dogs and cats 1. Pathogenesis and diagnosis

Adam Mugford, Ronald Li and Karen Humm

Acute kidney injury (AKI), an abrupt loss of renal function, is a commonly encountered emergency in small animal practice. This article, the first of two on AKI, reviews the pathophysiology and diagnosis of the condition in dogs and cats. The second article, to be published in the June issue of In Practice, will cover the treatment, recovery and prognosis associated with AKI.

In Practice 2013;35:302-316 doi:10.1136/inp.f3640

Acute kidney injury in dogs and cats 2. Management, treatment and outcome

Ronald Li, Adam Mugford, Karen Humm

Acute kidney injury (AKI) is a commonly encountered emergency in small animal practice. Dogs and cats with AKI are mostly presented in the maintenance phase of the disease, by which point renal function has been severely compromised and clinical signs are apparent. The first article in this two-part series, which was published in the May issue of In Practice discussed the pathogenesis and diagnosis of AKI. This article considers both specific therapy and general supportive treatment in dogs and cats.

Journal of Comparative Pathology

J Comp Pathol. 2013 Feb;148(2-3):248-51. doi: 10.1016/j.jcpa.2012.06.010. Epub 2012 Aug 4.

Nodular dermatofibrosis in a dog without a renal tumour or a mutation in the folliculin gene.

Zanatta M, Bettini G, Scarpa F, Fiorelli F, Rubini G, Mininni AN, Capitani O.

Canine nodular dermatofibrosis is a rare skin disease associated with renal cystadenoma or cystadenocarcinoma and uncommonly with uterine leiomyoma. It is generally seen in German shepherd dogs, but has been also reported in other breeds, and a relationship has been suggested with mutation of the gene encoding folliculin (FLCN), which is located on chromosome 5. A 10-year-old female golden retriever was presented because of numerous firm cutaneous nodules up to 4 cm in diameter over the entire body surface. Cytological and histopathological examinations confirmed generalized cutaneous nodular dermatofibrosis, but ultrasonography of both kidneys ruled out renal neoplasia. Ovariohysterectomy was performed because of prolonged oestrus periods. Microscopical examination of the excised tissues confirmed the absence of uterine neoplasia, but identified rete adenoma of the right ovary. Abdominal ultrasound performed repeatedly over a 5-year follow-up period did not identify any alteration in the renal parenchyma. Molecular studies excluded the presence of any mutation in the FLCN gene.

J Comp Pathol. 2013 Aug-Oct;149(2-3):156-61. doi: 10.1016/j.jcpa.2012.11.241. Epub 2013 Jan 21.

Vaginal Canine Transmissible Venereal Tumour Associated with Intra-tumoural Leishmania spp. Amastigotes in an Asymptomatic Female Dog.

Kegler K, Habierski A, Hahn K, Amarilla SP, Seehusen F, Baumgärtner W.

A 2-year-old female boxer dog was presented with a vaginal serosanguineous discharge not associated with oestrus. There was a friable mass occupying the upper caudal part of the vagina. Cytological and histological examination revealed a monomorphic population of neoplastic round cells consistent with canine transmissible venereal tumour (TVT). In addition, *Leishmania* spp. amastigotes were found within the neoplastic tissue. In order to characterize whether the amastigotes were present inside macrophages and/or neoplastic cells, a co-localization study using cell- and pathogen-specific markers was performed. To detect *Leishmania* spp. a 5.8S ribosomal RNA (rRNA) parasite-specific sequence was used for in-situ hybridization and Mac387 was used as a macrophage marker for immunohistochemistry. *Leishmania* spp. rRNA was detected inside Mac387(+) macrophages and within the cytoplasm of some neoplastic cells. DNA isolation and polymerase chain reaction using specific primers and sequencing analysis identified the organism as *Leishmania infantum* (syn. *Leishmania chagasi*). This is the first report describing infection of tumour cells by *L. infantum* in a genital TVT from an asymptomatic bitch. Transplantation of *Leishmania*-laden neoplastic cells could represent an alternative route of venereal transmission of leishmaniasis among dogs.

J Comp Pathol. 2013 Aug-Oct;149(2-3):280-90. doi: 10.1016/j.jcpa.2013.01.012. Epub 2013 Apr 10.

Development of Podocyte Injuries in Osborne-Mendel Rats is Accompanied by Reduced Expression of Podocyte Proteins.

Yasuno K, Araki S, Sakashita H, Kobayashi R, Baba T, Kawakami H, Kamiie J, Ogihara K, Shirota K.

Osborne-Mendel (OM) rats spontaneously develop glomerulopathy with progressive podocyte injury. Changes in protein expression levels in the foot processes of podocytes have been suggested to play an important role in the development of renal disease. The aim of this study was to investigate the temporal relationship between the expression of five podocyte proteins (nephrin, podocin, synaptopodin, α -actinin-4 and α 3-integrin) and the development of podocyte injuries, proteinuria and glomerulosclerosis in OM rats. Male OM rats 5-20 weeks of age and age-matched Fischer 344 rats were used. Semiquantitative analysis of expression of the five podocyte proteins was performed by immunofluorescence labelling. Nephrin mRNA expression was determined by quantitative real-time reverse transcriptase polymerase chain reaction and nephrin protein expression was determined by mass spectrometry. Progressive reduction in expression of the podocyte proteins correlated with the progression of podocyte injuries, the development of proteinuria and the subsequent development of glomerulosclerosis. Nephrin mRNA expression and nephrin concentration also showed temporal decreases in OM rats. Altered expression of podocyte proteins preceded the development of proteinuria and glomerulosclerosis, suggesting that this event contributes to podocyte dysfunction and progression to glomerulosclerosis.

J Comp Pathol. 2013 Jun 25. pii: S0021-9975(13)00082-0. doi: 10.1016/j.jcpa.2013.05.001. [Epub ahead of print]

Immunohistochemical Expression of HOXA-13 in Normal, Hyperplastic and Neoplastic Canine Prostatic Tissue.

Palmieri C, Riccardi E.

Homeobox genes are known to be examples of the intimate relationship between embryogenesis and tumourigenesis. Specifically, the HOXA13 gene plays a fundamental role in the development of the urogenital tract and external genitalia and in prostate organogenesis. There are no reports on the expression of HOXA13 in normal, hyperplastic or neoplastic canine prostate tissue or in other types of tumours. Six normal, 16 hyperplastic and 12 neoplastic canine prostates were examined microscopically and immunohistochemically with a polyclonal antibody specific for human HOXA13. An immunohistochemical score was generated. HOXA13 was expressed in the cytoplasm of epithelial cells in normal, hyperplastic and neoplastic prostates. The percentage of immunolabelled cells in all prostatic carcinomas (PCs) was greatly increased, with a score of 85.3 (\pm 5.25) compared with normal

(2 ± 0.71) and hyperplastic prostates (6.08 ± 2.21). The increase in HOXA13 expression in canine PCs suggests the involvement of this transcription factor in carcinogenesis and promotion of tumour growth.

Journal of Feline Medicine and Surgery

J Feline Med Surg. 2013 Feb;15(2):99-104. doi: 10.1177/1098612X12461007. Epub 2012 Sep 18.

Urinary cytokine levels in apparently healthy cats and cats with chronic kidney disease.

Habenicht LM, Webb TL, Clauss LA, Dow SW, Quimby JM.

Chronic kidney disease (CKD) is a common cause of illness and death in cats. The hallmark of CKD in cats is chronic tubulointerstitial nephritis, and inflammation contributes to the progression of renal fibrosis. However, at present, it is difficult to assess directly the degree of intra-renal inflammation without renal biopsy. Measurement of inflammatory cytokine levels in urine may provide a non-invasive means of assessing intra-renal inflammation. Urine cytokine levels (urine cytokine/urine creatinine ratio) were measured in 18 healthy cats and 26 cats with CKD. When urine cytokine levels in healthy and CKD cats were compared, we found significantly higher levels of IL-8 and transforming growth factor- β 1 (TGF- β 1) in urine of CKD cats, along with significantly lower vascular endothelial growth factor (VEGF) levels. A significant positive correlation between serum creatinine and TGF- β 1 levels was found in CKD cats. Urinary cytokine measurement may, potentially, be a useful means of assessing intra-renal inflammation, fibrosis and vascular health in cats with CKD.

J Feline Med Surg. 2013 Apr;15(4):280-4. doi: 10.1177/1098612X12465606. Epub 2012 Oct 26.

Litter box preference in domestic cats: covered versus uncovered.

Grigg EK, Pick L, Nibblett B.

Feline inappropriate elimination (periuria and/or perichezia) remains a very common behavioral complaint of cat owners. Treatment recommendations often include improving the attractiveness of the litter boxes available to the cat. One frequent recommendation is to avoid covered litter boxes, although this has not previously been tested experimentally. The goal of this study was to assess whether, all else being equal, cats preferentially used uncovered litter boxes over covered litter boxes. Twenty-eight cats were enrolled in the study and offered the choice of a covered or uncovered box. Waste was scooped daily from each box, and the weight of waste in the different box styles was compared and evaluated using paired t-tests and χ^2 analyses. Overall, there was no significant difference between use of the two box styles. Eight individual cats did exhibit a preference (four for covered, four for uncovered), but individual preference results are not evenly distributed, with more cats than expected showing no preference between litter box types. We postulate that, if boxes are kept sufficiently clean (ie, once daily minimum cleaning), most cats will not show a preference for either box type. The observation that a minority of cats in the study exhibited a preference supports the recommendation of providing individual cats with a 'cafeteria' of litter box styles, including a covered box, to determine whether such a preference exists. These findings add to existing literature on the topic of feline inappropriate elimination and provide additional information for clinicians recommending treatment options for cats exhibiting this behavior.

J Feline Med Surg. 2013 Apr;15(4):300-6. doi: 10.1177/1098612X12467997. Epub 2012 Nov 21.

Amyloidosis in association with spontaneous feline immunodeficiency virus infection.

Asproni P, Abramo F, Millanta F, Lorenzi D, Poli A.

Tissues from 34 naturally feline immunodeficiency virus (FIV)-infected cats, 13 asymptomatic cats and 21 cats with signs of feline acquired immunodeficiency syndrome (F-AIDS), and 35 FIV-seronegative subjects were examined to determine the presence of amyloid deposits. Twenty experimentally FIV-infected cats and five specific pathogen-free (SPF) control cats were also included

in the study. Paraffin-embedded sections from kidney and other organs were submitted to histological and histochemical analysis. Amyloid deposits were identified by a modified Congo red stain and confirmed by electron microscopy to demonstrate the presence of amyloid fibrils in amyloid positive glomeruli. In all positive cases, secondary amyloidosis was identified with potassium permanganate pretreatment and amyloid type was further characterised by immunohistochemistry using primary antibodies against human AA and feline AL amyloids. Amyloid deposits were present in different tissues of 12/34 (35%) naturally FIV-infected cats (seven presenting F-AIDS and five in asymptomatic phase) and in 1/30 FIV-seronegative cats. All the experimentally FIV-infected and SPF subjects showed no amyloid deposits. Amyloidosis has been reported in human lentiviral infections, and the data reported here demonstrate the need, in naturally FIV-infected cats, to consider the presence of amyloidosis in differential diagnosis of hepatic and renal disorders to better assess the prognosis of the disease.

J Feline Med Surg. 2013 Apr;15(4):349-52. doi: 10.1177/1098612X12467786. Epub 2012 Nov 21.

Unilateral uterine segmentary aplasia, papillary endometrial hyperplasia and ipsilateral renal agenesis in a cat.

Carvallo FR, Wartluft AN, Melivilu RM.

A 1-year-old, female, previously spayed domestic shorthair cat presented with abnormal behavior characterized by rubbing up against objects, vocalization and abnormal body posture. A diagnostic laparoscopy was performed and a dilated segment of the left uterus and ovary was found in association with ipsilateral renal agenesis. Papillary hyperplasia of the endometrium of the dilated segment was found on histopathology. The occurrence and findings of this condition are reviewed.

J Feline Med Surg. 2013 Jun;15(6):459-65. doi: 10.1177/1098612X12469522. Epub 2012 Dec 11.

Urinary tract infections in cats with chronic kidney disease.

White JD, Stevenson M, Malik R, Snow D, Norris JM.

Routine urine cultures were performed in cats with chronic kidney disease (CKD) to assess the overall prevalence and clinical signs associated with a positive urine culture (PUC). An occult urinary tract infection (UTI) was defined as a PUC not associated with clinical signs of lower urinary tract disease or pyelonephritis. Multivariate logistic and Cox proportional hazard regression models were used to evaluate the risk factors for an occult UTI and its relationship with survival. There were 31 PUCs from 25 cats. Eighty-seven percent of PUCs had active urine sediments. The most common infectious agent was *Escherichia coli* and most bacteria were sensitive to amoxicillin-clavulanate. Eighteen of 25 cats had occult UTIs. Among cats with occult UTI, increasing age in female cats was significantly associated with PUC; no significant association between occult UTI and survival was found and serum creatinine was predictive of survival in the short term (200 days) only. In conclusion, among cats with CKD, those with occult UTI were more likely to be older and female, but there was no association with severity of azotaemia. The presence of an occult UTI, when treated, did not influence survival.

J Feline Med Surg. 2013 Jun;15(6):478-82. doi: 10.1177/1098612X12471057. Epub 2012 Dec 12.

Comparison of renal ultrasonographic measurements between healthy cats of three cat breeds: Ragdoll, British Shorthair and Sphynx.

Debruyne K, Paepe D, Daminet S, Combes A, Duchateau L, Peremans K, Saunders JH.

Healthy cats of three cat breeds - Sphynx (n = 11), British Shorthair (n = 15) and Ragdoll (n = 15) - were included in this study. All cats underwent an ultrasonographic examination to assess renal length, cortical thickness, medullary thickness and corticomedullary ratio. Of all ultrasonographic measurements, renal length showed the highest variation. For all ultrasonographic dimensions, individual and kidney side (left vs right) variation were much more pronounced than interbreed variation. Sphynx cats tended to have larger kidneys (4.09 ± 0.33 cm) than British Shorthair ($3.77 \pm$

0.43 cm) and Ragdoll cats (3.87 ± 0.41 cm). British Shorthair cats, however, tended to have a thinner cortex (0.67 ± 0.13 cm) and medulla (0.76 ± 0.18 cm) than Sphynx (0.76 ± 0.14 cm and 0.90 ± 0.25 cm, respectively) and Ragdoll cats (0.75 ± 0.13 cm and 0.91 ± 0.22 cm, respectively). However, statistical tests did not reveal significant differences between these cat breeds. The corticomedullary ratio was similar for the three cat breeds (Sphynx: 0.93 ± 0.43 ; British Shorthair: 0.91 ± 0.26 ; Ragdoll: 0.88 ± 0.31). The left kidney (3.83 ± 0.42 cm) was significantly smaller than the right kidney (3.99 ± 0.40 cm) and showed a thicker medulla (left: 0.93 ± 0.21 cm, right: 0.79 ± 0.22 cm), and thus a lower corticomedullary ratio (left: 0.80 ± 0.23 , right: 1.01 ± 0.32). For the cortical thickness, no significant difference was observed between the left (0.71 ± 0.14 cm) and right kidney (0.74 ± 0.14 cm).

J Feline Med Surg. 2013 Jun;15(6):503-6. doi: 10.1177/1098612X12471519. Epub 2012 Dec 19.

Complications of Stamey percutaneous loop cystostomy catheters in three cats.

Hunt GB, Culp WT, Epstein S, Jandrey K, Ivanov M, Westropp JL.

Complications associated with the Stamey percutaneous loop cystostomy catheter (Cook Medical), including exposure of the most proximal side-hole and leakage of urine from the bladder, were encountered following percutaneous placement in three cats. In all cats, surgical exploration for removal of the catheter was performed.

J Feline Med Surg. 2013 Jul;15(7):576-81. doi: 10.1177/1098612X13489217.

Leptospira Species Infection in Cats: ABCD guidelines on prevention and management.

Hartmann K, Egberink H, Pennisi MG, Lloret A, Addie D, Belák S, Boucraut-Baralon C, Frymus T, Gruffydd-Jones T, Hosie MJ, Lutz H, Marsilio F, Möstl K, Radford AD, Thiry E, Truyen U, Horzinek MC.

Overview: Leptospirosis is a bacterial disease affecting a variety of domestic and wild animals as well as humans worldwide. Leptospirosis has been reported in over 150 mammalian species. It is considered an emerging infectious disease in humans and in dogs. Subclinically infected wild and domestic animals serve as reservoir hosts and are a potential source of infection for incidental hosts and humans. Infection: Reports of leptospirosis in cats are rare, but the importance of cats shedding *Leptospira* species and serving as a source of infection has recently gained attention. *Leptospira* species antibodies are commonly present in the feline population, and *Leptospira* species shedding of cats with outdoor exposure has been demonstrated. Cats mostly become infected through transmission from hunting rodents. Significance: The role of healthy carrier cats as a source of contamination, as well as the role of leptospires as a pathogen in cats, are likely underestimated.

J Feline Med Surg. 2013 Aug;15(8):691-7. doi: 10.1177/1098612X12474448. Epub 2013 Jan 29.

Discrepancy between use of lean body mass or nitrogen balance to determine protein requirements for adult cats.

Laflamme DP, Hannah SS.

This study was undertaken to contrast the minimum protein intake needed to maintain nitrogen balance or lean body mass (LBM) in adult cats using a prospective evaluation of 24 adult, neutered male cats fed one to three different diets. Following a 1-month baseline period during which all cats consumed a 34% protein diet, cats were fed a 20% (LO), 26% (MOD) or 34% (HI) protein diet for 2 months. During the baseline period and following the 2-month feeding period, nitrogen balance was assessed using a 96-h complete collection of urine and feces, and LBM was assessed using dual energy X-ray absorptiometry. Weight loss increased in a linear manner with decreasing protein intake ($P < 0.01$), despite no significant difference in calorie intake. Linear regression of the data indicated that approximately 1.5 g protein/kg ($2.1 \text{ g/kg}(0.75)$) body weight is needed to maintain nitrogen balance, while 5.2 g protein/kg ($7.8 \text{ g/kg}(0.75)$) body weight is needed to maintain LBM. This study provides evidence that nitrogen balance studies are inadequate for determining optimum protein requirements. Animals, including cats, can adapt to low protein intake and maintain nitrogen balance

while depleting LBM. Loss of LBM and an associated reduction in protein turnover can result in compromised immune function and increased morbidity. Current Association of American Feed Control Officials (AAFCO) and National Research Council (NRC) standards for protein adequacy may not provide adequate protein to support LBM. The minimum daily protein requirement for adult cats appears to be at least 5.2 g/kg (7.8 g/kg(0.75)) body weight, well in excess of current AAFCO and NRC recommendations. Further research is needed to determine the effect, if any, of body condition, age and gender on protein requirements.

J Feline Med Surg. 2013 Aug;15(8):698-705. doi: 10.1177/1098612X13475618. Epub 2013 Jan 24.

Effect of background region of interest and time-interval selection on glomerular filtration ratio estimation by percentage dose uptake of ^{99m}Tc-DTPA in comparison with ⁵¹Cr-EDTA clearance in healthy cats.

Debruyne K, Vandermeulen E, Saunders JH, Dobbeleir AA, Ham HR, Peremans K.

Evaluation of glomerular function is a useful part of the diagnostic approach in animals suspected of having renal disease. Time-interval and background region of interest (bg ROI) selection are determining factors when calculating the glomerular filtration ratio (GFR) based on percentage uptake of (^{99m})technetium-labelled diethylene triamine penta-acetic acid ((^{99m})Tc-DTPA). Therefore, three different time intervals (60-120 s, 120-180 s, 60-180 s) and three different bg ROIs (C-shape, caudolateral, cranial + caudal) were investigated. In addition, global GFRs based on percentage dose uptake of (^{99m})Tc-DTPA for the different time-intervals and bg ROIs were compared with the global GFR based on (⁵¹)chromium-ethylene diamine tetra-acetic acid ((⁵¹)Cr-EDTA) plasma clearance in nine healthy European domestic shorthair cats. Paired Student's t-tests and linear regression analysis were used to analyse the data. Different time intervals seemed to cause significant variation ($P < 0.01$) in absolute GFR values, regardless of the choice of bg ROI. Significant differences ($P < 0.01$) between bg ROIs were only observed in the 120-180s time interval between the C-shape and cranial + caudal bg ROI, and between the caudolateral and cranial + caudal bg ROI. The caudolateral bg ROI in the 60-180 s time interval showed the highest correlation coefficient ($r = 0.882$) between (^{99m})Tc-DTPA and (⁵¹)Cr-EDTA, although a significant difference ($P < 0.05$) was present between both techniques.

J Feline Med Surg. 2013 Aug;15(8):730-6. doi: 10.1177/1098612X12472180. Epub 2013 Jan 7.

Vitamin D intoxication caused by ingestion of commercial cat food in three kittens.

Wehner A, Katzenberger J, Groth A, Dorsch R, Koelle P, Hartmann K, Weber K.

Two siblings, a 6-month-old sexually intact male weighing 2.5 kg (cat 1) and a sexually intact female (cat 2) British Shorthair cat weighing 2.3 kg, were examined because of a 3-week history of polyuria, lethargy and laboured breathing. One year previously, another sibling (cat 3) had been presented because of similar, yet more severe, clinical signs at the age of 5 months. Physical examination revealed lethargy, dehydration and polypnoea with slightly increased inspiratory effort. Diagnostic investigation revealed severe hypercalcaemia (cats 1-3), renal azotaemia (cats 1 and 3) and a radiologically generalised miliary interstitial pattern of the lungs (cats 1-3) attributable to hypervitaminosis D caused by ingestion of commercial cat food. Cat 3 was euthanased. Cats 1 and 2 were treated with isotonic saline solution (180 ml/kg IV daily), sucralfate (30 mg/kg PO q12h), terbutaline (only cat 1: 0.1 mg/kg SC q4h), furosemide (1.5 mg/kg IV q8h) and tapering doses of prednisolone. Cat 2 was normal on day 14. Cat 1 had stable renal disease and was followed up to day 672. The radiological generalised miliary interstitial pattern of the lungs had improved markedly. Excessive cholecalciferol-containing commercially available cat food poses a great hazard to cats. Supportive treatment may result in long-term survival and improvement of radiological pulmonary abnormalities.

J Feline Med Surg. 2013 Aug;15(8):744-8. doi: 10.1177/1098612X12471663. Epub 2013 Jan 8.

Successful treatment of malakoplakia of the bladder in a kitten.

Rutland BE, Nimmo J, Goldsworthy M, Simcock JO, Simpson KW, Kuntz CA.

A 4-month-old female kitten presented with chronic lower urinary tract signs and *Escherichia coli* cystitis, and was diagnosed with urinary bladder malakoplakia based upon histopathology. The kitten was treated with a prolonged antibiotic course and the malakoplakia resolved. Malakoplakia is a chronic granulomatous reaction characterized by the formation of Michaelis-Gutman bodies within von Hansemann macrophages. It is well described in humans, but has never been documented in a living veterinary patient. This case report describes the first successful treatment of malakoplakia in veterinary medicine.

Journal of Feline Medicine and Surgery (2013) 15, 829–830

Use of pheromones to reduce stress in sheltered cats.

Beck A

J Feline Med Surg. 2013 Oct;15(10):843-8. doi: 10.1177/1098612X13477414. Epub 2013 Feb 11.

Occurrence of bacteriuria in 18 catheterised cats with obstructive lower urinary tract disease: a pilot study.

Hugonnard M, Chalvet-Monfray K, Dernis J, Pouzot-Nevoret C, Barthélémy A, Vialard J, Goy-Thollot I.

The incidence of catheter-associated urinary tract infections in cats catheterised for an obstructive lower urinary tract disease (LUTD) has not previously been evaluated. The objective of this study was to evaluate the frequency of significant bacteriuria in cats with obstructive LUTD managed for 48 h with a closed urine collection system. Eighteen male cats admitted for a non-infectious obstructive LUTD were evaluated. This was a prospective study. A standard protocol was used for aseptic catheter placement and maintenance. Three urine samples were collected from each animal through the catheter immediately after placement, 24 h after placement and just before removal. All samples underwent complete urinalysis, including bacterial culture. Catheter tips were tested by bacterial culture. Six cats (33.3%) developed significant bacteriuria during catheterisation. The causative bacteria were common feline uropathogens (*Escherichia coli*, *Staphylococcus* species) in five cases, and *Streptococcus bovis* in one. One cat developed a fungal infection. The presence of bacteria in urinary sediment was correlated strongly with positive urine culture results. The catheter tips from 10/18 cats (55.5%) were positive for culture. The positive predictive value of a positive culture from the urinary catheter tip was 87.5%. The specificity was 53.8%. The same infectious agents were cultured from both urine and catheter tip in six cases. In summary, one-third of cats developed significant bacteriuria during catheterisation. Silent bacteriuria could not be clearly differentiated from true urinary tract infection. The presence of bacteria in the urinary sediment was strongly indicative of bacteriuria. The specificity of urinary catheter tip culture was low.

J Feline Med Surg. 2013 Oct;15(10):849-57. doi: 10.1177/1098612X13477415. Epub 2013 Feb 14.

Prospective evaluation of healthy Ragdoll cats for chronic kidney disease by routine laboratory parameters and ultrasonography.

Paape D, Bavegems V, Combes A, Saunders JH, Daminet S.

Ragdoll breeder organisations often forewarn Ragdoll cat owners that renal problems may develop as a result of polycystic kidney disease (PKD), chronic interstitial nephritis, familial renal dysplasia or nephrocalcinosis. Healthy Ragdoll and non-Ragdoll cats were prospectively evaluated by measuring serum creatinine and urea concentrations, routine urinalysis and abdominal ultrasonography. All Ragdoll cats also underwent genetic PKD testing. One hundred and thirty-three Ragdoll and 62 control cats were included. Ragdoll cats had significantly lower serum urea concentrations and higher urinary specific gravity. However, median creatinine concentration, median urinary protein-to-creatinine ratio, and the proportion of cats with serum creatinine or urea concentration exceeding

the reference interval did not differ. One or more renal ultrasonographical changes were detected in 66/133 (49.6%) Ragdoll and in 25/62 (40%) control cats. Ragdoll cats showed significantly more frequent segmental cortical lesions (7.5% versus 0%), abnormal renal capsule (19.5% versus 8%) and echogenic urine (51.9% versus 25.8%). Chronic kidney disease (CKD) was ultrasonographically suspected in 7/133 (5.3%) Ragdoll and in none of the control cats, which approached significance. Laboratory parameters confirmed kidney dysfunction only in 1/7 of these Ragdoll cats. All Ragdoll cats were PKD negative. In conclusion, first, breed-specific serum creatinine reference intervals are not likely required for Ragdoll cats. Second, renal ultrasonographical abnormalities are common, both in Ragdoll and non-Ragdoll cats. Third, healthy young Ragdoll cats are uncommonly affected by PKD and CKD, but an increased susceptibility of Ragdoll cats to develop CKD cannot be excluded. Finally, Ragdoll cats are predisposed to segmental cortical lesions, which may indicate renal infarction or cortical scarring.

J Feline Med Surg. 2013 Oct;15(10):866-71. doi: 10.1177/1098612X13478264. Epub 2013 Feb 14.

Mineral metabolism in growing cats: changes in the values of blood parameters with age.

Pineda C, Aguilera-Tejero E, Guerrero F, Raya AI, Rodriguez M, Lopez I.

The purpose of this study was to describe changes in calcium, phosphorus, magnesium, parathyroid hormone, calcitriol and calcidiol in cats from 3 to 15 months of age. Fourteen European shorthair healthy cats of both sexes (seven males, seven females) belonging to a research colony were studied from 3 to 15 months of age. Plasma concentrations of total calcium, ionised calcium, albumin, phosphorus, magnesium, intact parathyroid hormone (I-PTH), whole parathyroid hormone (W-PTH), calcidiol and calcitriol were measured at 3, 6, 9, 12 and 15 months of age. From 3 months of age to adulthood cats showed a decrease in calcium (both total and ionised), phosphorus and magnesium. No major changes in PTH were evident, although the ratio of W-PTH:I-PTH decreased significantly with age. A reciprocal change in vitamin D metabolites (decrease in calcitriol and increase in calcidiol) was identified during the growing process. Our results, showing changes in most parameters of mineral metabolism during growth, reinforce the need to use adequate age-related reference values for diagnostic purposes.

J Feline Med Surg. 2013 Oct;15(10):911-6. doi: 10.1177/1098612X13477413. Epub 2013 Feb 14.

Xanthine urolithiasis causing bilateral ureteral obstruction in a 10-month-old cat.

Mestrinho LA, Gonçalves T, Parreira PB, Niza MM, Hamaide AJ.

Xanthine urolithiasis was diagnosed in a 10-month-old intact female domestic shorthair cat presented with acute renal failure due to bilateral ureteral obstruction. Ultrasonography revealed the presence of multiple uroliths in both kidneys and ureters that were not detectable on previous survey radiographs. Medical management failed and ureteral obstruction persisted with no evidence of stone migration into the bladder. Bilateral ureterotomy with urolith removal was performed in order to relieve the obstruction. The cat recovered from surgery, and blood urea nitrogen and creatinine values decreased within normal limits 6 days postoperatively. Urolith analysis by infrared spectrometry determined xanthine composition, and a higher blood and urine concentration of hypoxanthine and xanthine was also found. At 1-year follow-up, the cat was free of clinical signs. However, ultrasonography of the abdomen revealed small-size calculi in both kidneys, despite the low protein diet intake. The very young age of the animal suggests a possible congenital xanthinuria.

J Feline Med Surg. 2013 Oct;15(10):917-20. doi: 10.1177/1098612X13478267. Epub 2013 Feb 14.

Subcutaneous fluid port-associated soft tissue sarcoma in a cat.

McLeland SM, Imhoff DJ, Thomas M, Powers BE, Quimby JM.

A 20-year-old male castrated domestic longhair cat was evaluated for assessment of its chronic kidney disease (CKD) and a non-healing ulcerated mass at the site of a previously placed and

subsequently removed GIF tube. The cat had been diagnosed with CKD 10 years prior and two GIF tubes had been placed over a 5-year period, the second of which was associated with secondary infection. Biopsy of the non-healing ulcerated mass was consistent with grade 2 soft tissue sarcoma. At necropsy there was a discrete, serpentine, subcutaneous mass measuring approximately 8 mm in diameter that extended approximately 20 cm along the dorsum to the caudal thorax, following the path of the GIF tube, from the main intrascapular, ulcerated mass where the fluid port injection site was located. This is the first report of a fibrosarcoma arising at the site of a subcutaneous fluid port in a cat. Although the cat's owners were pleased with the 4 years of quality of life provided by this device, this complication should be considered when a decision to place ports for long-term management of disease is made.

J Feline Med Surg. 2013 Dec;15(12):1046-51. doi: 10.1177/1098612X13487361. Epub 2013 May 1.

Renal dimensions at ultrasonography in healthy Ragdoll cats with normal kidney morphology: correlation with age, gender and bodyweight.

Debruyne K, Paepe D, Daminet S, Combes A, Duchateau L, Peremans K, Saunders JH.

Fifty-six healthy Ragdoll cats underwent an ultrasonographical examination of the urinary tract to evaluate if gender, age, bodyweight and presence of a medullary rim sign had a significant influence on renal length and corticomedullary ratio (CM). Individual variation percentage was much more pronounced for renal length in comparison with CM ratio. Mean renal length measured 3.83 ± 0.45 cm (range 2.98-5.09 cm), mean cortical thickness 0.73 ± 0.15 cm (range 0.36-1.18 cm), mean medullary thickness 0.87 ± 0.19 cm (range 0.46-1.39 cm) and mean CM ratio 0.88 ± 0.29 (range 0.29-1.78). Renal length showed a significant positive correlation with bodyweight ($P < 0.0001$), age ($P = 0.0073$) and male gender ($P < 0.0001$). Therefore, these parameters have to be kept in mind when evaluating renal length on ultrasound. The CM ratio was solely influenced by the presence of a medullary rim sign ($P < 0.0001$). Further research, however, is needed to investigate the usefulness of the CM ratio for the detection of kidney disease by ultrasonography.

J Feline Med Surg. 2013 Dec;15(12):1052-62. doi: 10.1177/1098612X13489055. Epub 2013 May 30.

Predictors of outcome for cats with ureteral obstructions after interventional management using ureteral stents or a subcutaneous ureteral bypass device.

Horowitz C, Berent A, Weisse C, Langston C, Bagley D.

Novel treatment alternatives for feline ureteral obstruction(s) include placement of a double pigtail ureteral stent and a subcutaneous ureteral bypass (SUB) device. This study evaluated parameters for the prediction of hospitalization times, peri-operative survival, renal recovery and long-term survival in cats with benign ureteral obstructions after successful decompression with either a ureteral stent or SUB device. The medical records of 41 cats treated for benign ureteral obstruction(s) were retrospectively reviewed. Preoperative historical, biochemical and imaging parameters, along with intra- and postoperative biochemical parameters and complications were evaluated for predictors of hospitalization length, survival to discharge, 3-, 6- and 9-month post-procedure creatinine, and overall survival time. All patients had successful decompression of their renal pelvis. Hospitalization time was positively associated with presenting creatinine, perioperative complications, post-procedure creatinine and potassium, but was negatively associated with post-procedure sodium. No parameters were associated with survival to discharge. A higher creatinine at discharge was positively associated with a higher creatinine at follow-up. A decreased overall survival was associated with a higher presenting blood urea nitrogen, higher creatinine at hospital discharge and in over-hydrated patients during hospitalization. Cats with International Renal Interest Society stage 1 and 2 kidney disease, versus stage 3 and 4, at 3 months and 6 months post-procedure, lived longer. Cats with ureteral obstruction(s) treated with a ureteral stent or SUB device had an overall good survival and no admitting parameter was associated with survival to discharge. No single parameter

was associated with all outcomes in this study, making predicting patient survival and cost prior to ureteral decompression difficult.

J Feline Med Surg. 2013 Dec;15(12):1079-85. doi: 10.1177/1098612X13492164. Epub 2013 Jun 4.

Maine Coon renal screening: ultrasonographical characterisation and preliminary genetic analysis for common genes in cats with renal cysts.

Gendron K, Owczarek-Lipska M, Lang J, Leeb T.

The objective of this study was to assess the prevalence of renal cysts and other renal abnormalities in purebred Maine Coon cats, and to characterise these through genetic typing. Voluntary pre-breeding screening programmes for polycystic kidney disease (PKD) are offered for this breed throughout Switzerland, Germany and other northern European countries. We performed a retrospective evaluation of Maine Coon screening for renal disease at one institution over an 8-year period. Renal ultrasonography was performed in 187 healthy Maine Coon cats. Renal changes were observed in 27 of these cats. Renal cysts were found in seven cats, and were mostly single and unilateral (6/7, 85.7%), small (mean 3.6 mm) and located at the corticomedullary junction (4/6, 66.7%). Sonographical changes indicating chronic kidney disease (CKD) were observed in 10/187 (5.3%) cats and changes of unknown significance were documented in 11/187 (5.9%) cats. All six cats genetically tested for PKD1 were negative for the mutation, and gene sequencing of these cats did not demonstrate any common genetic sequences. Cystic renal disease occurs with a low prevalence in Maine Coons and is unrelated to the PKD observed in Persians and related breeds. Ultrasonographical findings compatible with CKD are not uncommon in juvenile Maine Coons.

J Feline Med Surg. 2013 Dec;15(12):1086-97. doi: 10.1177/1098612X13492739. Epub 2013 Jun 19.

Evaluation of urinalyses from untreated adult cats with lower urinary tract disease and healthy control cats: predictive abilities and clinical relevance.

Lund HS, Krontveit RI, Halvorsen I, Eggertsdóttir AV.

This case-controlled study evaluated urinalyses from 111 primary cases diagnosed with feline lower urinary tract disease (FLUTD) and 101 healthy control cats. Urine samples were analysed by standardised procedures, and differences between the two groups were compared by multivariable logistic regression analysis, while controlling for age, body weight, gender and reproductive status. Further, the ability of using urine sediment findings to predict bacteriuria was evaluated. In addition, urinalyses from cats with bacterial cystitis, idiopathic cystitis, urolithiasis and urethral plugs were compared. The main findings were that increasing body weight was significantly associated with increased odds of FLUTD, while the influence of age and reproductive status was of less importance. Increasing amounts of red blood cells and epithelial cells were significantly associated with increased odds of FLUTD. The predictive ability of using bacterial sediment findings to predict bacterial growth was dependent on subjective grading of the amount of bacteria in the sediment and was, at best, only moderate. The few significant differences found between the different FLUTD diagnoses were of limited diagnostic value.

J Feline Med Surg. 2013 Dec;15(12):1104-13. doi: 10.1177/1098612X13495025. Epub 2013 Jun 28.

Comparison of high-definition oscillometry -- a non-invasive technology for arterial blood pressure measurement -- with a direct invasive method using radio-telemetry in awake healthy cats.

Martel E, Egner B, Brown SA, King JN, Laveissiere A, Champeroux P, Richard S.

This study compared indirect blood pressure measurements using a non-invasive method, high-definition oscillometry (HDO), with direct measurements using a radio-telemetry device in awake cats. Paired measurements partitioned to five sub-ranges were collected in six cats using both methods. The results were analysed for assessment of correlation and agreement between the two methods, taking into account all pressure ranges, and with data separated in three sub-groups, low,

normal and high ranges of systolic (SBP) and diastolic (DBP) blood pressure. SBP data displayed a mean correlation coefficient of 0.92 ± 0.02 that was reduced for low SBP. The agreement level evaluated from the whole data set was high and slightly reduced for low SBP values. The mean correlation coefficient of DBP was lower than for SBP (ie, 0.81 ± 0.02). The bias for DBP between the two methods was 22.3 ± 1.6 mmHg, suggesting that HDO produced lower values than telemetry. These results suggest that HDO met the validation criteria defined by the American College of Veterinary Internal Medicine consensus panel and provided a faithful measurement of SBP in conscious cats. For DBP, results suggest that HDO tended to underestimate DBP. This finding is clearly inconsistent with the good agreement reported in dogs, but is similar to outcomes achieved in marmosets and cynomolgus monkeys, suggesting that this is not related to HDO but is species related. The data support that the HDO is the first and only validated non-invasive blood pressure device and, as such, it is the only non-invasive reference technique that should be used in future validation studies.

J Feline Med Surg. 2013 Dec;15(12):1119-22. doi: 10.1177/1098612X13492165. Epub 2013 Jun 4.

Application of the single blood sample method to estimate feline glomerular filtration rate in a clinically relevant situation.

Katayama M, Sasaki A, Takayasu M, Shimamura S, Uzuka Y, Murayama I, Satoh H, Furuhashi K.

To compare glomerular filtration rate (GFR) estimated by a single blood sample method, the non-ionic contrast medium iodixanol (40 mg I/kg) and the standard GFR tracer inulin (50 mg/kg) were co-administered as a bolus intravenous injection to 12 cats, followed by blood collection 60 and 90 mins later. Serum iodixanol and inulin concentrations were measured separately by high-performance liquid chromatography and colourimetric assay. A correlation ($r = 0.90$, $P < 0.01$) was noted between GFR values estimated by the single-blood-sample method using iodixanol and inulin, indicating that this procedure can apply to feline GFR estimates, even if different GFR tracers are used. In a feline kidney transplantation study, the GFR was monitored subsequently by this simplified iodixanol method throughout a 750-day observation period with no adverse reactions. The results demonstrate that the simplified method, including the volume of distribution, can be used as an alternative or expedient tool in a clinically relevant situation.

Journal of Small Animal Practice

J Small Anim Pract. 2013 Jan;54(1):28-32. doi: 10.1111/jsap.12004.x.

Proteinuria in canine patients with lymphoma.

Di Bella A, Maurella C, Cauvin A, Schmidt JM, Tapia BB, North SM.

OBJECTIVES: To determine if proteinuria is more common in dogs with lymphoma when compared with healthy dogs and to assess the severity and frequency of proteinuria in dogs with lymphoma.
METHODS: Determination of urine protein:creatinine ratio in 32 dogs with lymphoma compared with 30 healthy dogs.
RESULTS: Canine patients with lymphoma are more likely to be proteinuric compared with healthy dogs. Proteinuria is common in dogs with lymphoma, although in most cases it is not severe. The presence of proteinuria is not linked with the stage or substage of lymphoma.
CLINICAL SIGNIFICANCE: Mild proteinuria is a common finding in dogs with lymphoma. The clinical impact of the proteinuria is probably low.

J Small Anim Pract. 2013 Feb;54(2):67-74. doi: 10.1111/jsap.12009. Epub 2013 Jan 3.

Retrospective evaluation of doxorubicin-piroxicam combination for the treatment of transitional cell carcinoma in dogs.

Robat C, Burton J, Thamm D, Vail D.

OBJECTIVES: To determine whether doxorubicin-piroxicam combination is safe and has activity against transitional cell carcinoma in dogs.

METHODS: Data was collected retrospectively from 34 dogs from two institutions over a 6-year period. Signalment, clinical presentation, treatment specifics, adverse events, response, progression-free survival and overall survival time were evaluated.

RESULTS: Dogs received doxorubicin every 3 weeks and daily piroxicam; 17 dogs (50%) had surgery. Clinical presentations were those typically reported for transitional cell carcinoma. Mean number of doses administered was 3.5. Of the 23 dogs with measurable disease, 14 (60.5%) had stable disease, 7 (30.5%) had progressive disease and 2 (9%) a partial response. Adverse events were generally manageable, and gastrointestinal in origin; one dog died of treatment-related complications. Overall median progression-free survival and overall survival were 103 and 168 days, respectively.

Cytoreductive surgery did not result in prolongation of progression-free survival, but significantly prolonged overall survival. All dogs but one died as a result of disease progression.

CLINICAL SIGNIFICANCE: Doxorubicin-piroxicam combination therapy is well-tolerated in dogs with transitional cell carcinoma although progression-free survival, overall survival and biological response rates appear modest. Combination with surgery appears to offer a survival advantage; however, this may reflect tumour location and volume. Prospective studies are necessary to compare activity of combination doxorubicin-piroxicam to currently applied therapies.

J Small Anim Pract. 2013 Apr;54(4):184-9. doi: 10.1111/jsap.12046.

Comparative accuracy of several published formulae for the estimation of serum osmolality in cats.
Dugger DT, Mellema MS, Hopper K, Epstein SE.

OBJECTIVE: To determine the osmole gap utilizing 18 previously published formulae for the estimation of serum osmolality in cats.

PROCEDURES: Serum samples were frozen at -80°C after routine biochemical analysis. An Advanced Micro Osmometer 3300 was used to measure serum osmolality. Eighteen previously reported formulae were used to calculate osmolality from biochemical analysis results. The calculated osmolality was subtracted from the measured osmolality to determine the osmole gap. Osmole gaps for azotaemic and hyperglycaemic cats were compared to those from cats without azotaemia or hyperglycaemia using each formula.

RESULTS: The osmole gaps varied dependent on the formula used and the presence or absence of hyperglycaemia or azotaemia. Eleven formulae led to calculated osmolality and osmole gaps that were not statistically different when hyperglycaemia, azotaemia or both were present. Four of these 11 formulae resulted in osmole gaps near zero. For each formula used, the osmole gap increased with increasing osmolality.

CLINICAL SIGNIFICANCE: Multiple formulae to calculate serum osmolality can be used, but they result in significantly different osmole gaps. Clinicians should be aware of the specific reference interval for the formula being used. The formula $[2(\text{Na}^+) + \text{glucose} + \text{BUN}]$ is recommended as it is easy to use and reliable even in the presence of hyperglycaemia and/or azotaemia.

J Small Anim Pract. 2013 Jul;54(7):386-9. doi: 10.1111/jsap.12056. Epub 2013 Apr 4.

Duplicated ectopic ureter in a nine-year-old Labrador.

Novellas R, Stone J, Pratschke K, Hammond G.

A nine-year-old male neutered Labrador retriever presented with a history of chronic urinary tract infections and occasional dribbling of urine. Abdominal ultrasound showed changes suggestive of a left ectopic ureter. A pneumocystogram revealed an air-filled distended tubular and tortuous structure extending from the region of the prostatic urethra to the left kidney, consistent with an ectopic ureter. Intravenous urography depicted the presence of an additional left ureter with only slightly larger diameter than the right and with normal insertion in the bladder neck. A duplicated ectopic left ureter was suspected and confirmed during surgery. To the authors' knowledge, this is

the first description of a duplicated ectopic ureter in the canine species. The combination of ultrasound and contrast radiography was important to reach the diagnosis.

J Small Anim Pract. 2013 Aug;54(8):395-8. doi: 10.1111/jsap.12106. Epub 2013 Jul 13.

Urine concentrations of xanthine, hypoxanthine and uric acid in UK Cavalier King Charles spaniels.

Jacinto AM, Mellanby RJ, Chandler M, Bommer NX, Carruthers H, Fairbanks LD, Gow AG.

Xanthine urolithiasis and asymptomatic xanthinuria have been diagnosed in Cavalier King Charles spaniel dogs suggesting that primary xanthinuria may be a breed-related disorder, although its prevalence remains unclear. The hypothesis of this study was that asymptomatic xanthinuria is common in Cavalier King Charles spaniel dogs.

Free catch urine samples were collected from 35 client-owned Cavalier King Charles spaniel dogs and from 24 dogs of other breeds. The purine metabolites were measured by high-performance liquid chromatography. The urine ratios of xanthine/creatinine and hypoxanthine/creatinine were calculated and compared between the two groups of dogs.

The urine concentrations of purine metabolites were not significantly different between the two groups and were very low in both. The urine concentrations of xanthine in all 35 Cavalier King Charles spaniel were markedly lower than in the previously reported case of xanthine urolithiasis in a UK Cavalier King Charles spaniel dog.

Asymptomatic xanthinuria was not detected in this UK Cavalier King Charles spaniel population. This data may be used as a reference for urinary purine metabolite concentrations in the dog.

J Small Anim Pract. 2013 Dec;54(12):647-55. doi: 10.1111/jsap.12150. Epub 2013 Oct 24.

Biomarkers in the assessment of acute and chronic kidney diseases in the dog and cat.

Cobrin AR, Blois SL, Kruth SA, Abrams-Ogg AC, Dewey C.

In both human and veterinary medicine, diagnosing and staging renal disease can be difficult. Measurement of glomerular filtration rate is considered the gold standard for assessing renal function but methods for its assessment can be technically challenging and impractical. The main parameters used to diagnose acute and chronic kidney disease include circulating creatinine and urea concentrations, and urine-specific gravity. However, these parameters can be insensitive. Therefore, there is a need for better methods to diagnose and monitor patients with renal disease. The use of renal biomarkers is increasing in human and veterinary medicine for the diagnosis and monitoring of acute and chronic kidney diseases. An ideal biomarker would identify site and severity of injury, and correlate with renal function, among other qualities. This article will review the advantages and limitations of renal biomarkers that have been used in dogs and cats, as well as some markers used in humans that may be adapted for veterinary use. In the future, measuring a combination of biomarkers will likely be a useful approach in the diagnosis of kidney disorders.

Journal of the American Animal Hospital Association

J Am Anim Hosp Assoc. 2013 Jan;49(1):1-7. doi: 10.5326/JAAHA-MS-5943. Epub 2012 Nov 12.

UTIs in Small Animal Patients: Part 1: Etiology and Pathogenesis.

Smee N, Loyd K, Grauer G.

Understanding how urinary tract infections (UTIs) can occur and how to classify them can help the practitioner to make a plan for treatment. This review summarizes the etiology, pathogenesis, and host defense mechanisms associated with bacterial UTIs in dogs and cats. UTIs in Small Animal Patients: Part 2: Diagnosis, Treatment, and Complications will appear in the March/April 2013 issue of the Journal of the American Animal Hospital Association.

J Am Anim Hosp Assoc. 2013 Jan;49(1):46-53. doi: 10.5326/JAAHA-MS-5692. Epub 2012 Nov 12.

Systemic Hypertension and Hypertensive Retinopathy Following PPA Overdose in a Dog.

Ginn JA, Bentley E, Stepien RL.

A 4 yr old spayed female Labrador retriever was examined 4 hr after ingesting an overdose of phenylpropanolamine (PPA). Clinical signs included anxiety, piloerection, mucosal ulceration, cardiac arrhythmia, mydriasis, and hyphema. Clinicopathologic abnormalities included elevated creatine kinase (CK) and aspartate aminotransferase (AST), proteinuria, and pigmenturia. Ventricular tachycardia and severe systemic hypertension were documented. Hyphema and retinal detachment were documented oculus uterque (OU). Phenoxybenzamine, sotalol, and esmolol resolved the ventricular tachycardia, and blood pressure was controlled with nitroprusside. All clinicopathologic and cardiac abnormalities resolved within 7 days, and ocular changes resolved within 1 mo. Monitoring of blood pressure and rapid pharmacologic intervention were successful in controlling hypertension secondary to PPA overdose and minimizing retinal damage.

J Am Anim Hosp Assoc. 2013 Mar;49(2):83-94. doi: 10.5326/JAAHA-MS-5944. Epub 2013 Jan 16.

UTIs in Small Animal Patients: Part 2: Diagnosis, Treatment, and Complications.

Smee N, Loyd K, Grauer GF.

There are multiple considerations when making a treatment plan for patients with urinary tract infections (UTIs). In part 2 of this review the authors discuss the clinical signs, diagnosis, treatment, and complications associated with bacterial UTIs in dogs and cats. Part 1 of this review summarized etiology and pathogenesis (see the Jan/Feb 2013 issue of the Journal of the American Animal Hospital Association).

J Am Anim Hosp Assoc. 2013 Jul-Aug;49(4):231-6. doi: 10.5326/JAAHA-MS-5840. Epub 2013 May 20.

Variation of proteinuria in dogs with leishmaniasis treated with meglumine antimoniate and allopurinol: a retrospective study.

Pierantozzi M, Roura X, Paltrinieri S, Poggi M, Zatelli A.

A retrospective study was performed using 53 client owned dogs with leishmaniasis to determine whether the degree of proteinuria, evaluated by the urine protein/creatinine ratio (UP/C), changes following treatment with meglumine antimoniate and allopurinol. Medical records of dogs with leishmaniasis in clinical stage C (according to the Canine Leishmaniasis Working Group staging system) and either proteinuric or borderline proteinuric (according to the International Renal Interest Society [IRIS] staging system) were reviewed. All dogs were treated with meglumine antimoniate and allopurinol for 4-8 wk. After treatment, UP/C, total protein, and total globulin significantly decreased and albumin and the albumin/globulin ratio (A/G) increased. After treatment, 7 of the 53 dogs (13.4%) became nonproteinuric following either a proteinuric or borderline proteinuric stage. Moreover, 12 of the 53 proteinuric dogs (22.6%) changed their stage to borderline proteinuric. The antileishmaniasis treatment with meglumine antimoniate in combination with allopurinol in dogs significantly reduced the degree of proteinuria in a short period of time. The results of the current study may be useful to the veterinary practitioner in the clinical management of canine leishmaniasis (CanL) in dogs with proteinuric chronic kidney disease.

J Am Anim Hosp Assoc. 2013 Jul-Aug;49(4):262-6. doi: 10.5326/JAAHA-MS-5865. Epub 2013 May 20.

Iatrogenic tumor seeding after ureteral stenting in a dog with urothelial carcinoma.

Hosoya K, Takagi S, Okumura M.

A 5 yr old castrated male miniature dachshund presented with clinical signs attributable to carcinoma involving the bladder neck and prostate. On day 84 following diagnosis, the dog developed bilateral ureteral obstruction and ureteral stenting was attempted. The stents were inserted in a normograde fashion via percutaneous puncture of the dilated renal pelvises. Two wk later, the dog developed

nodules at both sites of renocentesis. En block resection of the masses was performed, and histologic examination confirmed that the masses were urothelial carcinoma, likely caused by iatrogenic tumor seeding. Ureteral stenting is a useful technique to relieve malignant ureteral obstruction; however, risk of iatrogenic tumor seeding must be considered.

J Am Anim Hosp Assoc. 2013 Sep-Oct;49(5):338-41. doi: 10.5326/JAAHA-MS-5885. Epub 2013 Jul 16.

Supernumerary kidney with ipsilateral cryptorchidism in a cat.

Paradise D, Clark D.

An 8 wk old male domestic longhair was presented with an abdominal mass and cryptorchidism. A 2 cm mass was palpable in the midabdomen. Ultrasonography confirmed a complex, septated, cystic mass adjacent and caudal to the right kidney. A normally appearing left kidney was present. Pathologic examination of the excised abdominal mass revealed it to be a kidney with an attached, normal caliber ureter. At surgery, this kidney was separate from the parenchyma of the second, cranial, right kidney. Subsequently, the second right kidney became hydronephrotic and was removed together with the cryptorchid testis and an apparently hypoplastic ureter. This is the first report of a supernumerary kidney in a cat, adding it to the differential diagnoses of abdominal masses.

J Am Anim Hosp Assoc. 2013 Nov-Dec;49(6):385-8. doi: 10.5326/JAAHA-MS-5895. Epub 2013 Jul 16.

Hypercalcemia of malignancy associated with renal cell carcinoma in a dog.

Merrick CH, Schleis SE, Smith AN, Mallett CL, Graff EC, Johnson C.

A 10 yr old castrated male Siberian husky was evaluated for polyuria, polydipsia, a retroperitoneal mass, and urolithiasis. A marked elevation in Ca was noted on initial blood work, and results of additional testing were consistent with hypercalcemia of malignancy, including an elevated parathyroid hormone-related peptide (PTHrp) value. Based on clinical signs, blood work, diagnostic imaging, and cytology results, unilateral renal neoplasia was suspected. Following a complete right nephrectomy and cystotomy, histopathologic examination confirmed a diagnosis of renal cell carcinoma (RCC). Five days postoperatively, the hypercalcemia had nearly resolved and the PTHrp was zero. This is the first reported case of hypercalcemia of malignancy associated with RCC in a dog.

Journal of the American Veterinary Medical Association

J Am Vet Med Assoc. 2013 Jan 1;242(1):59-68. doi: 10.2460/javma.242.1.59.

Evaluation of outcome following urethral stent placement for the treatment of obstructive carcinoma of the urethra in dogs: 42 cases (2004-2008).

Blackburn AL, Berent AC, Weisse CW, Brown DC.

OBJECTIVE: To evaluate the outcome following urethral stent placement for the palliative treatment of obstructive carcinoma of the urethra in dogs.

DESIGN: Retrospective case series.

ANIMALS: 42 dogs with obstructive carcinoma of the urethra.

PROCEDURES: Medical records for dogs in which a self-expanding metallic stent (SEMS) was used for the treatment of obstructive carcinoma of the urethra were reviewed. Signalment, diagnostic findings, clinical signs before and after SEMS placement, and patient outcome were analyzed. Fluoroscopic images were evaluated to determine the effects of stent size, obstruction length, tumor length, and urethral length and width on the incidence of incontinence or stranguria.

RESULTS: Resolution of urinary tract obstruction was achieved in 41 of 42 (97.6%) dogs. After SEMS placement, 6 of 23 male and 5 of 19 female dogs developed severe incontinence, and 1 of 23 male and 1 of 17 female dogs developed stranguria. Stent length, diameter, and location were not associated with incidence of incontinence or stranguria. Median survival time after SEMS placement

was 78 days (range, 7 to 536 days). Treatment with NSAIDs before and chemotherapeutics after SEMs placement increased median survival time to 251 days (range, 8 to 536 days).

CONCLUSIONS AND CLINICAL RELEVANCE: Urethral SEMs placement was an effective palliative treatment for dogs with obstructive carcinoma of the urethra; however, severe incontinence subsequently developed in 11 of 42 (26%) treated dogs. Adjunctive treatment of affected dogs with NSAIDs and chemotherapeutics significantly increased the median survival time.

J Am Vet Med Assoc. 2013 Mar 15;242(6):798-802. doi: 10.2460/javma.242.6.798.

Successful treatment of encrusted cystitis associated with *Staphylococcus pseudintermedius* infection in the urinary bladder of a dog.

Biegen VR, Slusser PG, Fischetti AJ, Geist MR.

Case Description-A 5-year-old female spayed mixed-breed dog was examined because of signs of persistent stranguria following treatment for urethral obstruction. **Clinical Findings-**Radiographic, ultrasonographic, cystoscopic, and histologic findings were consistent with encrusted cystitis. Results of bacteriologic culture of urine and bladder wall biopsy samples indicated growth of *Staphylococcus pseudintermedius*. **Treatment and Outcome-**The dog was initially treated via IV administration of fluids, placement of an indwelling urinary catheter, lavage of the bladder with sterile saline (0.9% NaCl) solution, and administration of antimicrobial drugs and bethanechol (to improve voiding of urine from the bladder). Antimicrobial drugs were administered for 3 months, and a commercially available diet for dissolution of urinary calculi was fed. Clinical signs of encrusted cystitis gradually resolved during the 3 months after the initial examination. Results of urinalysis and abdominal ultrasonographic examination performed 4 months after the initial examination indicated resolution of the disease. **Clinical Relevance-**Encrusted cystitis is extremely rare in small animals and has previously only been associated with *Corynebacterium* spp infection of the urinary bladder. Resolution of encrusted cystitis has previously been achieved via surgical debridement of the bladder and treatment with antimicrobial drugs. The clinical findings and successful resolution of clinical signs in the dog of the present report suggested that urease-positive bacteria other than *Corynebacterium* spp can cause encrusted cystitis and that feeding of a diet for dissolution of urinary calculi in conjunction with antimicrobial treatment may result in resolution of urinary bladder lesions and clinical signs attributable to the disease without the need for surgical debridement of encrusted plaques.

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Spatial and temporal patterns of *Leptospira* infection in dogs from northern California: 67 cases (2001-2010).

Hennebelle JH, Sykes JE, Carpenter TE, Foley J.

Objective-To conduct an epidemiological analysis of the spatial and temporal distribution of canine leptospirosis cases in northern California and detect spatial clustering in any region. **Design-**Retrospective case-control study. **Animals-**67 dogs with leptospirosis and 271 control dogs. **Procedures-**Medical records of case and control dogs were reviewed. Spatial coordinates of home addresses of the study population were analyzed visually and statistically via a Cuzick-Edwards test and spatial, temporal, and space-time permutation scan statistics. **Results-**Cases were distributed around the San Francisco Bay region as well as in the Sierra Nevada foothills near Sacramento, Calif, whereas controls were principally distributed along route I-80 between San Francisco and Sacramento, Calif. Clustering was found for the second through sixth nearest neighboring cases via the global spatial cluster test. A local spatial cluster of 30 cases was identified in San Francisco (95% confidence interval, 1.3 to 7.0), and a temporal cluster of 18 cases was identified from May 2003 through May 2004 (95% confidence interval, 1.4 to 6.5). No significant space-time cluster was identified. **Conclusions and Clinical Relevance-**The use of geographic information systems provided a visual representation of the results of statistical analysis for the location and time at which

leptospirosis cases occurred. This useful tool can be used to educate veterinary practitioners and the public about a potentially fatal zoonotic disease and direct vaccination strategies to help prevent disease occurrence.

J Am Vet Med Assoc. 2013 Apr 1;242(7):959-62. doi: 10.2460/javma.242.7.959.

Evaluation of the prevalence of urinary incontinence in spayed female dogs: 566 cases (2003-2008).

Forsee KM, Davis GJ, Mouat EE, Salmeri KR, Bastian RP.

Objective-To determine the prevalence of urinary incontinence in spayed female dogs and categorize affected dogs by age at time of ovariohysterectomy, number of litters prior to ovariohysterectomy, body weight, treatment of affected dogs, and severity of incontinence and to determine associations among these variables. **Design-**Retrospective case series. **Animals-**566 ovariohysterectomized dogs. **Procedures-**An attempt was made to contact owners of 912 dogs ovariohysterectomized between January 2003 and January 2008 to discuss presence or absence of urinary incontinence. The actual number of responders was 566. Those owners with incontinent pets received a questionnaire further assessing degree of incontinence, diagnostic testing, treatment, and history. **Results-**The prevalence of acquired urinary incontinence was determined to be 5.12% (29/566 dogs) on the basis of results of phone surveys and questionnaires. There was no significant difference in the age at time of ovariohysterectomy between incontinent and continent groups. A significant association was found between body weight and incontinence, with incontinence rates higher among larger (≥ 15 kg [33.1 lb]) dogs. Larger dogs were approximately 7 times as likely (OR, 7.2 [95% confidence interval, 2.5 to 21.1]) to develop acquired urinary incontinence, compared with small dogs (< 15 kg). **Conclusions and Clinical Relevance-**Although acquired urinary incontinence in female dogs is known to be associated with ovariohysterectomy, the prevalence in this study was low.

J Am Vet Med Assoc. 2013 Apr 15;242(8):1110-6. doi: 10.2460/javma.242.8.1110.

Outcome following gastrointestinal tract decontamination and intravenous fluid diuresis in cats with known lily ingestion: 25 cases (2001-2010).

Bennett AJ, Reineke EL.

Objective-To describe the outcome of cats treated with gastrointestinal tract decontamination, IV fluid diuresis, or both after ingestion of plant material from lilies of the *Lilium* and *Hemerocallis* genera. **Design-**Retrospective case series. **Animals-**25 cats evaluated after ingestion of lily plants. **Procedures-**Medical records of cats examined at the Matthew J. Ryan Veterinary Hospital of the University of Pennsylvania with known lily ingestion between July 2001 and April 2010 were reviewed. Inclusion in the study required evidence of lily plant ingestion within the preceding 48 hours. Type of lily ingested, time of ingestion, gastrointestinal tract decontamination procedures performed, and IV fluid diuresis were recorded. The presence or absence of acute kidney injury was determined by evaluating BUN concentration, creatinine concentration, and urine specific gravity. Outcome was defined as survival to discharge, death, or euthanasia. **Results-**The time from ingestion until evaluation at the Matthew J. Ryan Veterinary Hospital of the University of Pennsylvania ranged from < 30 minutes to 48 hours. Nineteen cats received gastrointestinal tract decontamination (18 cats at our hospital and 1 cat by the referring veterinarian). Twenty-three cats were admitted to the hospital for IV fluid diuresis, supportive care, and monitoring. Seventeen of these 23 (74%) cats had normal BUN and creatinine concentrations throughout hospitalization. At the time of discharge from the hospital, 2 of the 23 (9%) hospitalized cats had an increased BUN concentration, creatinine concentration, or both. All 25 (100%) cats survived to discharge from the hospital. **Conclusions and Clinical Relevance-**In this series of cats treated with gastrointestinal tract decontamination, IV fluid diuresis, or both within 48 hours after lily ingestion, the outcome was good, with a low incidence of acute kidney injury. Future studies are needed to determine the most effective gastrointestinal tract decontamination procedures and optimal duration of IV fluid therapy.

Treatment of traumatic penile urethral stricture in a dog with a self-expanding, covered nitinol stent.

Della Maggiore AM, Steffey MA, Westropp JL.

Case Description—An 8-month-old castrated male mixed-breed dog was evaluated because of hematuria, stranguria, and dysuria of approximately 2 weeks' duration that developed immediately following elective castration. **Clinical Findings**—Results of physical examination, ultrasonography, retrograde double-contrast cystourethrography, and urethroscopy were consistent with a traumatic urethral stricture immediately proximal to the os penis resulting in a partial obstruction of urine outflow. Results of ultrasonographic examination of abdominal organs were considered normal. Digital radiography revealed no evidence of calculi. **Treatment and Outcome**—Balloon dilation of the urethral stricture was performed and was followed by 2 bougienage procedures during the subsequent 2 weeks when clinical signs returned. The owners declined scrotal urethrostomy, and a self-expanding, covered nitinol stent was placed approximately 3 weeks after the initial evaluation, resulting in amelioration of clinical signs. Results of follow-up urethroscopy and contrast cystourethrography 1 year after stent placement revealed a statically positioned, patent urethral stent, although a small number of polypoid mucosal structures were identified distal to the stent and 1 small structure consistent with tissue ingrowth into the stent was identified. **Clinical Relevance**—Placement of a covered nitinol stent resulted in long-term resolution of clinical signs associated with traumatic stricture of the penile urethra in this young dog. Because the os penis in dogs limits radial expansion of the urethra, its presence may limit the use of stents in this location.

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Safety of contrast-enhanced ultrasonography in dogs and cats: 488 cases (2002–2011)

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Objective—To determine the incidence of adverse events within 24 hours after contrast-enhanced ultrasonography (CEUS) in dogs and cats and compare the risk of death within 24 hours after imaging for animals that underwent ultrasonography with and without injection of a contrast agent.

Design—Retrospective case-control study.

Animals—750 animals (411 case dogs, 238 control dogs, 77 case cats, and 24 control cats).

Procedures—At 11 institutions, medical records were reviewed of dogs and cats that had CEUS performed (cases) as were medical records of dogs and cats with clinical signs similar to those of case animals that had ultrasonography performed without injection of a contrast agent (controls).

Information regarding signalment; preexisting disease; type, dose, and administration route of contrast agent used; immediate (within 1 hour after CEUS) and delayed (> 1 and ≤ 24 hours after CEUS) adverse events; and occurrence and cause of death (when available) was extracted from each medical record. Risk of death within 24 hours after ultrasonography was compared between case and control animals.

Results—Of the 411 case dogs, 3 had immediate adverse events (vomiting or syncope) and 1 had a delayed adverse event (vomiting). No adverse events were recorded for case cats. Twenty-three of 357 (6.4%) clinically ill case animals and 14 of 262 (5.3%) clinically ill control animals died within 24 hours after ultrasonography; risk of death did not differ between cases and controls.

Conclusions and Clinical Relevance—Results indicated that CEUS was safe in dogs and cats.

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Evaluation of the diagnostic value of serologic microagglutination testing and a polymerase chain reaction assay for diagnosis of acute leptospirosis in dogs in a referral center.

Fraune CK, Schweighauser A, Francey T.

Objective-To determine the diagnostic value of a serologic microagglutination test (MAT) and a PCR assay on urine and blood for the diagnosis of leptospirosis in dogs with acute kidney injury (AKI). **Design-**Cross-sectional study. **Animals-**76 dogs with AKI in a referral hospital (2008 to 2009). **Procedures-**Dogs' leptospirosis status was defined with a paired serologic MAT against a panel of 11 *Leptospira* serovars as leptospirosis-associated (n = 30) or nonleptospirosis-associated AKI (12). In 34 dogs, convalescent serologic testing was not possible, and leptospirosis status was classified as undetermined. The diagnostic value of the MAT single acute or convalescent blood sample was determined in dogs in which leptospirosis status could be classified. The diagnostic value of a commercially available genus-specific PCR assay was evaluated by use of 36 blood samples and 20 urine samples. **Results-**Serologic acute testing of an acute blood sample had a specificity of 100% (95% CI, 76% to 100%), a sensitivity of 50% (33% to 67%), and an accuracy of 64% (49% to 77%). Serologic testing of a convalescent blood sample had a specificity of 92% (65% to 99%), a sensitivity of 100% (87% to 100%), and an accuracy of 98% (88% to 100%). Results of the *Leptospira* PCR assay were negative for all samples from dogs for which leptospirosis status could be classified. **Conclusions and Clinical Relevance-**Serologic MAT results were highly accurate for diagnosis of leptospirosis in dogs, despite a low sensitivity for early diagnosis. In this referral setting of dogs pretreated with antimicrobials, testing of blood and urine samples with a commercially available genus-specific PCR assay did not improve early diagnosis.

J Am Vet Med Assoc. 2013 Jun 1;242(11):1523-7. doi: 10.2460/javma.242.11.1523.

Effect of body position on indirect measurement of systolic arterial blood pressure in dogs.

Rondeau DA, Mackalonis ME, Hess RS.

Objective-To determine whether a difference existed in Doppler ultrasonographic measurements of systolic arterial blood pressure (SAP) in sitting versus laterally recumbent dogs and to determine the degree of variability in measurements made in each position. **Design-**Diagnostic test evaluation. **Animals-**51 healthy or sick adult dogs, without recent sedation or anesthesia and with an SAP \leq 300 mm Hg. **Procedures-**In a crossover design, SAP was measured via Doppler ultrasonography when dogs were sitting (on hind limbs with nonmeasured forelimb bearing weight) and laterally recumbent, with the cuff position at the level of the right atrium for both positions. Seven measurements were obtained per position for each dog. **Results-**Mean \pm SD SAP was significantly higher in the sitting (172.1 ± 33.3 mm Hg) versus recumbent (147.0 ± 24.6 mm Hg) position, and this difference was evident for 44 of 51 (86%) dogs. The mean difference in measured SAP between the 2 positions was 25.1 ± 28.5 mm Hg. Blood pressure measurements had a significantly higher repeatability in the recumbent position than in the sitting position. **Conclusions and Clinical Relevance-**Blood pressure measurements in dogs were significantly affected by body position, and they were higher for most dogs when sitting rather than laterally recumbent. Blood pressure measurements in the laterally recumbent body position were less variable than in the sitting position.

J Am Vet Med Assoc. 2013 Jun 1;242(11):1534-8. doi: 10.2460/javma.242.11.1534.

Metronomic administration of chlorambucil for treatment of dogs with urinary bladder transitional cell carcinoma.

Schrempp DR, Childress MO, Stewart JC, Leach TN, Tan KM, Abbo AH, de Gortari AE, Bonney PL, Knapp DW.

Objective-To determine the antitumor effects and toxicoses of metronomic oral administration of a low dose of chlorambucil in dogs with transitional cell carcinoma (TCC). **Design-**Prospective clinical trial. **Animals-**31 client-owned dogs with TCC for which prior treatments had failed or owners had declined other treatments. **Procedures-**Chlorambucil (4 mg/m²), PO, q 24 h) was administered to dogs. Before and at scheduled times during treatment, evaluations of dogs included physical examination, CBC, serum biochemical analyses, urinalysis, thoracic and abdominal imaging including cystosonography for measurement of TCCs, and grading of toxicoses. **Results-**29 of 31 dogs had failed prior TCC treatment. Of the 30 dogs with available data, 1 (3%) had partial remission (\geq 50% reduction in tumor volume), 20 (67%) had stable disease ($<$ 50% change in tumor volume), and 9 (30%) had progressive disease (\geq 50% increase in tumor volume or development of additional tumors); 1 dog was lost to follow-up. The median progression-free interval (time from the start of chlorambucil treatment to the day progressive disease was detected) for the dogs was 119 days (range, 7 to 728 days). The median survival time of dogs from the time of the start of chlorambucil treatment was 221 days (range, 7 to 747 days). Few toxicoses were detected; chlorambucil administration was discontinued because of toxicoses in only 1 dog. **Conclusions and Clinical Relevance-**Metronomic administration of chlorambucil was well tolerated, and 70% of dogs had partial remission or stable disease. Metronomic administration of chlorambucil may be a treatment option for dogs with TCC.

J Am Vet Med Assoc. 2013 Jun 1;242(11):1556-63. doi: 10.2460/javma.242.11.1556.

Endoscopic-guided sclerotherapy for renal-sparing treatment of idiopathic renal hematuria in dogs: 6 cases (2010-2012).

Berent AC, Weisse CW, Branter E, Adams LG, Aarhus A, Smee N, Berg R, Bagley DH.

Objective-To describe the use of sclerotherapy for the renal-sparing treatment of idiopathic renal hematuria (IRH) in dogs and report clinical outcomes. **Design-**Retrospective case series. **Animals-**6 dogs (8 renal pelvises) with IRH. **Procedures-**Medical records of dogs that underwent sclerotherapy were reviewed. Each ureterovesicular junction was identified cystoscopically to determine the side of bleeding, and a retrograde ureteropyelogram was performed with endoscopic and fluoroscopic guidance. A ureteropelvic junction balloon was used for ureteral occlusion, and pelvis filling volumes were recorded. A povidone iodine mixture, followed by a sterile silver nitrate solution, was infused into the renal pelvis. A double-pigtail ureteral stent was placed after the procedure. Information on preprocedure and postprocedure biochemical changes, imaging parameters, and clinical outcomes was obtained. **Results-**6 dogs (5 males and 1 female) had sclerotherapy for unilateral (4) or bilateral (2) bleeding. Five were right-sided and 3 were left-sided. The median age and weight of dogs were 3 years and 42.4 kg (93.28 lb), respectively. Median procedure time was 150 minutes. One dog that did not have a ureteral stent placed following the procedure developed short-term signs of renal pain and pyelectasis. Cessation of macroscopic hematuria occurred in 4 of 6 dogs (median, 6 hours). Two additional dogs improved moderately. Median follow-up time was 8 months (range, 3.5 to 20.5 months). **Conclusions and Clinical Relevance-**Topical sclerotherapy for IRH was safe and effective. Local sclerotherapy for IRH in dogs could be considered a valuable and minimally invasive renal-sparing treatment over ureteronephrectomy.

J Am Vet Med Assoc. 2013 Aug 1;243(3):389-93. doi: 10.2460/javma.243.3.389.

Mineral composition of urinary calculi from potbellied pigs with urolithiasis: 50 cases (1982-2012).

Chigerwe M, Shiraki R, Olstad EC, Angelos JA, Ruby AL, Westropp JL.

Objective-To determine the mineral composition and anatomic location of urinary calculi and to investigate sex and reproductive status as predisposing factors for development of urolithiasis in potbellied pigs. **Design-**Retrospective case series **Samples-**Urinary calculi from 50 purebred and crossbred potbellied pigs. **Procedures-**Laboratory records for urinary calculi of potbellied pigs submitted to the University of California-Davis Stone Laboratory from 1982 through 2012 were

reviewed. Mineral composition of calculi was determined by polarized light microscopy, infrared spectroscopy, and, in some cases, x-ray diffractometry. Results-Of the 48 urinary calculi analyzed by infrared spectroscopy, 21 (44%) were composed primarily of amorphous magnesium calcium phosphate; another 9 (19%) were primarily composed of calcium phosphate in the form of apatite. Of 50 urinary calculi, 22 (44%), 14 (28%), 10 (20%), 3 (6%), and 1 (2%) were removed from the urinary bladder only, urethra, both urinary bladder and urethra, urine, and renal pelvis, respectively. Sex of 6 potbellied pigs was not recorded. For 44 urinary calculi, 41 (93%) were from males (11 sexually intact males and 30 castrated) and 3 (7%) were from females (2 sexually intact females and 1 spayed). Among males, 73% (30/41) of submissions were from castrated males. Conclusions and Clinical Relevance-In contrast to results from studies in commercial pigs, the most common composition of urinary calculi identified in purebred and crossbred potbellied pigs was amorphous magnesium calcium phosphate. Potential predisposing factors for urolithiasis in potbellied pigs may be similar to those for urolithiasis in commercial pigs. These include diet, urinary tract infections, and sex. Thus, prevention of urolithiasis should target these potential predisposing factors.

J Am Vet Med Assoc. 2013 Aug 15;243(4):512-9. doi: 10.2460/javma.243.4.512.

Initial treatment factors associated with feline urethral obstruction recurrence rate: 192 cases (2004-2010).

Hetrick PF, Davidow EB.

Objective-To evaluate the association of treatment factors during initial urinary catheterization (IUC) of cats with recurrence of urethral obstruction at 24 hours and 30 days after catheter removal. Design-Retrospective case series. Animals-192 male cats with urethral obstruction that were treated at an emergency and specialty center from 2004 through 2010. Procedures-Data were obtained from the cats' medical records. Duration of indwelling catheterization, catheterization with a 5F versus 3.5F urinary catheter, treatment with phenoxybenzamine versus prazosin, consistent administration of pain medication, and treatment with meloxicam or antimicrobials during IUC were reviewed for association with rate of recurrent urethral obstruction (rUO). Results-Overall rUO rates were 10.94% (21/192 cats) at 24 hours and 23.57% (37/157 cats) at 30 days after IUC. At 24 hours and 30 days after IUC, rUO developed in 10 of 140 (7.14%) and 20 of 110 (18.18%) prazosin-treated cats, respectively, compared with 10 of 46 (21.74%) and 16 of 41 (39.02%) phenoxybenzamine-treated cats, respectively. Reobstruction developed following use of a 5F or 3.5F urinary catheter in 11 of 58 (18.97%) and 7 of 105 (6.67%) cats, respectively, through 24 hours. There was no association between rUO and duration of urinary catheterization, administration of antimicrobials or meloxicam, or consistent administration of pain medication during IUC. Conclusions and Clinical Relevance-At 24 hours and 30 days after IUC, rUO rates in prazosin-treated cats were significantly lower than rates in phenoxybenzamine-treated cats. Reobstruction rate at 24 hours was significantly lower when a 3.5F versus 5F urinary catheter was used.

J Am Vet Med Assoc. 2013 Sep 1;243(5):658-66. doi: 10.2460/javma.243.5.658.

Evaluation of calcium, phosphorus, and selected trace mineral status in commercially available dry foods formulated for dogs.

Gagné JW, Wakshlag JJ, Center SA, Rutzke MA, Glahn RP.

Objective-To evaluate concentrations of calcium, phosphorus, zinc, iron, copper, manganese, and selenium in several commercially available dry dog foods and compare these with current Association of American Feed Control Officials (AAFCO) recommendations for maintenance of healthy dogs. Design-Descriptive study. Sample-45 over-the-counter dry foods formulated for maintenance of healthy dogs (ie, maintenance foods) and 5 therapeutic dry foods formulated for dogs with hepatic or renal disease. Procedures-Mineral concentrations were measured via inductively coupled plasma mass spectrometry or inductively coupled plasma atomic emission spectroscopy and compared with AAFCO-recommended minimum and maximum values. Results-

Most (39/45) maintenance foods were in compliance with AAFCO recommendations for all mineral concentrations evaluated. Calcium concentration was > 7.1 g/1,000 kcal of metabolizable energy (ME) in 4 of 45 maintenance foods, and phosphorus concentration was > 4.6 g/1,000 kcal ME in 3 of these; 2 maintenance foods contained < 34 mg of zinc/1,000 kcal ME. These values were not within AAFCO-recommended ranges. Calcium-to-phosphorus ratio in foods formulated for dogs with renal disease was above, and copper concentration in foods formulated for dogs with hepatic disease was below, recommended ranges for healthy dogs. Conclusions and Clinical Relevance-Calcium concentrations exceeded recommended limits in some maintenance foods labeled for all life stages, underscoring the need to feed diets appropriately formulated for specific life stages, particularly for large- and giant-breed puppies. Studies investigating the bioavailability of minerals are necessary before firm recommendations can be made.

J Am Vet Med Assoc. 2013 Sep 1;243(5):703-8. doi: 10.2460/javma.243.5.703.

Evaluation of costs and time required for laparoscopic-assisted versus open cystotomy for urinary cystolith removal in dogs: 43 cases (2009-2012).

Arulpragasam SP, Case JB, Ellison GW.

Objective-To compare required time and costs of surgery and hospitalization as well as prevalence of incomplete urinary cystolith removal associated with laparoscopic-assisted cystotomy versus open cystotomy in dogs. Design-Retrospective case series. Animals-20 dogs with urolithiasis treated by laparoscopic-assisted cystotomy and 23 dogs treated by open cystotomy. Procedures-Medical records were reviewed. Surgery cost, hospitalization cost, total cost, surgery time, days in hospital, incomplete cystolith removal, and number of doses of analgesic administered IV after surgery were compared between the laparoscopic-assisted cystotomy and open cystotomy groups. Results-Surgery cost and total cost were significantly higher in the laparoscopic-assisted cystotomy group. Hospitalization cost, days in hospital, and prevalence of incomplete cystolith removal did not differ significantly between groups. Number of doses of analgesic was significantly lower in the laparoscopic-assisted cystotomy group. Conclusions and Clinical Relevance-Laparoscopic-assisted cystotomy was more time-consuming and expensive but associated with fewer postoperative doses of injectable analgesics, compared with open cystotomy. Laparoscopic-assisted cystotomy is an acceptable, more expensive, and minimally invasive alternative to open cystotomy for the removal of urinary cystoliths in dogs.

J Am Vet Med Assoc. 2013 Sep 1;243(5):709-11. doi: 10.2460/javma.243.5.709.

Suspected carprofen toxicosis caused by coprophagia in a dog.

Hutchins RG, Messenger KM, Vaden SL.

Case Description-A 1-year-old spayed female mixed-breed dog was evaluated because of urinary incontinence, polyuria, polydipsia, and minimally concentrated urine. Clinical Findings-Markedly high circulating alanine transaminase activity, mildly high circulating alkaline phosphatase activity, and low urine specific gravity were detected for the dog. Results of ultrasonographic examination of the abdomen and cytologic examination of liver samples were unremarkable. Carprofen was detected in serum and plasma samples obtained from the dog. Exposure to carprofen was attributed to ingestion of feces of another dog in the household that was receiving the drug daily. Treatment and Outcome-Access to feces of other dogs in the household was prevented; no other treatment was initiated. Urinary incontinence, polyuria, and polydipsia resolved, and urine specific gravity increased within 7 days following discontinuation of consumption of feces. Alanine transaminase activity was substantially lower than the value determined during the initial examination, and alkaline phosphatase activity was within the reference range 5 weeks after discontinuation of consumption of feces by the dog. Clinical Relevance-Findings for the dog of this report suggested that carprofen toxicosis can be caused by consumption of feces of another dog receiving the drug. This cause of

adverse effects should be a differential diagnosis for dogs with clinical signs and clinicopathologic abnormalities consistent with carprofen toxicosis.

J Am Vet Med Assoc. 2013 Oct 1;243(7):1025-9. doi: 10.2460/javma.243.7.1025.

Incidence of sterile hemorrhagic cystitis in dogs receiving cyclophosphamide orally for three days without concurrent furosemide as part of a chemotherapeutic treatment for lymphoma: 57 cases (2007-2012).

Best MP, Fry DR.

Objective-To evaluate the incidence of sterile hemorrhagic cystitis (SHC) and other adverse effects in dogs following oral administration of the single-day, maximum-tolerated dose (MTD) of cyclophosphamide divided over 3 days as part of a multiagent chemotherapy protocol for treatment of lymphoma without concurrent administration of furosemide. **Design-**Retrospective case series. **Animals-**57 dogs. **Procedures-**Medical records were reviewed to identify dogs with lymphoma that underwent the described cyclophosphamide treatment. Information was obtained regarding signalment, lymphoma stage, concurrent diseases, cyclophosphamide doses administered, adverse effects (including SHC), remission rates, and outcomes. The incidence of SHC was compared with that of literature-derived historical control groups that received the MTD of cyclophosphamide as a single, 1-day dose with or without furosemide treatment. **Results-**None of the 57 dogs developed SHC during the study period. Forty-seven of 57 (82%) dogs had complete remission of lymphoma. Other adverse effects were uncommon and self-limiting; no dogs had myelosuppression, and only 5 had mild gastrointestinal effects. Incidence of SHC was significantly lower than that reported for historical control dogs that received cyclophosphamide as a single dose without furosemide (24/219) and was not significantly different from that for historical control dogs that received cyclophosphamide as a single dose with furosemide (2/139). **Conclusions and Clinical Relevance-**No dogs in this study had SHC following oral administration of the single-day MTD of cyclophosphamide divided over a 3-day period without furosemide administration. Further research is needed to confirm whether this method of cyclophosphamide administration is equivalent or superior to the current single-dose administration method.

J Am Vet Med Assoc. 2013 Oct 15;243(8):1140-6. doi: 10.2460/javma.243.8.1140.

Evaluation of risk factors associated with recurrent obstruction in cats treated medically for urethral obstruction.

Eisenberg BW, Waldrop JE, Allen SE, Brisson JO, Aloisio KM, Horton NJ.

To determine risk factors for short-term recurrent urethral obstruction in cats after treatment by means of urinary catheterization and hospitalization.

Prospective case series.

83 client-owned cats.

Physical examination findings, laboratory abnormalities, treatment decisions, and environmental changes were evaluated as risk factors for recurrent urethral obstruction in the 30 days following hospital discharge.

Of the 68 cats with completed follow-up surveys, 10 had an episode of recurrent urethral obstruction. Older cats were significantly more likely to have recurrent urethral obstruction. No specific laboratory abnormalities were associated with the risk of recurrent urethral obstruction. Longer duration of catheterization was significantly associated with a decreased risk of recurrent urethral obstruction. Duration of hospitalization and volume of IV fluids delivered were not significantly associated with recurrent urethral obstruction. Increasing water availability after discharge was associated with a decreased risk of recurrent urethral obstruction. There was no association between diet and recurrent urethral obstruction.

Results of this study suggested that longer duration of catheterization may be associated with a lower probability of short-term recurrent urethral obstruction in male cats. Older cats were at higher

risk for recurrent obstruction. Owners should be encouraged to increase water availability after discharge in cats treated for urethral obstruction to decrease the likelihood of recurrence.

J Am Vet Med Assoc. 2013 Oct 15;243(8):1147-53. doi: 10.2460/javma.243.8.1147.

Efficacy of two commercially available, low-magnesium, urine-acidifying dry foods for the dissolution of struvite uroliths in cats.

Lulich JP, Kruger JM, Macleay JM, Merrills JM, Paetau-Robinson I, Albasan H, Osborne CA.

To compare the efficacy and safety of using 2 commercially available, low-magnesium, urine-acidifying dry foods to dissolve sterile struvite uroliths in cats.

Prospective, multicenter, randomized clinical trial .

37 cats with presumed struvite uroliths.

Cats were randomly assigned to be fed 1 of 2 low-magnesium, urine-acidifying dry foods (food A or B). For each cat, physical examination, urinalysis, and abdominal radiography were performed weekly to assess treatment response.

32 cats had complete urolith dissolution. Mean \pm SD times for a 50% reduction in urolith size (0.69 ± 0.1 weeks) and complete urolith dissolution (13.0 ± 2.6 days) were significantly shorter for cats fed food A, compared with those (1.75 ± 0.27 weeks and 27.0 ± 2.6 days, respectively) for cats fed food B. At study termination, mean \pm SD urine pH (6.083 ± 0.105) for cats fed food A was lower than that (6.431 ± 0.109) for cats fed food B. In 5 cats, uroliths did not dissolve and were subsequently determined to be composed of 100% ammonium urate ($n = 4$) or 100% calcium oxalate (1). Adverse events associated with diet were not observed in any of the cats.

Results indicated that dietary dissolution is safe and effective for eradication of sterile struvite uroliths in cats. Cats fed food A had faster urolith dissolution than did cats fed food B. Lack of a reduction in urolith size at 2 weeks after diet initiation was indicative of misdiagnosis or noncompliance.

J Am Vet Med Assoc. 2013 Nov 1;243(9):1316-22. doi: 10.2460/javma.243.9.1316.

Clinicopathologic and atypical features of naturally occurring leptospirosis in dogs: 51 cases (2000-2010).

Tangeman LE, Littman MP.

Objective-To determine clinicopathologic features, percentage of atypical abnormalities, antibody titers against *Leptospira* serogroups, and importance of convalescent titers in dogs with leptospirosis. Design-Retrospective case series. Animals-51 dogs with leptospirosis. Procedures-Criteria for inclusion were at least 1 positive microscopic agglutination test (MAT) result (titer $\geq 1:1,600$ in vaccinated dogs, titer $\geq 1:800$ in nonvaccinated dogs, or ≥ 4 -fold increase in convalescent titer), a complete medical record (including leptospirosis vaccination date, reason for initial evaluation, and CBC, serum biochemical analysis, and urinalysis results), and clinical signs or laboratory findings consistent with leptospirosis. Results-Initial clinical signs, temporal distribution, and signalment were similar to previous reports. Convalescent MAT titers were necessary for diagnosis in 45% of cases. Atypical abnormalities included radiographic evidence of pulmonary disease in 10 of 23 dogs and hepatic involvement alone in 7 of 51 dogs. Other abnormalities included proteinuria in 34 of 51 dogs, thrombocytopenia in 26 of 51, coagulopathy in 7 of 24 dogs, hypoalbuminemia in 14 of 51 dogs, and glucosuria in 9 of 51 dogs. Significant associations were found between antibodies against serogroup Grippotyphosa and renal involvement and serogroup Icterohaemorrhagiae and hepatic involvement. Conclusions and Clinical Relevance-Increased awareness of atypical abnormalities may decrease misdiagnosis of leptospirosis in dogs. Results of concurrent infectious disease testing should be interpreted with caution; misdiagnosis of leptospirosis could pose a public health risk. Convalescent titers were necessary to identify infection when acute testing results were negative. Further research is needed to determine the true associations between antibodies against identified serogroups and clinical features.

J Am Vet Med Assoc. 2013 Nov 15;243(10):1442-7. doi: 10.2460/javma.243.10.1442.

Effects of urinary bladder retroflexion and surgical technique on postoperative complication rates and long-term outcome in dogs with perineal hernia: 41 cases (2002-2009).

Grand JG, Bureau S, Monnet E.

Objective-To evaluate the effects of urinary bladder retroflexion (UBR) and surgical technique on postoperative complication rates and long-term outcome in dogs with perineal hernia. **Design-**Retrospective case series. **Animals-**41 client-owned dogs with perineal hernia that underwent surgery between November 2002 and November 2009. **Procedures-**Medical records were reviewed for information on dog signalment, history, physical examination findings, ultrasonographic findings, surgical techniques, intraoperative complications, duration of hospital stay, postoperative complications, and long-term outcome. **Results-**31 dogs had no UBR, and 10 dogs had UBR. Internal obturator muscle transposition (IOMT) was performed in 20 dogs, and a cystopexy or colopexy was performed before the IOMT (LapIOMT) in 21. Postoperative complications included tenesmus (n = 8) and urinary incontinence (1). Rates of postoperative complications were not significantly different between the no-UBR and UBR groups or between the IOMT and LapIOMT groups. Thirty-two dogs were free of clinical signs at the time of the study. The median disease-free interval did not differ significantly between dogs in the no-UBR and UBR groups, but it was significantly lower in the LapIOMT group than in the IOMT group. None of the 7 dogs with UBR that were treated without cystopexy developed recurrence of UBR. **Conclusions and Clinical Relevance-**UBR was not associated with an increased rate of postoperative complications relative to no UBR and had no effect on the long-term outcome in dogs with perineal hernia. The use of IOMT alone may be recommended for clinical use because LapIOMT offered no clear advantage.

J Am Vet Med Assoc. 2013 Dec 1;243(11):1580-5. doi: 10.2460/javma.243.11.1580.

Retroperitoneal fibrosis in feline renal transplant recipients: 29 cases (1998-2011).

Wormser C, Phillips H, Aronson LR.

OBJECTIVE: To evaluate features, treatment, and prognosis associated with retroperitoneal fibrosis that developed after renal transplantation in cats.

DESIGN: Retrospective case series.

ANIMALS: 29 cats.

PROCEDURES: Medical records of cats that developed retroperitoneal fibrosis after renal transplantation at the College of Veterinary Medicine, University of Pennsylvania, between 1998 and 2011 were reviewed for signalment, date of transplantation, age, results of urine and blood analyses, blood pressure at the time of diagnosis, infectious disease and medication anamneses, anesthetic protocols, and intraoperative complications.

RESULTS: Of 138 transplant recipients, 29 (21%) developed clinically important retroperitoneal fibrosis. Nineteen (66%) were male, and median age at the time of renal transplantation was 8 years (range, 4 to 13 years). Median number of days after transplantation to diagnosis of retroperitoneal fibrosis was 62 (range, 4 to 730 days; mean, 125 days). The most common clinical signs were lethargy and anorexia. All affected cats were azotemic (BUN concentration > 32 mg/dL; creatinine concentration > 2.0 mg/dL) and anemic (PCV < 35%) at the time of retroperitoneal fibrosis diagnosis, although cats were nonazotemic at the time of discharge following transplantation, and anemia was less pronounced. Twenty-five cats successfully underwent surgical ureterolysis in which scar tissue was dissected away from the allograft ureter to relieve extraluminal compression. Retroperitoneal fibrosis recurred in 6 (22%) cats a median of 180 days (range, 8 to 343 days) following the original diagnosis and was treated successfully by repeated ureterolysis.

CONCLUSIONS AND CLINICAL RELEVANCE: Retroperitoneal fibrosis occurred in a substantial percentage of feline renal transplant recipients and should be considered a differential diagnosis in

any feline renal transplant recipient with clinicopathologic findings, imaging abnormalities, or signs suggestive of obstructive uropathy.

J Am Vet Med Assoc. 2013 Dec 15;243(12):1719-25. doi: 10.2460/javma.243.12.1719.

Diagnostic accuracy of a point-of-care urine bacteriologic culture test in dogs.

Olin SJ, Bartges JW, Jones RD, Bemis DA.

OBJECTIVE: To determine diagnostic accuracy of a compartmented bacteriologic culture and antimicrobial susceptibility testing plate (CCSP) for detection of bacterial urinary tract infection (UTI) in dogs and antimicrobial susceptibility testing of bacterial isolates.

DESIGN: Evaluation study.

SAMPLE: 62 frozen, previously characterized bacterial isolates from canine urine cultures and 147 canine urine samples.

PROCEDURES: The study was conducted in 2 phases: preliminary assay validation (phase 1) and diagnostic validation (phase 2). For phase 1, the frozen bacterial isolates were revitalized and tested with the CCSP and with standard aerobic microbiological culture (SAMC). For phase 2, the urine samples were tested with the CCSP and SAMC in parallel.

RESULTS: For phase 1, after 24 hours of culture, 46 of 62 (74%) bacterial isolates had growth on the CCSP and all (100%) had growth in SAMC. For bacterial isolates with growth, the CCSP allowed correct identification of 45 of 46 (98%) isolates. Isolates yielding no growth on the CCSP were gram-positive cocci (*Staphylococcus* spp [n = 7] and *Enterococcus* spp [9]). In phase 2, the overall diagnostic accuracy of the CCSP, compared with SAMC, was 94% (sensitivity, 81%; specificity, 99%). The positive predictive value was 98% and negative predictive value was 92%. Susceptibility results for enrofloxacin and trimethoprim-sulfamethoxazole as determined with the CCSP had greatest concordance with those determined by SAMC (71% and 96%, respectively), compared with other antimicrobial susceptibilities.

CONCLUSIONS AND CLINICAL RELEVANCE: Use of the CCSP led to accurate exclusion of UTI in dogs without a UTI but was less reliable for diagnosis of UTI, particularly infections caused by gram-positive cocci. Standard aerobic microbiological culture remains the gold standard for detection of UTI in dogs.

Journal of Veterinary Diagnostic Investigation

J Vet Diagn Invest. 2013 Mar;25(2):219-25. doi: 10.1177/1040638713477644. Epub 2013 Feb 15.

Preliminary evaluation of a quantitative ethylene glycol test in dogs and cats.

Scherk JR, Brainard BM, Collicutt NB, Bush SE, Almy FS, Koenig A.

Ethylene glycol (EG) toxicity is commonly encountered in dogs and cats. The purpose of the current study was to determine if the Catachem test kit (Catachem Inc., Oxford, Connecticut) could precisely and accurately detect the presence of EG added to serum and plasma from 6 dogs and 4 cats. Serum and plasma samples were spiked at various concentrations of EG (0, 20, 60, and 100 mg/dl) and analyzed using the Catachem kit. Twenty randomly selected samples were also submitted for gas chromatography-mass spectroscopy (GC-MS) analysis of EG concentration, which was considered the gold standard. Inter- and intra-assay coefficients of variation (CVs) were calculated. Bland-Altman analysis was performed to compare the Catachem results to the GC-MS analyses. Analysis of serum samples showed a bias of 8.48 mg/dl (95% limits of agreement: 17.8 to -0.9 mg/dl) while spiked plasma samples had a bias of 7.32 mg/dl (18.1 to -3.5 mg/dl). Intra-assay CV was 0.7%. Interassay CV ranged from 1.2% to 2.0%. For all samples, the Catachem kit read higher than GC-MS values and slightly overestimated in vitro concentrations. The Catachem test kit is an accurate quantitative test for EG in dogs and cats that may aid in timely recognition of EG exposure. Because of the positive bias in all samples, some pets may receive treatment unnecessarily. However, animals with blood EG concentrations at or above the published lethal serum or plasma concentration will be readily identified so that treatment may be initiated.

Journal of Veterinary Emergency and Critical Care

J Vet Emerg Crit Care (San Antonio). 2013 Jan;23(1):23-8. doi: 10.1111/vec.12012. Epub 2013 Jan 14.

Comparison of routine urinalysis and urine Gram stain for detection of bacteriuria in dogs.

Way LI, Sullivan LA, Johnson V, Morley PS.

OBJECTIVE: To determine the utility of performing urine Gram stain for detection of bacteriuria compared to routine urine sediment examination and bacterial aerobic urine culture.

DESIGN: Prospective, observational study.

SETTING: University teaching hospital.

ANIMALS: Urine samples acquired via cystocentesis through convenience sampling from 103 dogs presenting to a tertiary referral institution.

INTERVENTIONS: All samples underwent routine urinalysis, including sediment examination, as well as urine Gram stain and quantitative bacterial aerobic urine culture.

MEASUREMENTS AND MAIN RESULTS: The urine Gram stain demonstrated improved sensitivity (96% versus 76%), specificity (100% versus 77%), positive predictive value (100% versus 83%), and negative predictive value (93% versus 69%) when identifying bacteriuria, compared to routine urine sediment examination.

CONCLUSIONS: The urine Gram stain is highly sensitive and specific when detecting the presence of bacteria in canine urine samples. Gram staining should be considered when bacteriuria is highly suspected and requires rapid identification while bacterial culture is pending.

J Vet Emerg Crit Care (San Antonio). 2013 Jan;23(1):37-40. doi: 10.1111/vec.12011. Epub 2013 Jan 11.

Measuring the level of agreement between directly measured blood pressure and pressure readings obtained with a veterinary-specific oscillometric unit in anesthetized dogs.

Acierno MJ, Fauth E, Mitchell MA, da Cunha A.

OBJECTIVE: To determine if an oscillometric device optimized for use in dogs produces systolic, diastolic, and mean arterial pressures (MAPs) measurements that are in good agreement with directly obtained pressures

DESIGN: Prospective study.

SETTING: University teaching hospital.

ANIMALS: Twenty-one dogs under general anesthesia for surgical procedures.

INTERVENTIONS: A 20-Ga catheter was placed into the dorsal pedal artery and systolic, diastolic, and MAPs were directly measured using a validated blood pressure measurement system. Indirect blood pressure measurements were collected using a widely available veterinary oscillometric blood pressure unit. Results obtained by the 2 methods were then compared.

MEASUREMENTS AND MAIN RESULTS: Agreement between the directly and indirectly measured pressure demonstrated a bias of 9.9 mm Hg and limits of agreement (LOA) 73.7 to -53.9, a bias of -8.9 mm Hg and LOA 23.3 to -41.2, and a bias of -6.3 mm Hg and LOA 28.2 to -40.8 for systolic, diastolic, and MAP, respectively.

CONCLUSIONS: There was poor agreement between the direct and indirect measured blood pressure measurement systems. Therefore, use of the oscillometric blood pressure unit evaluated in this study for monitoring patients under anesthesia cannot be recommended at this time.

J Vet Emerg Crit Care (San Antonio). 2013 Jan;23(1):53-7. doi: 10.1111/vec.12015. Epub 2013 Jan 14.

Iatrogenic water intoxication in two cats.

Lee JY, Rozanski E, Anastasio M, Parker VJ, Delaforcade A, Anastasio J.

OBJECTIVE: To describe 2 cats that developed acute iatrogenic water intoxication, one associated with a continuous infusion of water provided via an esophagostomy tube and one following SC administration of 5% dextrose in water (D5W).

CASE OR SERIES SUMMARY: A 10-year-old cat with squamous cell carcinoma was hospitalized for treatment of dehydration. Rehydration was provided with water via an esophagostomy tube at 5.7 mL/kg/h. After 30 hours of therapy, the cat was found dull and weak. Serum sodium was markedly decreased at 116 mmol/L (116 mEq/L). Supplemental water was stopped, and IV furosemide and mannitol were provided to eliminate free water. Hypertonic saline (1.5%) was administered IV to rapidly restore the sodium concentration. The serum sodium concentration corrected over 17 hours, and the cat was discharged without neurological complications. The second cat had previously received 300 mL D5W subcutaneously and presented 8 hours later with lethargy and paresis with a serum sodium level of 126 mmol/L (126 mEq/L). Intravenous fluid therapy was provided using 0.9% NaCl. Over the following day, the cat's mentation and paresis resolved and sodium concentrations normalized.

NEW OR UNIQUE INFORMATION PROVIDED: These 2 cases describe a presumed uncommon iatrogenic complication of severe hyponatremia due to water provided either via an esophagostomy tube or subcutaneously. While oral rehydration is often considered ideal, it may result in signs of water intoxication if not carefully monitored; additionally, D5W is never considered an acceptable fluid choice as a SC bolus. If promptly recognized, acute hyponatremia may be corrected rapidly with no lasting consequences.

J Vet Emerg Crit Care (San Antonio). 2013 Jan;23(1):63-7. doi: 10.1111/j.1476-4431.2012.00825.x.

Falsely increased plasma lactate concentration due to ethylene glycol poisoning in 2 dogs.

Hopper K, Epstein SE.

OBJECTIVE: To describe false increases in plasma lactate concentration measured on point-of-care analyzers in 2 dogs with ethylene glycol (EG) intoxication.

CASE SUMMARY: Two dogs presenting with EG intoxication had extreme increases of plasma lactate concentrations recorded on a point-of-care machine. Laboratory analysis by spectrophotometry of lactate concentration determined these lactate measurements to be erroneous. False increases in plasma lactate concentration were demonstrated in 2 out of 3 point-of-care machines tested.

NEW OR UNIQUE INFORMATION PROVIDED: Glycolate, a toxic metabolite of EG, can interfere with the measurement of plasma lactate by some analyzers and this may delay the correct diagnosis of EG toxicity if not recognized.

J Vet Emerg Crit Care (San Antonio). 2013 Mar;23(2):111-4. doi: 10.1111/vec.12039.

Veterinary nephrology - Yesterday and today.

Dibartola SP.

J Vet Emerg Crit Care (San Antonio). 2013 Mar;23(2):115-21. doi: 10.1111/vec.12030. Epub 2013 Mar 6.

Renal pathophysiology: lessons learned from the canine remnant kidney model.

Brown SA.

OBJECTIVE: To review the pathophysiology of chronic kidney disease (CKD) in dogs and the contributions of the canine remnant kidney model to our understanding of this disease.

DATA SOURCES: Original studies in the human and veterinary medical fields.

DATA SYNTHESIS: Three of the fundamental principles of modern nephrology—the intact nephron hypothesis, the trade-off hypothesis, and the hyperfiltration theory were developed directly as a result of studies of the remnant kidney model. Most of the pivotal early studies were conducted in dogs. As a result, our understanding of CKD, and of the renal and systemic adaptations to CKD, is largely based on studies of this model.

CONCLUSIONS: Studies of the remnant kidney model have advanced our understanding of the pathophysiology of CKD. Nearly every therapeutic intervention used in CKD, by veterinarians and physicians alike, has its basis in studies of the remnant kidney model or in knowledge that was derived from studies of this model. A great debt is owed to the canine participants in these studies and to a small number of key scientists who conducted this important and insightful research.

J Vet Emerg Crit Care (San Antonio). 2013 Mar;23(2):122-33. doi: 10.1111/vec.12032. Epub 2013 Mar 6.

The role of phosphorus in the pathophysiology of chronic kidney disease.

Geddes RF, Finch NC, Syme HM, Elliott J.

OBJECTIVE: To review the human and veterinary literature on the role of phosphorus in the pathophysiology of chronic kidney disease (CKD) and to explore why control of plasma phosphorus concentration is an important goal in the management of patients with this disease.

DATA SOURCES: Human and veterinary studies, reviews, clinical reports, textbooks, and recent research findings focused on phosphate homeostasis and CKD patient management.

HUMAN DATA SYNTHESIS: Recent studies using rodent models and human patients with CKD have focused on trying to elucidate the role of the phosphatonins, predominantly fibroblast growth factor-23, in phosphate homeostasis and the pathophysiology of secondary renal hyperparathyroidism (SRHP). Fibroblast growth factor-23 is now considered to be a key regulator of plasma phosphorus concentration in people but has only recently been investigated in companion animal species.

VETERINARY DATA SYNTHESIS: Cross-sectional studies of naturally occurring CKD in dogs and cats have shown hyperphosphatemia and SRHP to be highly prevalent and associated with increased morbidity and mortality in these patients. Experimental studies of surgically induced renal impairment in the dog and cat, and cases of naturally occurring CKD have emphasized the ability of renal care diets to modify plasma phosphorus and parathyroid hormone concentrations. Evidence from these studies indicates that maintaining plasma phosphorus concentrations to within the International Renal Interest Society targets for CKD patients improves survival time and reduces clinical manifestations of hyperphosphatemia and SRHP.

CONCLUSIONS: The maintenance of plasma phosphorus concentrations in to within the International Renal Interest Society targets is recommended in management of CKD patients. The discovery of the phosphatonins has improved understanding of the mechanisms involved in phosphorus homeostasis and SRHP and may lead to improved ability to monitor and manage these patients.

J Vet Emerg Crit Care (San Antonio). 2013 Mar;23(2):134-62. doi: 10.1111/vec.12036.

Calcitriol, calcidiol, parathyroid hormone, and fibroblast growth factor-23 interactions in chronic kidney disease.

de Brito Galvao JF, Nagode LA, Schenck PA, Chew DJ.

OBJECTIVE: To review the inter-relationships between calcium, phosphorus, parathyroid hormone (PTH), parent and activated vitamin D metabolites (vitamin D, 25(OH)-vitamin D, 1,25(OH)₂-vitamin D, 24,25(OH)₂-vitamin D), and fibroblast growth factor-23 (FGF-23) during chronic kidney disease (CKD) in dogs and cats.

DATA SOURCES: Human and veterinary literature.

HUMAN DATA SYNTHESIS: Beneficial effects of calcitriol treatment during CKD have traditionally been attributed to regulation of PTH but new perspectives emphasize direct renoprotective actions independent of PTH and calcium. It is now apparent that calcitriol exerts an important effect on renal

tubular reclamation of filtered 25(OH)-vitamin D, which may be important in maintaining adequate circulating 25(OH)-vitamin D. This in turn may be vital for important pleiotropic actions in peripheral tissues through autocrine/paracrine mechanisms that impact the health of those local tissues.

VETERINARY DATA SYNTHESIS: Limited information is available reporting the benefit of calcitriol treatment in dogs and cats with CKD.

CONCLUSIONS: A survival benefit has been shown for dogs with CKD treated with calcitriol compared to placebo. The concentrations of circulating 25(OH)-vitamin D have recently been shown to be low in people and dogs with CKD and are related to survival in people with CKD. Combination therapy for people with CKD using both parental and activated vitamin D compounds is common in human nephrology and there is a developing emphasis using combination treatment with activated vitamin D and renin-angiotensin-aldosterone-system (RAAS) inhibitors.

J Vet Emerg Crit Care (San Antonio). 2013 Mar;23(2):163-73. doi: 10.1111/vec.12026. Epub 2013 Mar 5.

Lyme nephritis.

Littman MP.

OBJECTIVE: To review what is known and highlight knowledge gaps regarding Lyme nephritis (LN).

DATA SOURCES: Publications identified via PubMed using the keywords "Borrelia burgdorferi," "Borreliosis," "glomerulonephritis," "protein-losing nephropathy," "autoimmunity," and "retriever," and as generated by investigators working in the fields of Borreliosis and immune-mediated glomerulonephritis.

HUMAN DATA SYNTHESIS: Postborrelial immune-mediated glomerulonephritis was described recently in 6 people; 3 responded to antimicrobials/steroids, 1 to antimicrobials/angiotensin-converting enzyme inhibitor/warfarin, 1 required hemodialysis but became hemodialysis independent after 5 months and treatment with antimicrobials, steroids, plasmapheresis, immunoglobulin, and 1 did not respond to steroids and angiotensin-converting enzyme inhibitor and still requires hemodialysis.

VETERINARY DATA SYNTHESIS: Lyme nephritis is seen in <1-2% of Lyme seropositive dogs, with an average onset at 5-6 years. Labrador and Golden Retrievers are predisposed to this condition. Prior or concurrent lameness is described in 9-28% cases. Historical presentations include acute progressive protein-losing nephropathy with membranoproliferative glomerulonephritis, tubular necrosis/regeneration, and interstitial nephritis, but possibly milder forms exist. Complications include thromboembolic events, hypertension, effusive disease, and oliguric/anuric renal failure. Diagnostic tests help stage disease and rule out other causes. Renal biopsy is advocated early, when intervention may help, and to prove if immune-complex disease exists. Treatment includes standard therapy for protein-losing nephropathy, long-term antimicrobials, and perhaps immunosuppressive therapy.

CONCLUSIONS: There is no experimental model of LN to study predisposing factors, pathogenesis, onset, progression, treatment, or prevention. There are no predictive tests to identify the few individuals at highest risk, therefore all seropositive dogs should be screened and monitored for proteinuria. Lyme nephritis mimics other forms of protein-losing nephropathy and sometimes Leptospirosis. Renal biopsy helps show if immune-complex disease exists, but may not prove LN specifically. More studies are warranted on dogs with Lyme-specific immune-complex deposition to evaluate risk factors, understand pathogenesis, variability of expression, and to validate treatment and prevention protocols.

J Vet Emerg Crit Care (San Antonio). 2013 Mar;23(2):174-83. doi: 10.1111/vec.12027. Epub 2013 Mar 5.

Familial renal disease in soft-coated wheaten terriers.

Vaden SL, Littman MP, Cianciolo RE.

OBJECTIVE: To review what is known about the familial renal diseases in soft-coated wheaten terriers (SCWT), provide an update in developments in this field including the relationship with protein-losing nephropathy (PLN) and the potential association with protein-losing enteropathy (PLE).

DATA SOURCES: Information was derived from studies of dogs maintained in the North Carolina State University colony, information contained within an open registry of affected dogs, and data gathered from the general population of wheaten terriers at risk as well as studies performed on banked DNA samples from affected SCWT in the general population and normal geriatric dogs seen at the University of Pennsylvania (PennVet).

HUMAN DATA SYNTHESIS: A two-hit pathogenesis has been proposed in some types of human focal segmental glomerulosclerosis, specifically the subset of cases that are associated with a podocytopathy. At risk podocytes may be predisposed to injury by disease processes that would be reversible in other patients.

VETERINARY DATA SYNTHESIS: Mutations were found in association with PLN in SCWT, indicating a podocytopathy that causes a change in glomerular permselectivity. This podocytopathy leads to the development of lesions resembling focal segmental glomerulosclerosis. There is also strong evidence supporting a high prevalence of food hypersensitivity reactions in SCWT, although it is unclear if these reactions have a primary or secondary role in the development of PLE. There are also suggestions of immunodysregulation in affected SCWT.

CONCLUSIONS: PLN in SCWT is due to a podocytopathy. The cause of PLE has not been identified; however, it is possible that PLE develops from a functional-structural abnormality in the intestines and food allergies develop as secondary phenomena. It is also possible that inflammatory events that are the result of either immunodysregulation or food allergies might lead to the development of PLE. In either case, PLE most likely exacerbates PLN in affected SCWT.

J Vet Emerg Crit Care (San Antonio). 2013 Mar;23(2):184-93. doi: 10.1111/vec.12031. Epub 2013 Mar 6.

Kidney diseases caused by glomerular basement membrane type IV collagen defects in dogs.

Lees GE.

OBJECTIVE: To review the pathogenesis, as well as the clinical and pathologic features of canine glomerular diseases caused by genetic type IV collagen defects.

DATA SOURCES: Original studies and review articles from human and veterinary medical fields.

HUMAN DATA SYNTHESIS: Presence in glomerular basement membranes (GBM) of a network composed of $\alpha 3.\alpha 4.\alpha 5$ heterotrimers of type IV collagen is required to maintain structure and function of glomerular capillary walls.

VETERINARY DATA SYNTHESIS: Hereditary nephropathy (HN) is the most commonly used name for kidney diseases that occur in dogs due to genetic type IV collagen abnormalities. To date, 4 different collagen IV gene mutations have been identified in dogs with HN; 2 are COL4A5 mutations that cause X-linked HN (XL-HN), and 2 are COL4A4 mutations that cause autosomal recessive HN (AR-HN). Affected males with XL-HN and affected males and females with AR-HN develop juvenile-onset kidney disease manifested by proteinuria typically starting at 3-6 months of age and followed by progressive kidney disease leading to terminal failure usually at 6-24 months of age. Carrier female dogs with XL-HN also develop proteinuria starting at 3-6 months of age, but progressive disease causing kidney failure is uncommon until they are >5 years old. The distinctive pathologic lesions of HN are extensive multilaminar splitting and thickening of the GBM, as demonstrated by electron microscopy, and abnormal type IV collagen α -chain content of basement membranes, as demonstrated by immunolabeling. Identification of the underlying gene mutations has permitted genetic testing and selective breeding practices that currently are minimizing HN in breeds known to be at risk.

CONCLUSIONS: Canine HN is a rare disease that should be considered whenever a dog exhibits a juvenile-onset kidney disease characterized partly by proteinuria, but highly specialized methods are required to pursue a definitive diagnosis.

J Vet Emerg Crit Care (San Antonio). 2013 Mar;23(2):194-204. doi: 10.1111/vec.12028. Epub 2013 Mar 20.

Extracorporeal renal replacement therapy and blood purification in critical care.

Cowgill LD, Guillaumin J.

OBJECTIVE: To review indications methods of renal replacement therapies (RRT) and practical considerations for the creation of a RRT program.

DATA SOURCES: Current human and veterinary literature review with a focus on advanced renal physiology and clinical experience in RRT and acute/chronic kidney diseases.

DATA SYNTHESIS: Renal replacement therapies encompass intermittent hemodialysis, continuous renal replacement therapy as well as some "hybrid" techniques. Each method of RRT has practical and theoretical advantages but currently there is no evidence that one technique is superior to the other.

CONCLUSIONS: RRT is a valuable therapeutic tool for treatment of acute kidney injury and chronic kidney disease. The implementation of an RRT program needs to take into consideration multiple parameters beyond the choice of an RRT platform.

J Vet Emerg Crit Care (San Antonio). 2013 Mar;23(2):205-15. doi: 10.1111/vec.12034. Epub 2013 Mar 7.

Evidence-based step-wise approach to managing chronic kidney disease in dogs and cats.

Polzin DJ.

OBJECTIVE: To provide a framework for successfully managing chronic kidney disease (CKD) over an extended period of time with the goal of optimizing clinical outcomes by fostering a veterinarian-client relationship that facilitates successful application of evidence-based treatment.

ETIOLOGY: Ultimately, CKD results from loss of functional nephrons; however, the specific disease process responsible for this loss usually cannot be determined due to development of chronic changes (eg, fibrosis) and compensatory adaptations that have occurred in the kidneys of patients with CKD. Earlier diagnosis may foster a better understanding of the etiologies of CKD.

DIAGNOSIS: Diagnosis of CKD is based on establishing loss of kidney function(s) due to primary kidney disease that have been present for an extended time (typically 3 months or longer).

THERAPY: The goals of therapy are to: (1) slow progressive loss of kidney function, (2) ameliorate clinical and biochemical consequences of CKD, and (3) maintain adequate nutrition. These goals are achieved by: (1) managing adaptive processes that promote progression of CKD, (2) controlling intake of water, nutrients, minerals and electrolytes, and (3) correcting hormonal deficiencies.

PROGNOSIS: The short-term prognosis for dogs with CKD varies from good to poor, while the long-term prognosis for dogs with CKD is generally guarded to poor depending on the International Renal Interest Society (IRIS) CKD stage of the patient. Both short-term and long-term prognosis for cats with CKD may vary from good to poor depending on the IRIS CKD stage. However, prognosis is more variable and unpredictable in cats.

J Vet Emerg Crit Care (San Antonio). 2013 Mar;23(2):216-29. doi: 10.1111/vec.12033. Epub 2013 Mar 7.

A clinical review of pathophysiology, diagnosis, and treatment of uroabdomen in the dog and cat.

Stafford JR, Bartges JW.

OBJECTIVE: To review current literature regarding uroabdomen in dogs and cats with respect to etiology, diagnostic approach, medical and surgical treatment, and prognosis.

ETIOLOGY: Uroabdomen in dogs and cats is most often associated with vehicular or blunt trauma.

This condition may also result from urinary tract obstruction, traumatic bladder expression or catheterization, neoplasia, and postoperative leakage following abdominal or urogenital surgery.

DIAGNOSIS: Disruption to the urinary tract should be considered when a patient is diagnosed with azotemia, hyperkalemia, and abdominal effusion. By comparing the creatinine concentration of the abdominal fluid to the serum or plasma creatinine concentration, a diagnosis of uroabdomen can be made if the creatinine ratio is $\geq 2:1$. In most patients imaging studies with contrast are necessary to identify the exact source of urine leakage and to determine therapeutic options.

THERAPY: Uroabdomen is a medical emergency, not a surgical emergency. Acute management involves stabilization of the patient with IV fluid therapy and treatment of hyperkalemia. Urinary diversion and, in some cases, peritoneal dialysis are necessary to stabilize the patient until life-threatening conditions such as hyperkalemia or concomitant injuries such as pulmonary contusions resolve. Once the patient is stable for anesthesia, surgical repair, if indicated, may be performed.

PROGNOSIS: The prognosis of patients with uroabdomen depends on the extent of urinary and nonurinary injuries as well as the development of complications. Potential complications include dehiscence or urine leakage following surgical repair of the urinary tract, urosepsis, unresolving azotemia secondary to renal damage or underlying renal insufficiency, or stricture formation in the urinary tract.

J Vet Emerg Crit Care (San Antonio). 2013 Mar;23(2):230-40. doi: 10.1111/vec.12035.

Current techniques in peritoneal dialysis.

Ross LA, Labato MA.

OBJECTIVE: To provide a current overview of the technique of peritoneal dialysis in dogs and cats.

CLINICAL IMPLICATION: Peritoneal dialysis is the process by which water and solutes move between blood in the peritoneal capillaries and fluid (dialysate) instilled into the peritoneal cavity, across the semipermeable membrane of the peritoneum. The primary indication for peritoneal dialysis (PD) in animals is for treatment of renal failure to correct water, solute, and acid-base abnormalities and to remove uremic toxins.

SUMMARY: Peritoneal dialysis is a modality of renal replacement therapy commonly used in human medicine for the treatment of chronic kidney disease and end-stage kidney failure. Peritoneal dialysis utilizes the peritoneum as a membrane across which fluids and uremic solutes are exchanged.

Dialysate is instilled into the peritoneal cavity and, through the process of diffusion and osmosis, water, toxins, electrolytes, and other small molecules are allowed to equilibrate.

J Vet Emerg Crit Care (San Antonio). 2013 May;23(3):335-9. doi: 10.1111/vec.12014. Epub 2013 Jan 30.

Presumptive central nervous system cuterebriasis and concurrent protein-losing nephropathy in a dog.

Thawley VJ, Suran JN, Boller EM.

OBJECTIVE: To describe the clinical course and successful management of a dog suspected to have central nervous system (CNS) Cuterebra larval migration and concurrent protein-losing nephropathy (PLN).

CASE SUMMARY: A 1-year-old castrated male mixed breed dog was diagnosed with presumptive CNS cuterebriasis based on history, progressively deteriorating mentation, seizures, and magnetic resonance images showing a tubular lesion consistent with a migrating Cuterebra tract. Additionally, serum biochemistry and urine analyses revealed the development of a severe PLN. Surgical removal of the Cuterebra was attempted unsuccessfully, and subsequently, the dog was treated with ivermectin, antihistamines, anticonvulsants, and a tapering dose of glucocorticoids. Over several weeks the dog's neurologic status improved and the PLN resolved completely.

NEW OR UNIQUE INFORMATION PROVIDED: This case describes successful management of presumptive CNS cuterebriasis in a dog. It is also, to our knowledge, the first report of PLN associated with cuterebriasis in the veterinary literature.

Journal of Veterinary Internal Medicine

J Vet Intern Med. 2013 Jan-Feb;27(1):17-21. doi: 10.1111/jvim.12017. Epub 2012 Nov 27.

A single-blood-sample method using inulin for estimating feline glomerular filtration rate.

Katayama M, Saito J, Katayama R, Yamagishi N, Murayama I, Miyano A, Furuhashi K.

BACKGROUND: Application of a multisample method using inulin to estimate glomerular filtration rate (GFR) in cats is cumbersome.

OBJECTIVES: To establish a simplified procedure to estimate GFR in cats, a single-blood-sample method using inulin was compared with a conventional 3-sample method.

ANIMALS: Nine cats including 6 clinically healthy cats and 3 cats with spontaneous chronic kidney disease.

METHODS: Retrospective study. Inulin was administered as an intravenous bolus at 50 mg/kg to cats, and blood was collected at 60, 90, and 120 minutes later for the 3-sample method. Serum inulin concentrations were colorimetrically determined by an autoanalyzer method. The GFR in the single-blood-sample method was calculated from the dose injected, serum concentration, sampling time, and estimated volume of distribution on the basis of the data of the 3-sample method.

RESULTS: An excellent correlation was observed ($r = 0.99$, $P = .0001$) between GFR values estimated by the single-blood-sample and 3-sample methods.

CONCLUSIONS AND CLINICAL IMPORTANCE: The single-blood-sample method using inulin provides a practicable and ethical alternative for estimating glomerular filtration rate in cats.

J Vet Intern Med. 2013 Jan-Feb;27(1):31-8. doi: 10.1111/jvim.12029. Epub 2012 Dec 26.

Effect of weight loss in obese dogs on indicators of renal function or disease.

Tvarijonaviciute A, Ceron JJ, Holden SL, Biourge V, Morris PJ, German AJ.

BACKGROUND: Obesity is a common medical disorder in dogs, and can predispose to a number of diseases. Human obesity is a risk factor for the development and progression of chronic kidney disease.

OBJECTIVES: To investigate the possible association of weight loss on plasma and renal biomarkers of kidney health.

ANIMALS: Thirty-seven obese dogs that lost weight were included in the study.

METHODS: Prospective observational study. Three novel biomarkers of renal functional impairment, disease, or both (homocysteine, cystatin C, and clusterin), in addition to traditional markers of chronic renal failure (serum urea and creatinine, urine specific gravity [USG], urine protein-creatinine ratio [UPCR], and urine albumin corrected by creatinine [UAC]) before and after weight loss in dogs with naturally occurring obesity were investigated.

RESULTS: Urea ($P = .043$) and USG ($P = .012$) were both greater after weight loss than before loss, whilst UPCR, UAC, and creatinine were less after weight loss ($P = .032$, $P = .006$, and $P = .026$, respectively). Homocysteine ($P < .001$), cystatin C ($P < .001$) and clusterin ($P < .001$) all decreased upon weight loss. Multiple linear regression analysis revealed associations between percentage weight loss (greater weight loss, more lean tissue loss; $r = -0.67$, $r(2) = 0.45$, $P < .001$) and before-loss plasma clusterin concentration (greater clusterin, more lean tissue loss; $r = 0.48$, $r(2) = 0.23$, $P = .003$).

CONCLUSION AND CLINICAL IMPORTANCE: These results suggest possible subclinical alterations in renal function in canine obesity, which improve with weight loss. Further work is required to determine the nature of these alterations and, most notably, the reason for the association between before loss plasma clusterin and subsequent lean tissue loss during weight management.

Vet Intern Med. 2013 Jan-Feb;27(1):39-46. doi: 10.1111/j.1939-1676.2012.01027.x. Epub 2012 Nov 9.

Evaluation of urinary catheters coated with sustained-release varnish of chlorhexidine in mitigating biofilm formation on urinary catheters in dogs.

Segev G, Bankirer T, Steinberg D, Duvdevani M, Shapur NK, Friedman M, Lavy E.

BACKGROUND: Biofilm formation occurs commonly on urinary catheters.

OBJECTIVES: To assess the efficacy of urinary catheters coated with sustained-release varnish of chlorhexidine in decreasing catheter-associated biofilm formation in dogs.

ANIMALS: Thirty client-owned dogs.

METHODS: Prospective study. Thirteen dogs were catheterized with urinary catheters coated with sustained-release varnish of chlorhexidine (study group), and 13 dogs were catheterized with an untreated urinary catheter (control group). Presence and intensity of biofilm formation on the urinary catheters were assessed and compared between the groups by evaluating colony-forming units (CFU) of biofilm bacteria, and semiquantitatively, using confocal laser scanning microscopy and electron microscopy.

RESULTS: None of the dogs experienced adverse effects associated with the presence of the urinary catheters. Median CFU count of biofilm bacteria at all portions of the urinary catheter was significantly ($P < .001$) lower in the study compared with the control group. The degree of biofilm formation on the urinary catheters, as evaluated by confocal laser scanning microscopy and electron microscopy, was significantly lower in the study compared with the control group. Electron microscopy examination identified crystals on some of the urinary catheters. The proportion of catheters on which crystals were observed was significantly lower on the distal part of the urinary catheter in the study group compared with the control group (16.7% versus 66.7%, respectively; $P = .04$).

CONCLUSIONS AND CLINICAL IMPORTANCE: Chlorhexidine sustained-release varnish-coated urinary catheters effectively decrease urinary catheter-associated biofilm formation in dogs.

J Vet Intern Med. 2013 Jan-Feb;27(1):99-105. doi: 10.1111/jvim.12011. Epub 2012 Nov 29.

Use of an implanted sacral nerve stimulator to restore urine voiding in chronically paraplegic dogs.

Granger N, Chew D, Fairhurst P, Fawcett JW, Lacour SP, Craggs M, Mosse CA, Donaldson N, Jeffery ND.

BACKGROUND: Loss of urinary control after spinal cord injury increases risk of urinary tract disease and is problematical for owners of affected dogs.

OBJECTIVES: To design, implant, and test a sacral nerve stimulating device for controlling urine voiding in paraplegic dogs.

ANIMALS: Nine pet dogs with severe thoracolumbar spinal cord injury causing paraplegia, loss of hindquarter sensation, and incontinence for more than 3 months. The procedure was offered prospectively to owners of suitable candidates after the irreversibility of the incontinence had been ascertained.

METHODS: Open label clinical study. Surgically implantable electrode "books" were designed for insertion and retention of mixed sacral nerves. Sacral nerves were accessed via laminectomy and stimulated to test their ability to elicit detrusor contraction and then inserted into the electrode book, which was attached to a subcutaneously implanted, externally activated receiver.

RESULTS: In 8/9 dogs, S2 nerves elicited the largest increases in intravesicular pressure with minimum stimulation and were placed in electrode books. Voiding efficiency was >90% in 8 of the 9 implanted dogs. No important detrimental effects of the procedure were observed.

CONCLUSIONS AND CLINICAL IMPORTANCE: This sacral nerve stimulating implant is a simple and apparently effective neuroprosthetic device that restores urine voiding in paraplegic dogs.

J Vet Intern Med. 2013 Jan-Feb;27(1):126-33. doi: 10.1111/jvim.12013. Epub 2012 Dec 3.

Randomized trial of cisplatin versus firocoxib versus cisplatin/firocoxib in dogs with transitional cell carcinoma of the urinary bladder.

Knapp DW, Henry CJ, Widmer WR, Tan KM, Moore GE, Ramos-Vara JA, Lucroy MD, Greenberg CB, Greene SN, Abbo AH, Hanson PD, Alva R, Bonney PL.

BACKGROUND: Cisplatin combined with a nonselective cyclooxygenase (cox) inhibitor has potent antitumor activity against transitional cell carcinoma (TCC) in dogs, but this treatment is limited by renal toxicosis. Cox-2 is expressed in TCC, but only in limited sites within the kidney. A cox-2 inhibitor could enhance the antitumor activity of cisplatin with potentially fewer adverse effects on the kidney.

HYPOTHESIS: Cisplatin/cox-2 inhibitor treatment will have greater antitumor activity but no more renal toxicosis than cisplatin alone in dogs with TCC.

ANIMALS: Forty-four dogs with naturally occurring urinary bladder TCC.

METHODS: Dogs were randomized to receive cisplatin (60 mg/m²) IV q21d), firocoxib (5 mg/kg PO q24h), or the combination. Tumor measurements were determined before and at 6-week intervals during treatment. Renal function was monitored by serum creatinine concentration, iohexol clearance, and urine specific gravity. Toxicoses were graded according to Veterinary Co-Operative Oncology Group (VCOG) criteria.

RESULTS: The remission rate with cisplatin/firocoxib (57%) was significantly (P = .021) higher than that with cisplatin alone (13%). Renal and gastrointestinal toxicoses were common in dogs receiving cisplatin, but there were no significant differences between dogs receiving cisplatin or cisplatin/firocoxib. Firocoxib alone induced partial remission or stable disease in 20 and 33% of dogs, respectively.

CONCLUSIONS: Firocoxib significantly enhanced the antitumor activity of cisplatin resulting in partial remission in more than half of the cases. The toxicoses inherent to cisplatin, however, were noted in dogs receiving this combination. Firocoxib had antitumor effects as a single agent and can be considered a palliative treatment for dogs with TCC.

J Vet Intern Med. 2013 Mar;27(2):217-26. doi: 10.1111/jvim.12033. Epub 2013 Jan 16.

Potential adverse effects of omega-3 Fatty acids in dogs and cats.

Lenox CE, Bauer JE.

Fish oil omega-3 fatty acids, mainly eicosapentaenoic acid and docosahexaenoic acid, are used in the management of several diseases in companion animal medicine, many of which are inflammatory in nature. This review describes metabolic differences among omega-3 fatty acids and outlines potential adverse effects that may occur with their supplementation in dogs and cats with a special focus on omega-3 fatty acids from fish oil. Important potential adverse effects of omega-3 fatty acid supplementation include altered platelet function, gastrointestinal adverse effects, detrimental effects on wound healing, lipid peroxidation, potential for nutrient excess and toxin exposure, weight gain, altered immune function, effects on glycemic control and insulin sensitivity, and nutrient-drug interactions.

J Vet Intern Med. 2013 Mar;27(2):227-33. doi: 10.1111/jvim.12036. Epub 2013 Jan 30.

Fibroblast Growth Factor 23 (FGF-23) Concentrations in Cats with Early Nonazotemic Chronic Kidney Disease (CKD) and in Healthy Geriatric Cats.

Finch NC, Geddes RF, Syme HM, Elliott J.

BACKGROUND: Fibroblast growth factor (FGF-23) has an important role in phosphate regulation. Its clinical relevance in cats with CKD has not been explored previously.

HYPOTHESIS/OBJECTIVES: The study objectives were (1) to determine whether FGF-23 concentrations are increased in nonazotemic cats, cats which developed azotemia within 12 months of screening compared with cats that remained non-azotemic, and (2) to evaluate the relationships between FGF-23 and PTH and FGF-23 and glomerular filtration rate (GFR).

ANIMALS: Sixty-two healthy client-owned geriatric cats, 14 of which developed azotemia during the 12-month follow-up period.

METHODS: Healthy nonazotemic cats were recruited prospectively into the study and followed for 12 months. At the study end-point, cats were categorized into 3 groups according to plasma creatinine concentration. PTH, FGF-23, and additional biochemical variables were evaluated at baseline and after 12 months. GFR was measured by a corrected slope-intercept iohexol clearance method.

RESULTS: FGF-23 concentrations at baseline were found to be significantly increased in cats that developed azotemia ($P = .001$) compared with cats that did not develop azotemia. A significant positive relationship was identified between FGF-23 and PTH, whereas the relationship between FGF-23 and GFR was negative.

CONCLUSIONS AND CLINICAL IMPORTANCE: FGF-23 concentrations predicted development of azotemia in geriatric cats. Positive relationships between FGF-23 and PTH suggest an association between FGF-23 and renal secondary hyperparathyroidism.

J Vet Intern Med. 2013 Mar;27(2):234-41. doi: 10.1111/jvim.12044. Epub 2013 Feb 11.

Fibroblast growth factor 23 in feline chronic kidney disease.

Geddes RF, Finch NC, Elliott J, Syme HM.

BACKGROUND: Fibroblast growth factor 23 (FGF-23) is a phosphaturic hormone involved in the pathogenesis of secondary renal hyperparathyroidism (SRHP) in humans. There are no published studies examining feline FGF-23.

OBJECTIVES: Validation of a method for FGF-23 quantification in feline plasma and assessment of the associations among plasma FGF-23, PTH, creatinine, and phosphate concentrations in cats with chronic kidney disease (CKD).

ANIMALS: One hundred nonazotemic and azotemic geriatric (>9 years) client-owned cats.

METHODS: Retrospective cross-sectional study: Cats were categorized into 4 groups: control group (plasma creatinine (Cr) ≤ 2.0 mg/dL), stage 2 (Cr 2.1-2.8 mg/dL), stage 3 (Cr 2.9-5.0 mg/dL), stage 4 (Cr > 5.0 mg/dL). Stages 2 and 3 were further subdivided based on International Renal Interest Society targets for plasma phosphate concentration (PO₄): stage 2a (PO₄ ≤ 4.5 mg/dL), stage 2b (PO₄ > 4.5 mg/dL), stage 3a (PO₄ ≤ 5 mg/dL), stage 3b (PO₄ > 5 mg/dL). Plasma FGF-23 concentrations were measured by a human intact FGF-23 ELISA. Descriptive statistics and linear regression were performed.

RESULTS: The ELISA demonstrated acceptable precision, reproducibility, and specificity. Plasma FGF-23 concentrations increased with increasing plasma creatinine concentrations and were significantly different between all groups ($P < .008$). Plasma FGF-23 concentrations were significantly higher in cats in stage 2b than stage 2a ($P = .008$) and in stage 3b than in stage 3a ($P = .012$). Phosphate, log creatinine, total calcium, log parathyroid hormone, and packed cell volume were all independent predictors of FGF-23.

CONCLUSIONS AND CLINICAL IMPORTANCE: FGF-23 concentrations increase with increasing stage of feline CKD and might be a marker or mediator of feline SRHP.

J Vet Intern Med. 2013 May;27(3):462-8. doi: 10.1111/jvim.12067. Epub 2013 Mar 25.

Hypercoagulability in dogs with protein-losing nephropathy as assessed by thromboelastography.

Lennon EM, Hanel RM, Walker JM, Vaden SL.

BACKGROUND: Dogs with protein-losing nephropathy (PLN) are at risk of thromboembolic disease, but the mechanism leading to hypercoagulability and the population of dogs at risk are unknown.

OBJECTIVES: To characterize thromboelastography (TEG) and its association with serum albumin (SALB), UPC, and antithrombin activity in dogs with PLN.

ANIMALS: Twenty-eight client-owned dogs with PLN (urine protein:creatinine ratio [UPC] > 2.0) and 8 control dogs were prospectively enrolled in this observational study.

METHODS: TEG parameters, antithrombin activity, serum biochemical profiles, and UPC were measured. TEG analyses were run in duplicate with kaolin activation; reaction time (R), clot formation time (K), α -angle (α), maximal amplitude (MA), and global clot strength (G) were analyzed.

RESULTS: Dogs with PLN had lower K ($P = .004$), and higher α ($P = .001$), MA ($P < .001$), and G ($P < .001$) values than controls. No significant correlation between TEG parameters and UPC, SALB, or antithrombin was noted. Twelve PLN dogs (42.8%) were azotemic and 19 (67.8%) were hypoalbuminemic (SALB < 3.0 g/dL); 11 had SALB < 2.5 g/dL.

CONCLUSIONS AND CLINICAL IMPORTANCE: These results indicate that dogs with PLN have TEG values that demonstrate hypercoagulability compared with a control population but that antithrombin, SALB, or UPC cannot be used in isolation to predict this result. A comprehensive evaluation of the coagulation system in individual patients may be necessary to predict the point at which anti-thrombotic therapy is indicated.

J Vet Intern Med. 2013 May;27(3):491-9. doi: 10.1111/jvim.12065. Epub 2013 Mar 25.

Acquired proximal renal tubular dysfunction in 9 labrador retrievers with copper-associated hepatitis (2006-2012).

Langlois DK, Smedley RC, Schall WD, Kruger JM.

BACKGROUND: Copper-associated hepatitis (CAH) has been well described in Labrador Retrievers. However, the association of CAH with proximal renal tubular dysfunction in this breed has not been characterized.

OBJECTIVES: To report clinical features, hepatic and renal histopathologic findings, tissue copper concentrations, and outcome of Labradors with CAH and proximal renal tubular disease.

ANIMALS: Nine Labrador Retrievers with renal glucosuria and biopsy-confirmed CAH.

METHODS: Clinical, clinicopathologic, and light microscopic findings were retrospectively reviewed. Rhodanine staining or atomic emission spectroscopy was performed on all hepatic samples and available renal tissue (4 dogs) to assess copper concentrations.

RESULTS: Eight dogs had a history of polyuria and polydipsia, and all dogs had increased serum bilirubin concentrations. Five dogs had hyperchloremic metabolic acidosis. Three dogs with acidemia had paradoxical alkaluria. All renal specimens had increased copper concentrations. Renal tubular vacuolization, degeneration, and regeneration were observed on light microscopy. Four dogs died within 10 days of diagnosis. One dog survived 2 months; 4 dogs survived more than 1 year. In long-term survivors, including 2 that did not undergo immediate copper chelation, resolution of renal tubular dysfunction occurred within weeks to months.

CONCLUSIONS AND CLINICAL IMPORTANCE: Labrador Retrievers with CAH can develop clinical and laboratory evidence of renal tubular dysfunction in association with increased renal copper concentrations. Given the rarity of renal tubular disorders, detection of renal glucosuria and increased ALT activity in a Labrador Retriever is suggestive of CAH. Although renal tubular dysfunction may indicate advanced disease, successful long-term outcome is possible with a variety of therapies.

J Vet Intern Med. 2013 May;27(3):507-15. doi: 10.1111/jvim.12074. Epub 2013 Apr 3.

Effects of dietary salt intake on renal function: a 2-year study in healthy aged cats.

Reynolds BS, Chetboul V, Nguyen P, Testault I, Concordet DV, Carlos Sampedrano C, Elliott J, Trehou-Sechi E, Abadie J, Biourge V, Lefebvre HP.

BACKGROUND: Increasing salt intake to promote diuresis has been suggested in the management of feline lower urinary tract disease. However, high dietary salt intake might adversely affect blood pressure and renal function.

OBJECTIVES: The objective of this study was to assess the long-term effects of increased salt intake on renal function in healthy aged cats.

METHODS: This study was controlled, randomized, and blinded. Twenty healthy neutered cats (10.1 ± 2.4 years) were randomly allocated into 2 matched groups. One group was fed a high salt diet (3.1 g/Mcal sodium, 5.5 g/Mcal chloride) and the other a control diet of same composition except for salt content (1.0 g/Mcal sodium, 2.2 g/Mcal chloride). Clinical examination, glomerular filtration rate,

blood pressure measurement, cardiac and kidney ultrasonography, and urinary and blood tests were performed before and over 24 months after diet implementation. Statistics were performed using a general linear model.

RESULTS: Sixteen cats completed the 2 year study. The only variables affected by dietary salt intake were plasma aldosterone and urinary sodium/creatinine ratio, respectively, higher and lower in the control group all over the study period and urinary specific gravity, lower in the high salt diet group at 3 months.

CONCLUSIONS AND CLINICAL IMPORTANCE: Glomerular filtration rate (GFR), blood pressure, and other routine clinical pathological variables in healthy aged cats were not affected by dietary salt content. The results of this 2 year study do not support the suggestion that chronic increases in dietary salt intake are harmful to renal function in older cats.

J Vet Intern Med. 2013 Jul;27(4):782-90. doi: 10.1111/jvim.12089. Epub 2013 May 6.

A single sample method for estimating glomerular filtration rate in cats.

Finch NC, Heiene R, Elliott J, Syme HM, Peters AM.

Validated methods of estimating glomerular filtration rate (GFR) in cats requiring only a limited number of samples are desirable.

To test a single sample method of determining GFR in cats.

The validation population (group 1) consisted of 89 client-owned cats (73 nonazotemic and 16 azotemic). A separate population of 18 healthy nonazotemic cats (group 2) was used to test the methods.

Glomerular filtration rate was determined in group 1 using corrected slope-intercept iohexol clearance. Single sample clearance was determined using the Jacobsson and modified Jacobsson methods and validated against slope-intercept clearance. Extracellular fluid volume (ECFV) was determined from slope-intercept clearance with correction for the 1 compartment assumption and by deriving a prediction formula for ECFV (ECFVPredicted) based on the body weight. The optimal single sample method was tested in group 2.

A blood sample at 180 minutes and ECFVPredicted were optimal for single sample clearance. Mean \pm SD GFR in group 1 determined using the Jacobsson and modified Jacobsson formulae was 1.78 ± 0.70 and 1.65 ± 0.60 mL/min/kg, respectively. When tested in group 2, the Jacobsson method overestimated multisample clearance. The modified Jacobsson method (mean \pm SD 2.22 ± 0.34 mL/min/kg) was in agreement with multisample clearance (mean \pm SD 2.19 ± 0.34 mL/min/kg). The modified Jacobsson method provides accurate estimation of iohexol clearance in cats, from a single sample collected at 180 minutes postinjection and using a formula based on the body weight to predict ECFV. Further validation of the formula in patients with very high or very low GFR is required.

J Vet Intern Med. 2013 Jul;27(4):814-21. doi: 10.1111/jvim.12090. Epub 2013 May 6.

Chronic Kidney Disease in Dogs in UK Veterinary Practices: Prevalence, Risk Factors, and Survival.

O'Neill DG, Elliott J, Church DB, McGreevy PD, Thomson PC, Brodbelt DC.

The prevalence for chronic kidney disease (CKD) in dogs varies widely (0.05-3.74%). Identified risk factors include advancing age, specific breeds, small body size, and periodontal disease.

To estimate the prevalence and identify risk factors associated with CKD diagnosis and survival in dogs. Purebred dogs were hypothesized to have higher CKD risk and poorer survival characteristics than crossbred dogs.

A merged clinical database of 107,214 dogs attending 89 UK veterinary practices over a 2-year period (January 2010-December 2011).

A longitudinal study design estimated the apparent prevalence (AP) whereas the true prevalence (TP) was estimated using Bayesian analysis. A nested case-control study design evaluated risk factors. Survival analysis used the Kaplan-Meier survival curve method and multivariable Cox proportional hazards regression modeling.

The CKD AP was 0.21% (95% CI: 0.19-0.24%) and TP was 0.37% (95% posterior credibility interval 0.02-1.44%). Significant risk factors included increasing age, being insured, and certain breeds (Cocker Spaniel, Cavalier King Charles Spaniel). Cardiac disease was a significant comorbid disorder. Significant clinical signs included halitosis, weight loss, polyuria/polydipsia, urinary incontinence, vomiting, decreased appetite, lethargy, and diarrhea. The median survival time from diagnosis was 226 days (95% CI 112-326 days). International Renal Interest Society stage and blood urea nitrogen concentration at diagnosis were significantly associated with hazard of death due to CKD. Chronic kidney disease compromises dog welfare. Increased awareness of CKD risk factors and association of blood biochemistry results with survival time should facilitate diagnosis and optimize case management to improve animal survival and welfare.

J Vet Intern Med. 2013 Jul;27(4):830-9. doi: 10.1111/jvim.12108. Epub 2013 May 16.

A retrospective study of acute kidney injury in cats and development of a novel clinical scoring system for predicting outcome for cats managed by hemodialysis.

Segev G, Nivy R, Kass PH, Cowgill LD.

Information regarding acute kidney injury (AKI) in cats is limited, and there are no reliable tools to objectively assess disease severity and predict outcome.

To assess clinical signs, clinicopathologic abnormalities, etiology, and outcome of cats with AKI, and to develop models using clinical metrics and empirically derived scores to predict outcome.

One hundred and thirty-two client-owned cats.

Retrospective study. Bivariate logistic regression analyses were performed to identify variables predictive of 30-day survival. Continuous variables outside the reference range were divided into quartiles to yield quartile-specific odds ratios (OR) for survival. Models were developed incorporating weighting factors assigned to each quartile based on the OR. A predictive score for each model was calculated for each cat by summing all weighting factors. A second, multivariable logistic regression model was created from actual values of the same variables. Receiver operating characteristic curve analyses were performed to determine the models' performance. Models were further tested using a subset of cases not used in initial assessment.

Fifty five of 132 cats (42%) remained dialysis-independent for at least 30 days after discharge, and the remaining 77 cats either died (n = 37, 28%) or were euthanized (n = 40, 30%). The most common etiology was ureteral obstruction (n = 46, 35%). Higher scores were associated with decreased probability of survival (P < .001). Models correctly classified outcomes in 75-77% of the cases and 84-89% of the cases in the subsequent evaluation.

Models can provide objective guidance in assessing AKI prognosis and severity, but should be validated in other cohorts of cats.

J Vet Intern Med. 2013 Sep;27(5):998-1010. doi: 10.1111/jvim.12155. Epub 2013 Aug 19.

Urinary biomarkers for acute kidney injury in dogs.

De Loor J, Daminet S, Smets P, Maddens B, Meyer E.

Routinely, kidney dysfunction and decreased glomerular filtration rate (GFR) are diagnosed by the evaluation of changes in the serum creatinine (SCr) and blood urea nitrogen (BUN) concentrations. However, neither of these tests is sensitive or specific enough for the early diagnosis of impaired kidney function because they are both affected by other renal and nonrenal factors. Furthermore, kidney injury can be present in the absence of kidney dysfunction. Renal reserve enables normal GFR even when nephrons are damaged. Renal biomarkers, especially those present in urine, may be useful for the study of both acute and chronic nephropathies. The aim of this review is to describe the current status of urinary biomarkers as diagnostic tools for kidney injury in dogs with particular focus on acute kidney injury (AKI). The International Renal Interest Society (IRIS) canine AKI grading system and the implementation of urinary biomarkers in this system also are discussed. The discovery of novel urinary biomarkers has emerged from hypotheses about the pathophysiology of

kidney injury, but few proteomic urine screening approaches have been described in dogs. Lack of standardization of biomarker assays further complicates the comparison of novel canine urinary biomarker validation results among studies. Future research should focus on novel biomarkers of renal origin and evaluate promising biomarkers in different clinical conditions. Validation of selected urinary biomarkers in the diagnosis of canine kidney diseases must include dogs with both renal and nonrenal diseases to evaluate their sensitivity, specificity as well as their negative and positive predictive values.

J Vet Intern Med. 2013 Sep 6. doi: 10.1111/jvim.12187. [Epub ahead of print]

The Effect of Feeding a Renal Diet on Plasma Fibroblast Growth Factor 23 Concentrations in Cats with Stable Azotemic Chronic Kidney Disease.

Geddes RF, Elliott J, Syme HM.

Fibroblast growth factor 23 (FGF-23) is a phosphatonin, which is increased in cats with azotemic CKD. Dietary phosphate restriction decreases FGF-23 concentrations in humans and rodents, but this relationship has not previously been examined in the cat.

To investigate the effect of feeding renal diet on plasma FGF-23 concentrations in cats with stable azotemic CKD.

Azotemic, client-owned cats (≥ 9 years); 33 cats ate renal diet (RD group) and 11 cats did not eat renal diet (comparator group) over 28-56 days.

Retrospective longitudinal study: Plasma FGF-23, PTH, and phosphate concentrations were measured at baseline and after 28-56 days. Cats in the RD group were classified as hyperphosphatemic (HP) or normophosphatemic (NP) based on the International Renal Interest Society targets for plasma phosphate concentration. Nonparametric tests were performed.

In the HP group ($n = 15$), feeding renal diet was associated with a significant decrease in plasma phosphate ($P = .001$), PTH ($P = .007$), and FGF-23 ($P = .008$), but not creatinine concentrations ($P = .91$). In the NP group ($n = 18$), feeding renal diet was associated with a significant decrease in plasma FGF-23 ($P = .006$), but not phosphate ($P = .48$), PTH ($P = .35$), or creatinine concentrations ($P = .10$). No significant changes were seen in any parameters in the comparator group during the study period.

Feeding renal diet is associated with reductions in plasma FGF-23 concentrations in hyper- and normophosphatemic cats with stable azotemic CKD, suggesting that dietary phosphate restriction may enable cats with CKD to maintain normal plasma phosphate concentrations in association with lower plasma FGF-23 concentrations.

J Vet Intern Med. 2013 Sep 10. doi: 10.1111/jvim.12180. [Epub ahead of print]

Evaluation of Neutrophil Gelatinase-Associated Lipocalin as a Marker of Kidney Injury in Dogs.

Segev G, Palm C, Leroy B, Cowgill LD, Westropp JL.

Acute kidney injury (AKI) is a common and often fatal disorder in dogs.

Urine neutrophil gelatinase-associated lipocalin (NGAL)/creatinine ratio is a sensitive and specific biomarker of AKI in dogs.

Ninety-four dogs.

Prospective study. Dogs were classified as follows: (1) healthy dogs, (2) dogs with lower urinary tract disorders, (3) dogs with chronic kidney disease (CKD), (4) dogs with azotemic International Renal Interest Society (IRIS) AKI Grades II-V, and (5) dogs with IRIS AKI Grade I (nonazotemic). Urinary NGAL was quantitated in each dog using an ELISA assay and concentrations were expressed as a ratio to urinary creatinine concentration from the same specimen, and designated the urinary NGAL/creatinine ratio (UNCR).

There was a significant difference in UNCR among the study groups ($P < .001$). Both the azotemic and nonazotemic AKI groups had higher UNCR when compared with all other groups ($P < .001$ for all pairs). There was a statistically significant difference in UNCR between dogs diagnosed with CKD

compared with dogs with lower urinary tract diseases ($P = .005$) as well as between dogs with CKD and healthy dogs ($P = .001$). Receiver operator characteristics (ROC) analysis of UNCR as an indicator of azotemic and nonazotemic AKI had an area under the ROC curve of 0.94 and 0.96, respectively. NGAL/creatinine ratio is a sensitive and specific marker of AKI. It can be used to screen patients at risk for AKI and can be utilized to diagnose milder forms of AKI potentially earlier in the course of the disease.

J Vet Intern Med. 2013 Sep 20. doi: 10.1111/jvim.12196. [Epub ahead of print]

Evaluation of a Catalase-Based Urine Test for the Detection of Urinary Tract Infection in Dogs and Cats.

Kvitko-White HL, Cook AK, Nabity MB, Zhang S, Lawhon SD.

Bacterial infection of the urinary tract is a common disorder in dogs and cats. Although microscopic examination of urine sediment is routinely used to screen for infection, this test can lack sensitivity or require expertise. A reliable in-clinic screening test would be a useful adjunct for the identification of dogs and cats with bacterial urinary tract infection (UTI).

That a catalase-based urine test (Accutest Uriscreen™) is a more sensitive screening test for UTI in dogs and cats than urine microscopic sediment examination.

One hundred and sixty client-owned dogs and cats.

Surplus urine from animals presented to a veterinary teaching hospital was used in this prospective observational study. A routine urinalysis, aerobic bacterial culture, and the Uriscreen test were performed on cystocentesis samples. Sensitivity and specificity with 95% confidence intervals and positive and negative likelihood ratios were calculated for Uriscreen and microscopic sediment examination using culture results as the gold standard.

Bacterial culture was positive in 27/165 (16.4%) samples. The sensitivity, specificity, and positive and negative likelihood ratios for the Uriscreen were 89%, 71%, 3.0, and 0.15, respectively. Sensitivity, specificity, and positive and negative likelihood ratios for urine sediment microscopic examination were 78%, 90%, 7.8, and 0.24, respectively.

The Uriscreen is a more sensitive screening test for UTI in dogs and cats than sediment examination; however, the urine sediment examination was more specific. A negative Uriscreen result helps exclude UTI; however, urine bacterial culture is still necessary to exclude or confirm UTI in all cases.

J Vet Intern Med. 2013 Sep 3. doi: 10.1111/jvim.12176. [Epub ahead of print]

SLC3A1 and SLC7A9 Mutations in Autosomal Recessive or Dominant Canine Cystinuria: A New Classification System.

Brons AK, Henthorn PS, Raj K, Fitzgerald CA, Liu J, Sewell AC, Giger U.

Cystinuria, one of the first recognized inborn errors of metabolism, has been reported in many dog breeds.

To determine urinary cystine concentrations, inheritance, and mutations in the SLC3A1 and SLC7A9 genes associated with cystinuria in 3 breeds.

Mixed and purebred Labrador Retrievers ($n = 6$), Australian Cattle Dogs (6), Miniature Pinschers (4), and 1 mixed breed dog with cystine urolithiasis, relatives and control dogs.

Urinary cystinuria and aminoaciduria was assessed and exons of the SLC3A1 and SLC7A9 genes were sequenced from genomic DNA.

In each breed, male and female dogs, independent of neuter status, were found to form calculi. A frameshift mutation in SLC3A1 (c.350delG) resulting in a premature stop codon was identified in autosomal-recessive (AR) cystinuria in Labrador Retrievers and mixed breed dogs. A 6 bp deletion (c.1095_1100del) removing 2 threonines in SLC3A1 was found in autosomal-dominant (AD) cystinuria with a more severe phenotype in homozygous than in heterozygous Australian Cattle Dogs. A missense mutation in SLC7A9 (c.964G>A) was discovered in AD cystinuria in Miniature Pinschers with

only heterozygous affected dogs observed to date. Breed-specific DNA tests were developed, but the prevalence of each mutation remains unknown.

These studies describe the first AD inheritance and the first putative SLC7A9 mutation to cause cystinuria in dogs and expand our understanding of this phenotypically and genetically heterogeneous disease, leading to a new classification system for canine cystinuria and better therapeutic management and genetic control in these breeds.

J Vet Intern Med. 2013 Sep 10. doi: 10.1111/jvim.12189. [Epub ahead of print]

Masitinib-Associated Minimal Change Disease with Acute Tubular Necrosis Resulting in Acute Kidney Injury in a Dog.

Brown MR, Cianciolo RE, Nabity MB, Brown CA, Clubb FJ, Lees GE.

Special Issue: International Renal Interest Society Consensus Clinical Practice Guidelines for Glomerular Disease in Dogs. November/December 2013, Volume 27, Issue Supplement s1. Pages S1–S75

J Vet Intern Med. 2013 Nov-Dec;27 Suppl 1:S1. doi: 10.1111/jvim.12229.

Introduction from the international renal interest society.

Brown S.

J Vet Intern Med. 2013 Nov-Dec;27 Suppl 1:S2-4. doi: 10.1111/jvim.12225.

Development of clinical guidelines for management of glomerular disease in dogs.

Polzin DJ, Cowgill LD.

J Vet Intern Med. 2013 Nov-Dec;27 Suppl 1:S5-9. doi: 10.1111/jvim.12227.

Vision of the WSAVA renal standardization project.

Cowgill LD, Polzin DJ.

J Vet Intern Med. 2013 Nov-Dec;27 Suppl 1:S10-8. doi: 10.1111/jvim.12226.

Pathologic evaluation of canine renal biopsies: methods for identifying features that differentiate immune-mediated glomerulonephritides from other categories of glomerular diseases.

Cianciolo RE1, Brown CA, Mohr FC, Spangler WL, Aresu L, van der Lugt JJ, Jansen JH, James C, Clubb FJ, Lees GE.

BACKGROUND: Human renal biopsies are routinely evaluated with light microscopy (LM) using a panel of histologic stains, transmission electron microscopy (TEM), and immunofluorescence (IF) microscopy to obtain a diagnosis. In contrast, the pathologic evaluation of glomerular disease in veterinary medicine has relied mostly on LM and was of limited utility. To address this problem, recently established veterinary renal diagnostic centers have adopted methods used in human nephropathology for evaluation of renal biopsies. Three broad categories of disease, which have the greatest implications for clinical management of proteinuric dogs, have been established and include amyloidosis, immune complex-mediated glomerulonephritis (ICGN), and non-ICGN.

OBJECTIVE: To demonstrate histopathologic, ultrastructural, and IF findings in renal biopsy specimens that experienced veterinary nephropathologists utilize to make accurate and clinically useful diagnoses in dogs with proteinuric glomerular disease and to provide guidelines for the proper evaluation of renal biopsies.

METHODS: Renal biopsy specimens were routinely examined by LM, IF, and TEM. Samples were reviewed by members of the World Small Animal Veterinary Association Renal Standardization Study Group to identify lesions that were diagnostic for, or suggestive of, the presence of immune complexes (IC) or amyloidosis in all modalities. Ten guidelines for renal biopsy evaluation were formulated.

RESULTS: Each method of investigation contributed important findings that were integrated to make an accurate final morphological diagnosis. The guidelines were validated by an independent group of veterinary pathologists.

CONCLUSIONS AND CLINICAL IMPORTANCE: Routine evaluation of renal biopsies with LM, TEM, and IF is feasible and necessary for making accurate, morphologic diagnoses that can be used to guide clinical management of dogs with glomerular disease.

Vet Intern Med. 2013 Nov-Dec;27 Suppl 1:S19-26. doi: 10.1111/jvim.12223.

Consensus recommendations for the diagnostic investigation of dogs with suspected glomerular disease.

IRIS Canine GN Study Group Diagnosis Subgroup, Littman MP, Daminet S, Grauer GF, Lees GE, van Dongen AM.

BACKGROUND: The International Renal Interest Society (IRIS) offers guidelines for chronic kidney disease and acute kidney injury. As dogs with glomerular disease may present differently and require different treatment than those with whole nephron or tubular disease, the IRIS Canine Glomerulonephritis (GN) Study Group was convened to formulate guidelines for these cases. The Diagnosis Subgroup was asked to make recommendations for diagnostic evaluation of such cases.

OBJECTIVE: To seek consensus among renal specialists for the evaluation of dogs with proteinuria because of suspected glomerular disease.

METHODS: After reviewing the literature, subgroup members discussed and wrote the draft paper and recommendations, which members of the IRIS Canine GN Study Group voted upon by electronic secret ballot, with comments noted. Consensus was declared if votes showed strong or general agreement from 85% of the respondents.

RESULTS: Diagnostic tests were categorized as essential, recommended, or potentially helpful, with prioritization dependent on case characteristics, eg, for cases with uncomplicated proteinuria versus complicated with hypoalbuminemia, azotemia, or both. Consensus was reached with 86-100% agreement on all questions posed. All cases should have basic examinations including blood pressure measurement, blood, and urine testing, and a search for infectious diseases relevant to their environs. The majority ranked imaging (chest radiographs, abdominal ultrasonogram) and renal biopsy procured and interpreted by experienced personnel as essential evaluations in complicated cases, but a few respondents deemed these to be essential in uncomplicated cases as well.

CONCLUSIONS AND CLINICAL IMPORTANCE: Strong consensus about recommendations for diagnostic evaluation of dogs with suspected glomerular protein loss was attained. These guidelines help clinicians characterize disease processes for more informed therapeutic decision-making.

J Vet Intern Med. 2013 Nov-Dec;27 Suppl 1:S27-43. doi: 10.1111/jvim.12230.

Consensus recommendations for standard therapy of glomerular disease in dogs.

IRIS Canine GN Study Group Standard Therapy Subgroup, Brown S, Elliott J, Francey T, Polzin D, Vaden S.

Standard therapy forms the basic foundation for care of dogs with glomerular disease, as it is herein recommended for use in all affected animals regardless of causation of the disease. Consensus recommendations target the evaluation and management of proteinuria, inhibition of the renin-angiotensin-aldosterone system, modification in dietary intake with special consideration for those nutrients with renal effects, diagnosis and treatment of systemic hypertension, and evaluation and management of body fluid volume status in dogs with glomerular disease.

J Vet Intern Med. 2013 Nov-Dec;27 Suppl 1:S44-54. doi: 10.1111/jvim.12228.

Consensus recommendations for immunosuppressive treatment of dogs with glomerular disease based on established pathology.

IRIS Canine GN Study Group Established Pathology Subgroup, Segev G, Cowgill LD, Heiene R, Labato MA, Polzin DJ.

The purpose of this report was to provide consensus recommendations for the use of immunosuppressive therapy in dogs with active glomerular diseases. Recommendations were developed based on comprehensive review of relevant literature on immunosuppressive therapy of glomerular disease in dogs and humans, contemporary expert opinion, and anecdotal experience in dogs with glomerular disease treated with immunosuppression. Recommendations were subsequently validated by a formal consensus methodology. The Study Group recommends empirical application of immunosuppressive therapy for dogs with severe, persistent, or progressive glomerular disease in which there is evidence of an active immune-mediated pathogenesis on kidney biopsy and no identified contraindication to immunosuppressive therapy. The most compelling evidence supporting active immune-mediated mechanisms includes electron-dense deposits identified with transmission electron microscopic examination and unequivocal immunofluorescent staining in the glomeruli. For diseases associated with profound proteinuria, attendant hypoalbuminemia, nephrotic syndrome, or rapidly progressive azotemia, single drug or combination therapy consisting of rapidly acting immunosuppressive drugs is recommended. The Study Group recommends mycophenolate alone or in combination with prednisolone. To minimize the adverse effects, glucocorticoids should not be used as a sole treatment, and when used concurrently with mycophenolate, glucocorticoids should be tapered as quickly as possible. For stable or slowly progressive glomerular diseases, the Study Group recommends mycophenolate or chlorambucil alone or in combination with azathioprine on alternating days. Therapeutic effectiveness should be assessed serially by changes in proteinuria, renal function, and serum albumin concentration. In the absence of overt adverse effects, at least 8 weeks of the rapidly acting nonsteroidal drug therapy and 8-12 weeks of slowly acting drug therapy should be provided before altering or abandoning an immunosuppressive trial.

J Vet Intern Med. 2013 Nov-Dec;27 Suppl 1:S55-9. doi: 10.1111/jvim.12222.

Consensus guidelines for immunosuppressive treatment of dogs with glomerular disease absent a pathologic diagnosis.

IRIS Canine GN Study Subgroup on Immunosuppressive Therapy Absent a Pathologic Diagnosis, Pressler B, Vaden S, Gerber B, Langston C, Polzin D.

BACKGROUND: In certain situations, veterinarians must decide whether or not to recommend immunosuppressive therapy for dogs with suspect glomerular disease in the absence of renal biopsy-derived evidence that active immune mechanisms are contributing to glomerular injury. The purpose of this report is to provide guidelines for the use of immunosuppressive drugs under these conditions.

ANIMALS: Animals were not used in this study.

METHODS: Recommendations were developed by a formal consensus method.

RESULTS: Four recommendations were developed and accepted at a high level of consensus (median 92.5% agreement). Renal biopsy should not be performed when contraindications are present or when results will not alter treatment or outcome. Immunosuppressive drugs should not be given when the source of proteinuria is unknown, they are otherwise contraindicated, or a familial nephropathy or amyloidosis is likely. However, they should be considered when dogs are already being given standard therapy and the serum creatinine is >3.0 mg/dL, azotemia is progressive, or hypoalbuminemia is severe. Thorough client communication regarding pros and cons of such treatment as well as close and careful patient monitoring is required.

CONCLUSION AND CLINICAL IMPORTANCE: These recommendations can help guide the decision about renal biopsy in patients with proteinuria as well as the use of immunosuppressive drugs in those patients where the decision was made not to perform renal biopsy.

J Vet Intern Med. 2013 Nov-Dec;27 Suppl 1:S60-6. doi: 10.1111/jvim.12232.

Consensus recommendations for treatment for dogs with serology positive glomerular disease.

IRIS Glomerular Disease Study Group, Goldstein RE, Brovida C, Fernández-Del Palacio MJ, Littman MP, Polzin DJ, Zatelli A, Cowgill LD.

J Vet Intern Med. 2013 Nov-Dec;27 Suppl 1:S67-75. doi: 10.1111/jvim.12247.

Prevalence of immune-complex glomerulonephritides in dogs biopsied for suspected glomerular disease: 501 cases (2007-2012).

Schneider SM, Cianciolo RE, Nabity MB, Clubb FJ Jr, Brown CA, Lees GE.

BACKGROUND: Glomerulonephropathies are common causes of kidney disease in dogs.

OBJECTIVE: To determine the prevalence of immune-complex glomerulonephritis (ICGN) in North American dogs biopsied for suspected glomerular disease.

ANIMALS: Renal biopsies (n = 733) submitted to the Texas Veterinary Renal Pathology Service between January 1, 2007 and December 31, 2012 were reviewed. Dogs were included if the biopsy was performed for suspected glomerular disease.

METHODS: Specimens were evaluated by light microscopy (LM), immunofluorescence (IF), and transmission electron microscopy (TEM). Findings were retrospectively evaluated to categorize the diagnosis for each case. For the diagnosis of ICGN, TEM findings were considered conclusive when LM and IF were equivocal.

RESULTS: Of the 501 dogs included in the study, 241 (48.1%) had ICGN; 103 (20.6%) had primary glomerulosclerosis; 76 (15.2%) had amyloidosis; 45 (9.0%) had nonimmune complex (IC) glomerulopathy; 24 (4.8%) had non-IC nephropathy; and, 12 (2.4%) had primary tubulointerstitial disease. Many (66/241; 27.4%) ICGN cases required TEM for definitive diagnosis, including 14 cases (5.8%) that were not suspected on LM. Of cases not diagnosed as ICGN, a substantial proportion (60/260; 23.1%) required TEM to rule out immune complex deposits, including 14 of 189 cases (7.4%) presumptively diagnosed as ICGN on LM.

CONCLUSIONS AND CLINICAL IMPORTANCE: Approximately half of all dogs biopsied for suspected glomerular disease had conditions other than ICGN. Renal biopsy is needed to accurately categorize the underlying disease and direct appropriate treatment. Additionally, TEM and IF evaluations by experienced nephropathologists are necessary to obtain an accurate diagnosis in many cases.

The Journal of Veterinary Medical Science

J Vet Med Sci. 2013 Apr 1;75(3):391-3. Epub 2012 Nov 2.

A spayed female cat with squamous cell carcinoma in the uterine remnant.

Hayashi A, Tanaka H, Tajima T, Nakayama M, Ohashi F.

A 7-year-old spayed female domestic short-haired cat presented with dysuria and hematuria that had been unresponsive to medical therapy. Imaging tests such as ultrasonography, urethrocytography and computed tomography revealed a pelvic mass compressing the urethra. Based on histological examination of the mass following surgical resection, the cat was diagnosed squamous cell carcinoma (SCC) derived from the uterine remnant. After surgery, dysuria was resolved, but on instead, urine and fecal incontinence were observed. Then, about four months after surgery, recurrence of the mass and the symptoms was observed. Consequently, the cat was ultimately euthanized. This is the first report of SCC arising from the uterine remnant in a spayed female cat.

J Vet Med Sci. 2013 May 2;75(4):515-7. Epub 2012 Nov 13.

Development of a sandwich enzyme-linked immunosorbent assay to detect and measure serum levels of canine ferritin.

Chikazawa S, Hori Y, Hoshi F, Kanai K, Ito N, Sato J, Orino K, Watanabe K, Higuchi S.

We established a homologous sandwich enzyme-linked immunosorbent assay (ELISA) to measure serum levels of canine ferritin. Our assay uses a rabbit anti-canine heart ferritin polyclonal antibody,

and canine heart ferritin as a standard. Serum ferritin concentration in healthy dogs (n=163) was 789 ± 284 ng/ml (mean ± standard deviation), a value higher than reported previously. Confidence levels relating to repeatability, dilution and recovery for this method were high. Therefore, we believe our developed sandwich ELISA will be effective in evaluating serum levels of canine ferritin.

J Vet Med Sci. 2013 Jul 1;75(6):749-53. Epub 2013 Jan 25.

Identification and antimicrobial susceptibility of enterococci isolated from dogs and cats subjected to differing antibiotic pressures.

Kataoka Y, Ito C, Kawashima A, Ishii M, Yamashiro S, Harada K, Ochi H, Sawada T.

The purpose of the present study was to determine the prevalence of antibiotic-resistant enterococci in dogs and cats subjected to differing antibiotic pressures, and the prevalence of vancomycin resistance genes in isolates from these animals. Enterococci were isolated from fecal samples of 65 healthy dogs and 29 healthy cats brought to animal hospitals, from rectal swabs of 73 puppies and 15 kittens from five breeders and two pet shops, and from fecal samples of 20 dogs and 9 cats that were treated with antibiotics in Nippon Veterinary and Life Science University Animal Medical Center. The rates of resistance to ampicillin among isolates from the kitten-puppy group and healthy dog-cat group were 6.8 and 4.3%, respectively. In contrast, the rates of resistance to ampicillin in enterococci from the treatment group under antibiotic pressure were 37.5%. There was a significant difference between the antibiotic-treated group and the untreated group (P<0.01). Similarly, in the treatment group, the rate of resistance to enrofloxacin was extremely high (75.0%). In comparison, in the healthy group and kitten-puppy group, the rates of resistance to enrofloxacin were 23.4 and 12.1%, respectively. Among these groups, a significant difference was also observed in the apparent resistance rates (P<0.01). Vancomycin-resistant enterococci (VRE) harboring vanA or vanB were not detected in any groups. Therefore, contamination of VRE in dogs and cats is still considered to be minimal in Japan.

J Vet Med Sci. 2013 Oct 31;75(10):1363-5. Epub 2013 May 14.

Use of an aortic stent graft extension for the treatment of urethral stricture in a dog.

Bae JH, Kwon YH, Jung YC, Jung JM, Lee HB, Lee KC, Kim NS, Kim MS.

A 2-year-old male mixed dog was referred to us for further evaluation and treatment of a 4-week-history of oliguria and abdominal distension after a surgical repair of urethral injury. To relieve the urethral stricture, we placed a self-expanding aortic stent graft extension with a partial coverage with an expanded polytetrafluoroethylene (ePTFE). After the placement of the stent, the dog presented with a normal urinary voiding, despite the presence of urinary incontinence. The current case indicates that the ePTFE-covered, self-expanding ASGE is an effective intervention for the treatment of severe urethral stricture in the dog.

J Vet Med Sci. 2013 Nov;75(11):1529-33. Epub 2013 Jul 10.

Successful management of multidrug-resistant *Pseudomonas aeruginosa* pneumonia after kidney transplantation in a dog.

Park KM, Nam HS, Woo HM.

An 8-year-old male mongrel dog that had undergone renal transplantation was presented 25 days later with an acute cough, anorexia and exercise intolerance. During the investigation, neutrophilic leukocytosis was noted, and thoracic radiographs revealed caudal lung lobe infiltration. While being treated with two broad-spectrum antibiotics, clinical signs worsened. Pneumonia due to infection with multidrug-resistant (MDR) *Pseudomonas* (P.) *aeruginosa*, sensitive only to imipenem and amikacin, was confirmed by bacteria isolation. After treatment with imipenem-cilastatin without reducing the immunosuppressant dose, clinical signs completely resolved. During the 2-year follow-up period, no recurrence was observed. To the best of authors' knowledge, this is the first report of

pneumonia caused by MDR *P. aeruginosa* in a renal recipient dog and successful management of this disease.

J Vet Med Sci. 2013 Dec 30;75(12):1601-7. Epub 2013 Aug 13.

Qualitative and quantitative contrast enhanced ultrasonography of the pancreas using bolus injection and continuous infusion methods in normal dogs.

Lim SY, Nakamura K, Morishita K, Sasaki N, Murakami M, Osuga T, Ohta H, Yamasaki M, Takiguchi M.

Quantitative contrast enhanced ultrasound is a major breakthrough for ultrasound imaging in recent years. However, contrast enhancement of the pancreas is brief with bolus injection. To assess if continuous infusion of Sonazoid(®) can prolong the duration of pancreatic enhancement over bolus injections, eight adult dogs received bolus injection and continuous infusion of Sonazoid(®) on separate days. Contrast enhanced ultrasound of the pancreatic parenchyma and proximal descending duodenum was performed, and time intensity curves reflecting tissue perfusions were generated. Perfusion parameters- time to initial upslope, peak time, time to wash-out and peak intensity were calculated and evaluated. Fast wash-in to intense peak, followed by rapid wash-out was observed for time intensity curves of bolus injection. With continuous infusion, contrast wash-in to peak intensity was gradual, followed by long plateau and slow wash-out. Median contrast enhancement durations of the pancreas and duodenum were significantly prolonged by continuous infusion from 11 sec (range, 10 to 23 sec) and 16 sec (range, 3 to 43 sec) at bolus injection to 205 sec (range, 170 to 264 sec, $P<0.01$) and 193 sec (range, 169 to 216 sec, $P<0.05$), respectively. Median peak intensity of the pancreas was 100.9 MPV (range, 80.2 to 124.3 MPV) at bolus injection and 77.6 MPV (range, 58.2 to 99.5 MPV, $P<0.05$) at continuous infusion. Prolonged continuous imaging is afforded by continuous infusion of contrast agent. Peak intensity of the pancreas was slightly diminished in continuous infusion, but offered adequate imaging subjectively.

J Vet Med Sci. 2013 Dec 30;75(12):1615-8. Epub 2013 Jul 23.

Factors influencing measurement of serum iron concentration in dogs: diurnal variation and hyperferritinemia.

Chikazawa S, Hori Y, Kanai K, Ito N, Hoshi F, Orino K, Watanabe K, Higuchi S.

We evaluated diurnal variation and hyperferritinemia as factors that influence the values of serum iron concentration in dogs, using the International Committee for Standardization in Hematology (ICSH) colorimetric method. Serum iron levels were significantly higher in the morning than in the evening in 6 clinically healthy beagle dogs, and the maximum decrease in serum iron concentration was 47.3%. Moreover, the change in serum iron concentrations in 22 clinical canine cases with various serum ferritin levels was evaluated by immunoprecipitation of ferritin. The rate of decline in the serum iron concentrations positively correlated with serum ferritin levels ($r=0.48$, $P=0.024$). These results show that it is necessary to consider the sampling time and serum ferritin level for accurate interpretation of serum iron concentrations in dogs.

Journal of Veterinary Pharmacology and Therapeutics

J Vet Pharmacol Ther. 2013 Apr;36(2):154-60. doi: 10.1111/j.1365-2885.2012.01398.x. Epub 2012 Apr 8.

In vitro glucuronidation of the angiotensin II receptor antagonist telmisartan in the cat: a comparison with other species.

Ebner T, Schänzle G, Weber W, Sent U, Elliott J.

Glucuronidation of telmisartan comprises nearly its entire metabolic clearance in several mammalian species including human. However, data were lacking for the cat, a species noted for its inability to glucuronidate some drugs. Therefore, the glucuronidation of telmisartan was investigated using

feline liver microsomes and compared to liver microsomes of rats, dogs, and human, intestinal human microsomes and cell lines expressing human UDP-glucuronosyltransferases (UGT). Incubation of telmisartan with cat liver microsomes readily yielded telmisartan glucuronide, and pooled (N = 3 for each gender) cat liver microsomes even showed the highest glucuronidation rate (cat > dog >> human > rat). Michaelis Menten kinetics were observed with Km of 7.5 and 10 μ m and Vmax of 3.9 and 3.3 nmol/min/mg for male and female cats, respectively. Confirming the in vitro data, telmisartan glucuronide was detected as the major circulating metabolite in cat plasma. To elucidate which UGT enzymes are involved, telmisartan was incubated with cell lines expressing human UGTs. The highest glucuronidation activity was observed for UGT1A8, UGT1A7, and UGT1A9. In conclusion, telmisartan was effectively glucuronidated in cats. Defects of the UGT1A6 gene in cats do not affect the glucuronidation of telmisartan as it is not a substrate of human UGT1A6.

Journal of Veterinary Science

J Vet Sci. 2013 Jun;14(2):223-6. doi: 10.4142/jvs.2013.14.2.223. Epub 2013 Jun 21.

Analysis of ultrastructural glomerular basement membrane lesions and podocytes associated with proteinuria and sclerosis in Osborne-Mendel rats with progressive glomerulonephropathy.

Yasuno K, Kamiie J, Shirota K.

The renal glomeruli of 12 male Osborne-Mendel (OM) rats 3 to 24 weeks old were examined by electron microscopy. Effacement of podocyte foot processes (FPs) developed at 3 weeks of age and became progressively worse over time. Loss or dislocation of the slit membrane was also found. Vacuoles and osmiophilic lysosomes appeared in the podocytes starting at 6 weeks of age. Podocyte detachment from the glomerular basement membrane (GBM) was apparent at 18 weeks of age. Laminated GBM was occasionally observed in all animals. These features might lead to the development of spontaneous proteinuria and glomerulosclerosis in OM rats.

New Zealand veterinary journal

N Z Vet J. 2013 Mar;61(2):98-106. doi: 10.1080/00480169.2012.719212. Epub 2012 Sep 27.

A serological survey of leptospiral antibodies in dogs in New Zealand.

Harland AL, Cave NJ, Jones BR, Benschop J, Donald JJ, Midwinter AC, Squires RA, Collins-Emerson JM.

AIM: To investigate the prevalence of titres to four endemic leptospiral serovars in dog sera from the lower half of the North Island, and the South Island of New Zealand submitted to diagnostic laboratories, and to explore the association between the prevalence of seropositive samples to leptospirosis and breed group, age group and sex.

METHODS: Serum samples from 655 dogs residing in the central and lower North Island and from the South Island of New Zealand were sourced from the Massey University Veterinary Teaching Hospital and from submissions to New Zealand Veterinary Pathology in 2005. They were screened by the Microscopic Agglutination Test (MAT) against *Leptospira interrogans* serovars Copenhageni and Pomona and *L. borgpetersenii* serovars Hardjo and Ballum. Titres greater or equal to 96 were considered positive. Variables investigated for their association with the prevalence of seropositive samples to leptospirosis included serovar, breed, North vs. South Island, age and sex.

RESULTS: Positive MAT titres to *Leptospira interrogans* serovar Copenhageni were found in 10.3 % of dogs (95% CI=8.1-12.9), and were more common than positive titres to other leptospiral serovars. Small breeds did not have a lower prevalence of Copenhageni titres than other breeds. Positive titres to *Leptospira borgpetersenii* serovar Hardjo were associated with breeds of dogs used as farm working dogs. There was no significant difference in the prevalence of positive leptospiral titres between dogs from the North or South Islands. Dogs greater than 12 years of age were less likely to have positive titres to *Leptospira* than younger dogs. No association was found between positive titres and sex.

CONCLUSIONS: Breeds of dogs used as farm working were at greater risk of exposure to *Leptospira borgpetersenii* serovar Hardjo. Small breeds did not have a lower risk of seropositivity to Copenhageni than farm working breeds. Further study should be undertaken to confirm the prevalence of positive titres to leptospirosis in farm dogs and dogs resident in the South Island.

CLINICAL RELEVANCE: The risk of dogs being exposed to *Leptospira interrogans* serovar Copenhageni, and requirement for vaccination against serovar Copenhageni, cannot be determined by geographical location or breed group. Vaccination against *Leptospira borgpetersenii* serovar Hardjo is likely to be beneficial in working dogs.

N Z Vet J. 2013 Jul;61(4):212-6. doi: 10.1080/00480169.2013.775691. Epub 2013 Mar 14.

Nephroliths and ureteroliths: a new stone age.

Adams LG.

Nephroliths may obstruct the renal pelvis or ureter, predispose to pyelonephritis, or result in compressive injury of the renal parenchyma leading to progressive chronic kidney disease. Indications for removal of nephroliths in dogs include obstruction, recurrent infection, progressive nephrolith enlargement, presence of clinical signs (renal pain), and patients with nephroliths in a solitary functional kidney. The most common indication for removal of upper tract uroliths in cats is ureteral obstruction caused by ureteroliths. Nonobstructive nephroliths in cats are not usually treated unless they move into the ureter resulting in ureteral obstruction. The treatment approach to nephroliths and ureteroliths is different for dogs versus cats. Surgical removal of nephroliths or ureteroliths by nephrotomy and ureterotomy respectively is associated with potential for complications in more than 30% of cats treated by ureterotomy; therefore, minimally invasive options should also be considered. Extracorporeal shock wave lithotripsy (ESWL) treatment of nephroliths results in small "passable" stone fragments in most dogs, whereas ESWL does not work effectively in cats. Ureteral stents are effective for relief of ureteral obstruction by ureteroliths in both dogs and cats. Ureteral stents may be left in place long-term to relieve ureteral obstruction by ureteroliths. Post-operative morbidity and mortality are substantially lower for ureteral stent placement compared to open surgical ureterotomy in cats.

N Z Vet J. 2013 Nov;61(6):362-6. doi: 10.1080/00480169.2013.781895. Epub 2013 Apr 20.

Sarcomatoid renal cell carcinoma with scant epithelial components in an Angora cat.

Gulbahar M, Arslan H, Gacar A, Karayigit M, Nisbet O, Albayrak H, Kabak Y.

A 6-year-old, neutered, female Angora cat presented with a history of lethargy and anorexia for 2 months and a clinically palpable and gradually enlarging, solid mass in the abdominal cavity extending from the last costal arch to the pelvic cavity.

Examination of the cat revealed jaundice, dehydration and hypothermia. Haematological manifestations included lymphopenia and substantial decrease in haematocrit value. Biochemical analysis of the blood revealed hypoglycaemia, three-fold elevated blood urea nitrogen values, increased level of serum aspartate aminotransferase and increased total bilirubin while the creatinine level was normal. Ultrasonographic examination of the abdomen showed a disrupted and large hypoechoic area around the left kidney. The cat was anaesthetised and the left kidney was removed, but the cat died following surgery.

On post-mortem examination, the left kidney was markedly enlarged and both the cortical and medullary parenchyma were replaced by confluent, multilobulated, pale tan-white, firm nodular masses protruding above the capsular surface. Metastasis was not observed. Cytological examination revealed a population of spindle-shaped cells of variable size, with abundant coarse chromatin and occasionally prominent nucleoli. Initial sections of the kidney were indicative of undifferentiated sarcoma confirmed by immunohistochemistry revealing vimentin-positive and cytokeratin-negative results in all tumour tissues. Additional sections showed very small amounts of both cytokeratin-positive and vimentin-positive areas.

Sarcomatoid renal cell carcinoma (SRCC) with scant epithelial components originating from left kidney.

Clinical and pathological features were similar to those of human SRCC, even though there was no evidence of metastases. Immunohistochemistry for vimentin and cytokeratin may be useful for definitive diagnosis of renal cell carcinoma with sarcomatoid differentiation, although staining of sections from several different parts of the tumour may be necessary. When a primary renal tumour is presented, SRCC should be considered as this diagnosis may influence treatment protocols and the clinical outcome.

Research in Veterinary Science

Res Vet Sci. 2013 Jun;94(3):440-5. doi: 10.1016/j.rvsc.2013.01.002. Epub 2013 Jan 26.

Automated and visual analysis of commercial urinary dipsticks in dogs, cats and cattle.

Defontis M, Bauer N, Failing K, Moritz A.

Two dipsticks developed for human use were evaluated for routine urinalysis and for detection of proteinuria in dogs (n=101), cats (n=50) and cattle (n=100). The aims were to determine their diagnostic usefulness in dogs, cats and cattle and to compare automated versus visual methods of reading. Results obtained with automated reading correlated better with reference methods than visual reading. Correlation with the reference methods was good to excellent for automated estimation of creatinine (dog: rs=0.86, cat: rs=0.83, cattle: rs=0.87) and pH (dog: rs=0.96, cat: rs=0.91, cattle: rs=0.94). The correlation was good for protein (dog: rs=0.88, cat: rs=0.91), glucose (cat: rs=0.83) and urine protein:creatinine (UPC) ratio (dog: rs=0.75, cat: rs=0.89). Estimation of proteinuria in cattle and pyuria in cats lacked specificity and detection of isosthenuria lacked sensitivity in all species. Semiquantitative estimation of UPC ratio was specific (100% and 91.2% at a cut-off of 0.2 in cats and 0.4 in dogs, respectively).

Res Vet Sci. 2013 Dec;95(3):924-9. doi: 10.1016/j.rvsc.2013.07.002. Epub 2013 Aug 6.

Urinary C reactive protein levels in dogs with leishmaniasis at different stages of renal damage.

Martínez-Subiela S, García-Martínez JD, Tvarijonaviciute A, Tecles F, Caldin M, Bernal LJ, Cerón JJ.

The objectives of the study were to validate a time-resolved immunofluorometric assay for C reactive protein (CRP) quantification in urine of dogs and to investigate the influence that the presence of proteinuria and azotemia could have on serum and urinary CRP (uCRP) values in dogs with leishmaniasis. Samples obtained from dogs naturally infected with *Leishmania infantum* were classified into four groups on the basis of the results of urinary protein/creatinine ratio and serum creatinine (sCr). In addition, 7 dogs were monitored at initial diagnosis and after a follow up visit. The assay showed good analytical performance based on precision, accuracy and limit of detection results. Results of the study suggested that CRP is present in urine of dogs with leishmaniasis and renal damage since uCRP/creatinine ratio was significantly increased in dogs with proteinuria, being the highest values observed in dogs with proteinuria and elevated sCr, and that the measurement of uCRP could be a tool to detect and evaluate the possible kidney damage associated with this disease.

Res Vet Sci. 2013 Dec;95(3):1181-5. doi: 10.1016/j.rvsc.2013.09.002. Epub 2013 Sep 13.

Elevation of neutrophil gelatinase-associated lipocalin (NGAL) in non-azotemic dogs with urinary tract infection.

Daure E, Belanger MC, Beauchamp G, Lapointe C.

Neutrophil gelatinase-associated lipocalin (NGAL) is a promising biomarker in humans and dogs with kidney disease. This protein is expressed by many cells including renal tubular cells and neutrophils. The aim of this study was to evaluate the effect of urinary tract infection (UTI) on urinary NGAL (uNGAL) concentration in dogs. Urine culture and measurement of uNGAL level were performed in

80 non-azotemic dogs suspected of UTI and 19 healthy dogs. Dogs were divided in three groups: 19 healthy dogs, 25 dogs with positive culture and 55 dogs suspected of UTI but with negative culture. uNGAL and uNGAL/Creatinine was significantly higher ($P < 0.0001$) in dogs with UTI (14.22 ng/mL;19.74 $\mu\text{g/g}$) compared to Healthy (0.24 ng/mL;0.11 $\mu\text{g/g}$) and Negative (1.13 ng/mL;1.28 $\mu\text{g/g}$) dogs. A uNGAL value < 3.38 ng/mL had a negative predictive value for UTI of 87%. Presence of UTI has to be considered when uNGAL is used to detect kidney disease.

Theriogenology

Theriogenology. 2013 Jul 1;80(1):24-33. doi: 10.1016/j.theriogenology.2013.03.005. Epub 2013 Apr 16.

Functional anatomy and ultrasound examination of the canine penis.

Goericke-Pesch S, Hölscher C, Failing K, Wehrend A.

The aim of this study was to identify the functional-anatomical structures of the canine penis during and after erection to demonstrate the respective changes to provide a basis for further examinations of pathological conditions like priapism. Additionally, a gray-scale analysis was performed to quantify results from the ultrasound examination. In total, 80 dogs were examined. In group (Gr.) A, 44 intact or castrated dogs were examined, and in Gr. B, 36 dogs were examined during erection and after complete detumescence of the penis. The following parameters were assessed: (1) using physical measurements: length of the Pars longa glandis [Plg] and length of the Bulbus glandis [Bg]; and (2) using ultrasound: total penile diameter, width of the erectile tissue of the Plg, diameter of the Corpus spongiosum [Cs] including the penile bone and urethra, vertical diameter, circumference of the penis, cross-sectional area, and area of the Cs including the urethra. The mentioned parameters could be assessed in all dogs of Gr. A and Gr. B with the only exception being the urethra that could be visualized using ultrasound in some dogs only and predominantly in the erected penis (Gr. B). Concomitantly, the erectile tissue of the Plg and the Cs was more heterogenous and hypo- to anechoic during erection compared with dogs in Gr. A and Gr. B after detumescence. Comparing the results in Gr. B, the length of the Plg and the Bg were decreased approximately 40.6% and 38.0%, the total width of the penis 40.5%, the total width of the erectile tissue of the Plg 48.0%, and the width of the Cs 15.6% during detumescence compared with erection. Comparing the decrease in size at the different locations (apex penis, middle of Plg, middle of Bg) for vertical diameter, total circumference, and cross-section area, it was largest at the Bg. B-mode ultrasound is a suitable tool to investigate not only the morpho-functional structures of the resting canine penis, but also of the erected and detumescent penis, and to investigate the underlying changes during erection and detumescence.

Veterinary Clinics of North America: Small Animal Practice

Vet Clin North Am Small Anim Pract. 2013 Mar;43(2):351-65. doi: 10.1016/j.cvsm.2012.11.002.

Diabetes and the kidney in human and veterinary medicine.

Bloom CA, Rand JS.

Diabetic nephropathy is a well-recognized clinical consequence of both type 1 and type 2 diabetes mellitus in humans. Major risk factors include poor glycemic control, hypertension, and microalbuminuria, as well as genetic factors. In both type 1 and 2 diabetics with nephropathy, structural changes occur in the kidneys before overt clinical disease. Studies suggest that some of the risk factors and structural renal changes of human diabetes also exist in diabetic dogs and cats. This article assembles existing information on the presence of risk factors, laboratory and histologic findings, and consequences of human diabetic nephropathy as applied to cats.

Vet Clin North Am Small Anim Pract. 2013 Jul;43(4):721-34. doi: 10.1016/j.cvsm.2013.03.003. Epub 2013 Apr 24.

Fluid therapy for the emergent small animal patient: crystalloids, colloids, and albumin products.

Mazzaferro E, Powell LL.

Fluid therapy is essential in the treatment of emergent veterinary patients. Many different types of intravenous fluids are available, including crystalloids, artificial colloids, and natural colloids. The type, dose, and administration rate can determine the outcome in a critically ill patient. This article discusses the various types of fluids and their indication for use.

Vet Clin North Am Small Anim Pract. 2013 Jul;43(4):843-67. doi: 10.1016/j.cvsm.2013.03.013. Epub 2013 Apr 28.

Management of urinary tract emergencies in small animals.

Balakrishnan A, Drobatz KJ.

This article focuses on some of the most commonly seen urinary tract emergencies in dogs and cats, with emphasis on basic pathophysiology, diagnosis, and emergency management of these cases.

Vet Clin North Am Small Anim Pract. 2013 Sep;43(5):1013-26. doi: 10.1016/j.cvsm.2013.04.002. Epub 2013 Jun 13.

Applying pharmacokinetics to veterinary clinical practice.

Trepanier LA.

This article describes clinical examples in which pharmacokinetic parameters can be used to optimize veterinary patient care. Specific applications include extrapolating drug dosages, optimizing therapy with therapeutic drug monitoring, interpreting pharmacokinetic information provided by drug labels and pharmaceutical companies, and adjusting drug dosages in patients with hepatic or renal failure.

Vet Clin North Am Small Anim Pract. 2013 Sep;43(5):1079-89. doi: 10.1016/j.cvsm.2013.04.005. Epub 2013 Jun 2.

Antimicrobials, Susceptibility Testing, and Minimum Inhibitory Concentrations (MIC) in Veterinary Infection Treatment.

Papich MG.

Veterinarians are quick to attribute an unsuccessful antimicrobial treatment to a failure of the culture and susceptibility test. There are many reasons why antimicrobial treatment fails. When evaluating a patient that has failed to respond to therapy, one must consider any of the many factors that contribute to antibiotic failure.

Vet Clin North Am Small Anim Pract. 2013 Sep;43(5):1091-107. doi: 10.1016/j.cvsm.2013.04.006. Epub 2013 Jun 2.

Antibiotic treatment of resistant infections in small animals.

Papich MG.

There are few veterinary clinical studies to support a recommended use and dose for treating resistant bacterial infections in small animals. Resistance against many common antibiotics is possible and a susceptibility test is advised. Infections caused by *Pseudomonas aeruginosa* presents a special problem. *Staphylococcus* isolated from small animals is most likely to be *Staphylococcus pseudintermedius*. The most important resistance mechanism for *Staphylococcus* is methicillin resistance. The only antimicrobials to which some gram-negative bacilli are sensitive may be extended-spectrum cephalosporins, carbapenems (penems), selected penicillin derivatives, amikacin, or tobramycin. A susceptibility test is needed to identify the appropriate drug for these infections.

Vet Clin North Am Small Anim Pract. 2013 Nov;43(6):1193-208, v. doi: 10.1016/j.cvsm.2013.07.011. Epub 2013 Aug 1.

Clinical approach to advanced renal function testing in dogs and cats.

Pressler BM.

Serum creatinine concentration is insensitive for detecting kidney injury and does not assist in differentiation between glomerular versus tubular damage. Advanced renal function tests, including glomerular filtration rate testing, determining fractional excretion of electrolytes, and assay of urine biomarkers, may allow earlier detection of reduced renal function mass, differentiation of renal from non-renal causes of azotemia, and assist with localization of damage. This article reviews the principles, indications, and limitations of these tests and describes their use in sample clinical scenarios.

Vet Clin North Am Small Anim Pract. 2013 Nov;43(6):1319-30, vii. doi: 10.1016/j.cvsm.2013.07.002. Epub 2013 Aug 3.

Diagnosis of disorders of iron metabolism in dogs and cats.

Bohn AA.

Iron is an essential element and is used by every cell in the body. This article summarizes iron metabolism and disorders associated with iron metabolism in dogs and cats. The diagnostic tests currently in use for assessing iron status are discussed.

Veterinary Clinical Pathology

Vet Clin Pathol. 2013 Mar;42(1):78-84. doi: 10.1111/vcp.12004. Epub 2012 Dec 3.

Comparison of white and red blood cell estimates in urine sediment with hemocytometer and automated counts in dogs and cats.

O'Neil E, Burton S, Horney B, Mackenzie A.

BACKGROUND: Therapeutic decisions regarding urinalysis are commonly based on the presence of white and red blood cells. Traditionally, numbers per high-power field are estimated using wet-mount microscopic examination. This technique is not standardized and counts are likely prone to inaccuracy. In addition, differentiation of leukocyte types is not possible.

OBJECTIVES: The aims of this study were to (1) compare WBC and RBC estimates using wet-mount examination with counts obtained using a hemocytometer, (2) assess if a hematology automated analyzer (Sysmex ST-2000iV/XT) provides reliable WBC and RBC counts in urine comparable to hemocytometer counts, and (3) evaluate air-dried Wright-Giemsa-stained urine drop sediment preparations for the determination of differential leukocyte counts.

METHODS: WBC and RBC counts were obtained by performing wet-mount estimates, manual hemocytometer counts, and Sysmex automated counts on 219 canine and feline urine samples. Results were correlated using Spearman rank correlation. Air-dried Wright-Giemsa stained sediment drop preparations (n = 215) were examined for differential counts of leukocytes.

RESULTS: A low but significant association was found between WBC estimates on wet-mount examination and hemocytometer counts ($\rho = 0.37$, $P < .01$). There was a high and significant association when RBC counts were compared between wet-mount and hemocytometer evaluation ($\rho = 0.7$, $P < .01$). There was very high and significant interassay correlation between Sysmex data from duplicate samples for what the analyzer classified as WBC ($\rho = 0.97$, $P < .01$) and RBC ($\rho = 0.94$, $P < .01$). Low correlations were found between the Sysmex RBC counts and both wet-mount estimates and hemocytometer RBC counts ($\rho = 0.43$, $P < .01$ and $\rho = 0.39$, $P < .01$, respectively). Cell preservation in the air-dried sediment preparations was so poor that differential counts could not be performed.

CONCLUSION: WBC and RBC estimates on wet-mount examination agreed with hemocytometer counts and are therefore considered adequate. The Sysmex ST-2000iV/XT did not provide reliable cell counts under the conditions used.

The Veterinary Journal

Vet J. 2013 Apr;196(1):126-7. doi: 10.1016/j.tvjl.2012.10.002. Epub 2012 Nov 9.

Prevalence of the *Leptospira* serovars bratislava, grippotyphosa, mozdok and pomona in French dogs.

Renaud C, Andrews S, Djelouadji Z, Lecheval S, Corrao-Revol N, Buff S, Demont P, Kodjo A.

Although most French dogs are correctly vaccinated against leptospirosis with inactivated strains of canicola and icterohaemorrhagiae, the disease is still very prevalent in France raising the question of whether the vaccines used require updating. The aim of the present study was to provide serological data regarding circulation of the *Leptospira* serovars: grippotyphosa, bratislava, pomona and mozdok, which are contained in vaccines available in other parts of the world and which could be rapidly adapted for France. Results indicated that the epidemiology was consistent with the circulation of *Leptospira* belonging to the serogroups Australis and Grippotyphosa and that the case to support the inclusion of either pomona or mozdok in a dog vaccine for France was weak.

Vet J. 2013 Oct;198(1):15-8. doi: 10.1016/j.tvjl.2013.07.034. Epub 2013 Aug 11.

Limitations of MIC as the sole criterion in antimicrobial drug dosage regimen design: The need for full characterization of antimicrobial pharmacodynamic profile especially for drug-resistant organisms.

Gehring R, Riviere JE.

Vet J. 2013 Oct;198(1):109-15. doi: 10.1016/j.tvjl.2013.06.022. Epub 2013 Jul 27.

Big-endothelin 1 (big ET-1) and homocysteine in the serum of dogs with chronic kidney disease.

Rossi G, Giordano A, Breda S, Lisi C, Roura X, Zatelli A, Paltrinieri S.

This study was aimed at determining the serum concentration of homocysteine (Hcy) and big endothelin-1 (big ET-1, the precursor of endothelin) in dogs with chronic kidney disease (CKD) with and without hypertension, proteinuria and inflammation, in order to explore their role as biomarkers of hypertension associated with CKD. Hcy and big ET-1 were measured using an enzyme-linked immunosorbent assay and an enzymatic cyclic reaction, respectively, in dogs with CKD staged, as proposed by the International Renal Interest Society (IRIS), using serum creatinine, urinary protein to creatinine (UPC) ratio and systolic blood pressure, and classified as affected or not by inflammation based on the serum concentration of C-reactive protein (CRP). Serum Hcy was significantly higher in dogs of IRIS stages II, III and IV compared with controls and in proteinuric compared with non-proteinuric dogs. No differences relating to the degree of hypertension or to the CRP concentration were found. Serum big ET-1 significantly increased in dogs of IRIS stage IV compared with controls, in proteinuric compared with non-proteinuric dogs, in dogs with severe hypertension compared with those without hypertension, and in dogs with increased CRP compared to those with normal CRP concentrations. Hcy only correlated with serum creatinine but big ET-1 significantly correlated with serum creatinine, UPC ratio, systolic blood pressure, and increased CRP. In conclusion, both Hcy and big ET-1 increase in dogs with CKD. Although further research is needed, big ET-1, but not Hcy, may also be considered as a biomarker of hypertension.

Vet J. 2013 Oct;198(1):239-44. doi: 10.1016/j.tvjl.2013.06.030. Epub 2013 Jul 31.

Evaluation of snake envenomation-induced renal dysfunction in dogs using early urinary biomarkers of nephrotoxicity.

Hrovat A, Schoeman JP, de Laat B, Meyer E, Smets P, Goddard A, Nagel S, Daminet S.

Renal dysfunction in dogs envenomed by poisonous snakes is currently detected using traditional serum and urinary biomarkers such as creatinine and proteinuria. However, these markers lack sensitivity at the early stages of renal dysfunction and their diagnostic accuracy is affected by pre-analytical factors commonly occurring in these dogs, such as haemolysis and haemoglobinuria. Early

detection of renal dysfunction would allow for the identification of dogs requiring intensive treatment and monitoring and may help inform prognosis. The aim of this study was to evaluate the performance of several novel urinary biomarkers of glomerular dysfunction, namely, urinary albumin (uAlb), immunoglobulin G (ulgG) and C-reactive protein (uCRP) and of proximal tubular dysfunction (urinary retinol binding protein (uRBP)) compared to traditional end points in dogs with renal damage caused by snake envenomation. Biomarker results were compared between 19 dogs bitten by snakes producing either neurotoxins or cytotoxins and 10 clinically healthy controls. uAlb, ulgG, and uRBP were significantly increased in snake-envenomed dogs at presentation compared to controls, whereas only ulgG and uCRP were significantly elevated 24h post-envenomation. The urinary protein:creatinine ratio was also increased in envenomed dogs compared to controls, but because of the presence of haematuria and haemoglobinuria, differentiation between pre-renal and renal proteinuria was not possible. The results showed that these novel urinary biomarkers may assist in better detecting renal dysfunction in dogs envenomed by poisonous snakes at the acute disease stage compared to traditional laboratory endpoints.

Vet J. 2013 Nov;198(2):513-7. doi: 10.1016/j.tvjl.2013.08.021. Epub 2013 Aug 27.

Laparoscopic nephrectomy in dogs: an initial experience of 16 experimental procedures.

Kim YK, Park SJ, Lee SY, Suh EH, Lee L, Lee HC, Yeon SC.

Left laparoscopic nephrectomy was performed in 16 dogs to describe the surgical techniques and initial experiences associated with operation time and surgery complications. The renal vein and artery were occluded by three ligating clips, respectively, and the ureter was sectioned after ligation with ligating clips at the level of the iliac vessels. A morcellation technique was used to remove the kidney from the abdominal cavity after placing it into a specimen retrieval bag. Total operation time and time spent for each different surgical stage in the first five operations were compared with those in the last five of the 16 operations. The factors that affected the differences of total operation time were examined, including sex, bodyweight, number of operations, incision length, and surgical stages. Six intra-operative complications occurred including splenic hemorrhage (3 cases), torn specimen retrieval bag during kidney morcellation (1 case), and subcutaneous emphysema (2 cases). Surgical time for laparoscopic nephrectomy was affected primarily by the time spent for renal vascular pedicle section and could be decreased as the number of cases increased. Thus, laparoscopic nephrectomy using ligating clips and morcellation for kidney removal could be considered where nephrectomy is indicated in dogs.

Vet J. 2013 Dec;198(3):625-30. doi: 10.1016/j.tvjl.2013.09.015. Epub 2013 Sep 21.

Follow-up protein profiles in urine samples during the course of obstructive feline idiopathic cystitis.

Treutlein G, Deeg CA, Hauck SM, Amann B, Hartmann K, Dorsch R.

Feline idiopathic cystitis (FIC) is a common lower urinary tract disorder in cats, which often recurs. Published reports document increased urine fibronectin and thioredoxin concentrations in cats with FIC compared with healthy control cats. Therefore, these proteins might be of interest in the pathophysiology of FIC. The purpose of the present study was to evaluate variations in these urine proteins throughout the course of FIC by assessing their concentrations in urine specimens from cats with a history of obstructive FIC. Urine total protein (TP) was measured using the Bradford assay, while urine fibronectin and thioredoxin concentrations were determined by Western blot analysis. Urine TP was significantly higher in cats with obstructive FIC at presentation (day 0) than in healthy control cats ($P < 0.01$). There were significant decreases in urine TP in cats with obstructive FIC after 3 months ($P < 0.01$). Significantly higher urine fibronectin ($P < 0.01$) and thioredoxin ($P < 0.05$) concentrations were demonstrated in cats with FIC at day 0 compared to control cats, but there was no significant change over time ($P > 0.05$). Increased concentrations of these proteins over time might

reflect ongoing structural and pathological alterations to functional processes in the urinary bladders of cats with obstructive FIC.

Vet J. 2013 Dec;198(3):678-83. doi: 10.1016/j.tvjl.2013.09.062. Epub 2013 Oct 1.

Causes of death and the impact of histiocytic sarcoma on the life expectancy of the Dutch population of Bernese mountain dogs and Flat-coated retrievers.

Erich SA, Rutteman GR, Teske E.

Bernese mountain dogs and Flat-coated retrievers are predisposed to hereditary oncological diseases. Since 1986 several authors have reported a high prevalence of tumours in both breeds, especially malignant histiocytosis/histiocytic sarcoma, which has a negative influence on life expectancy. However, many earlier reports included relatively low numbers of dogs, distributed over a small number of broad categories, often using outdated disease criteria. The aim of this study was to provide new data on causes of death, and the relative role of tumours, especially histiocytic sarcoma, collected and verified in a large number of dogs of both breeds in co-operation with dog owners and veterinarians. The study demonstrates that the death of at least 55.1% of Bernese mountain dogs and 63.8% of Flat-coated retrievers is associated with malignant tumours. In addition, it appears that over 1/7 of all Bernese mountain dogs and Flat-coated retrievers die because of histiocytic sarcoma. This emphasises the need for further research on tumours, especially histiocytic sarcoma.

Vet J. 2013 Dec;198(3):723-4. doi: 10.1016/j.tvjl.2013.09.008. Epub 2013 Sep 17.

Evaluation of renal impairment in dogs after envenomation by the common European adder (*Vipera berus berus*).

Palviainen M, Raekallio M, Vainionpää M, Lahtinen H, Vainio O.

Envenomation by the common European adder (*Vipera berus berus*) causes clinical renal injury in dogs. In this study, serum concentrations of albumin, creatinine, total protein and urea were measured in 32 dogs bitten by adders. Urinary creatinine, protein, and retinol binding protein 4 concentrations, and the activities of γ -glutamyl transpeptidase (GGT) and alkaline phosphatase (ALP), were measured in 32 affected dogs and 23 healthy controls. Clinical assessment was conducted with a grading scale and a renal function score was applied to classify dogs based on laboratory findings. Urinary protein:creatinine, GGT:creatinine and ALP:creatinine ratios appear to be useful in evaluating renal impairment in dogs with adder envenomation. Increasing kidney function score was correlated with increased urinary ALP:creatinine and GGT:creatinine ratios.

Veterinary Pathology

Vet Pathol. 2013 Jan;50(1):147-55. doi: 10.1177/0300985812453176. Epub 2012 Jul 5.

Histomorphometry of feline chronic kidney disease and correlation with markers of renal dysfunction.

Chakrabarti S, Syme HM, Brown CA, Elliott J.

Chronic kidney disease is common in geriatric cats, but most cases have nonspecific renal lesions, and few studies have correlated these lesions with clinicopathological markers of renal dysfunction. The aim of this study was to identify the lesions best correlated with renal function and likely mediators of disease progression in cats with chronic kidney disease. Cats were recruited through 2 first-opinion practices between 1992 and 2010. When postmortem examinations were authorized, renal tissues were preserved in formalin. Sections were evaluated by a pathologist masked to all clinicopathological data. They were scored semiquantitatively for the severity of glomerulosclerosis, interstitial inflammation, and fibrosis. Glomerular volume was measured using image analysis; the percentage of glomeruli that were obsolescent was recorded. Sections were assessed for

hyperplastic arteriosclerosis and tubular mineralization. Kidneys from 80 cats with plasma biochemical data from the last 2 months of life were included in the study. Multivariable linear regression ($P < .05$) was used to assess the association of lesions with clinicopathological data obtained close to death. Interstitial fibrosis was the lesion best correlated with the severity of azotemia, hyperphosphatemia, and anemia. Proteinuria was associated with interstitial fibrosis and glomerular hypertrophy, whereas higher time-averaged systolic blood pressure was associated with glomerulosclerosis and hyperplastic arteriosclerosis.

Vet Pathol. 2013 Jul;50(4):676-81. doi: 10.1177/0300985812465326. Epub 2012 Nov 6.

Cutaneous metastasis of transitional cell carcinoma in 12 dogs.

Reed LT, Knapp DW, Miller MA.

In humans, cutaneous metastasis of transitional cell carcinoma (TCC) has been attributed to direct extension, lymphatic or hematogenous dissemination, or surgical implantation. The purpose of this study was to characterize the clinical and histologic features of cutaneous TCC metastasis, confirmed by uroplakin-III immunohistochemistry, in dogs. The 12 cases were 9 spayed female and 3 neutered male dogs, 6 to 14 years old (mean, 11 years). Four dogs had a history of urinary incontinence. Three had undergone abdominal surgery for TCC diagnosis or treatment. The primary neoplasms were 7 papillary infiltrating and 5 nonpapillary infiltrating TCC. Cutaneous lesions were detected at a mean of 123 days (median, 38 days) after diagnosis of the primary TCC and appeared as plaques, papules, or nodules in, with 1 exception, perineal, inguinal, or ventral abdominal dermis or subcutis. Of 8 dogs with dermal TCC, 5 had epidermal erosion or ulceration. In 10 dogs, TCC was detected in cutaneous lymphatic vessels, identified by endothelial immunoreactivity for Prox1. Metastases were also detected in lymph nodes in all dogs and at distant noncutaneous sites, usually the lungs, in 10 dogs. Mean survival after diagnosis was 162 days (median, 90 days). Despite medical treatment of 10 dogs after the development of cutaneous metastasis, remission was not achieved; 4 dogs had stable disease. Although TCC could have spread to skin by direct extension or lymphatic or vascular dissemination, the proximity of most cutaneous metastases to the vulva or prepuce raises the additional possibility of transepidermal spread through urine-scalded skin.

Vet Pathol. 2013 Sep;50(5):753-60. doi: 10.1177/0300985812459336. Epub 2012 Sep 6.

Light and electron microscopic analysis of consecutive renal biopsy specimens from leishmania-seropositive dogs.

Aresu L, Benali S, Ferro S, Vittone V, Gallo E, Brovida C, Castagnaro M.

Canine visceral leishmaniasis frequently causes renal damage that leads to chronic kidney disease. Fifteen dogs seropositive for *Leishmania* were selected and biopsied before (T0) and 60 days later after (T1) treatment with a specific anti-*Leishmania* pharmacological agent. Various parameters were selected for evaluating the glomerular and tubulointerstitial damage. At T0, mesangioproliferative and membranoproliferative glomerulonephritis were observed in 6 dogs, chronic glomerulosclerosis in 5, and end-stage kidney in 3; renal tissue from 1 dog was within normal histologic limits. The most frequently observed ultrastructural changes were foot-process effacement, thickening of the basement membranes, and immune deposits. One dog had mesangial immune deposits at T1 that had not been present at T0, so the diagnosis was changed to mesangioproliferative glomerulonephritis. In dogs with end-stage kidney, the number of obsolescent glomeruli and cystic atrophied glomeruli was increased at T1. However, progression of the glomerular lesions was minimal in most dogs. Worsening of tubulointerstitial scores was evident in the dogs with the most severe lesions at the first biopsy. Progression of the tubulointerstitial damage was minimal in the mildly affected dogs, and the interstitial inflammation was abated. In conclusion, renal lesions can progress over a 60-day period in canine leishmaniasis. A longer period between the renal biopsies would be necessary to demonstrate more severe changes. In addition a specific anti-*Leishmania* treatment could have a significant effect in the early stages of the disease.

Veterinary Radiology & Ultrasound

Vet Radiol Ultrasound. 2013 Jan-Feb;54(1):17-24. doi: 10.1111/j.1740-8261.2012.01985.x. Epub 2012 Sep 11.

Effects of furosemide on ureteral diameter and attenuation using computed tomographic excretory urography in normal dogs.

Secrest S, Essman S, Nagy J, Schultz L.

One of the limitations of computed tomographic excretory urography (CTEU) for diagnosis of ureteral disease in dogs is that normal ureteral peristalsis can cause intermittent and inconsistent filling. The aims of this study were to determine if the addition of furosemide to a standard CTEU protocol would increase identification of the ureteral segments, increase ureteral attenuation and increase ureteral diameter in normal dogs. Standard and furosemide-enhanced CTEU scans were acquired in 14 healthy dogs 3 and 10 minutes postcontrast. Ureteral diameters, attenuation values, and percent ureteral filling scores were recorded without the knowledge of furosemide treatment. Comparisons were made between treatments for each postcontrast scan time. The addition of furosemide to the CTEU protocol improved visualization of the ureters by significantly increasing the number of ureteral segments that were able to be identified, as well as their diameter when imaging the patient 3 min following contrast injection ($P = 0.012$). No major side effects were observed at the dose of 4 mg/kg. There was no advantage to imaging dogs 10 min following contrast administration as the ureteral segments were less attenuating and a smaller percentage of the ureter could be identified. We conclude that the addition of furosemide to canine CTEU studies is safe and may help improve visualization of the ureters.

Vet Radiol Ultrasound. 2013 Mar-Apr;54(2):127-32. doi: 10.1111/vru.12007. Epub 2012 Dec 20.

Estimation of feline renal volume using computed tomography and ultrasound.

Tyson R, Logsdon SA, Werre SR, Daniel GB.

Renal volume estimation is an important parameter for clinical evaluation of kidneys and research applications. A time efficient, repeatable, and accurate method for volume estimation is required. The purpose of this study was to describe the accuracy of ultrasound and computed tomography (CT) for estimating feline renal volume. Standardized ultrasound and CT scans were acquired for kidneys of 12 cadaver cats, in situ. Ultrasound and CT multiplanar reconstructions were used to record renal length measurements that were then used to calculate volume using the prolate ellipsoid formula for volume estimation. In addition, CT studies were reconstructed at 1 mm, 5 mm, and 1 cm, and transferred to a workstation where the renal volume was calculated using the voxel count method (hand drawn regions of interest). The reference standard kidney volume was then determined ex vivo using water displacement with the Archimedes' principle. Ultrasound measurement of renal length accounted for approximately 87% of the variability in renal volume for the study population. The prolate ellipsoid formula exhibited proportional bias and underestimated renal volume by a median of 18.9%. Computed tomography volume estimates using the voxel count method with hand-traced regions of interest provided the most accurate results, with increasing accuracy for smaller voxel sizes in grossly normal kidneys (-10.1 to 0.6%). Findings from this study supported the use of CT and the voxel count method for estimating feline renal volume in future clinical and research studies.

Vet Radiol Ultrasound. 2013 Jul;54(4):343-50. doi: 10.1111/vru.12029. Epub 2013 Mar 15.

Comparison between bolus tracking and timing-bolus techniques for renal computed tomographic angiography in normal cats.

Mai W, Suran JN, Cáceres AV, Reetz JA.

Renal dual-phase computed tomographic angiography (CTA) is used to assess suitability of feline donors prior to transplantation. A prerequisite for successful CTA is optimal synchronization between the arterial passage of contrast material and CT data acquisition. This retrospective study was conducted to compare quality of renal vascular enhancement at dual-phase CTA in normal cats between two techniques of timing of data acquisition: the timing-bolus and the bolus tracking method. Nine cats were scanned using the timing-bolus technique and 14 with the bolus tracking technique using otherwise similar scanning parameters in a 16-slice multidetector row CT scanner. The quality of enhancement of the renal vessels at the scanned arterial phase and venous phase was assessed both subjectively and objectively by three board-certified radiologists. Arterial enhancement was not observed at the scanned arterial phase in three of the nine cats with the timing-bolus technique but only 1 of the 14 cats with the bolus tracking technique. Early venous enhancement at the scanned arterial phase was common with the bolus tracking technique. Data acquisition was significantly faster with the bolus tracking technique. We conclude that the bolus tracking technique is a valid technique that could be integrated into the routine protocol for 16-detector row CT renal angiography in cats.

Vet Radiol Ultrasound. 2013 Jun 6. doi: 10.1111/vru.12069. [Epub ahead of print]

ULTRASOUND APPEARANCE OF THE OUTER MEDULLA IN DOGS WITHOUT RENAL DYSFUNCTION.

Hart DV, Winter MD, Conway J, Berry CR.

Ultrasound findings of the canine kidney include a hyperechoic cortex and a hypo to anechoic medulla. In this study, the sonographic appearance of the outer renal medulla in dogs without evidence of renal disease is described. Dogs that underwent abdominal ultrasound over a 6-month period were subjected to review and then divided into six groups based on body weight (kg): < 4.9, 5.0-9.9, 10-19.9, 20-29.9, 30-39.9, and ≥ 40 . Chi-square analysis was used to determine if the frequency of a hyperechoic outer medulla was significantly different between weight groups, sex, and age (P -value < 0.05). Of the 145 dogs that met the inclusion criteria, 45 had a hyperechoic outer medulla relative to the cortex and inner medulla. In the remaining dogs, the outer medulla was isoechoic to the cortex. Dogs less than 5 kg had the highest frequency of a hyperechoic outer medulla ($P < 0.0001$) and dogs greater than 40 kg did not have a hyperechoic outer medulla ($P < 0.0001$). Sex had no influence on the presence or absence of the hyperechoic outer medulla; however, younger dogs were overrepresented (6.4 ± 0.6 years compared with 7.8 ± 0.4 years; $P = 0.04$). Ultrasound descriptions of the canine kidney have not taken into account the contributions of the renal cortex and outer medulla. Based on this study of dogs with no clinically significant renal disease, the outer medulla can be isoechoic or hyperechoic to the cortex and a hyperechoic outer medulla is more commonly seen in small breed dogs.

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EFFECT OF ANISOTROPY AND SPATIAL COMPOUND IMAGING ON RENAL CORTICAL ECHOGENICITY IN DOGS.

Ruth JD, Heng HG, Miller MA, Constable PD.

The echogenicity of the renal cortex is an important parameter to consider in dogs that are suspected to have renal dysfunction. Focal increases in echogenicity have been attributed to neoplasia, infection, calcification, fibrosis, gas, and infarction. Anisotropic backscatter has been described as a source of focally increased renal cortical echogenicity in several species. The source of anisotropy appears to be the medullary rays, which are oriented perpendicular to the renal capsule. Spatial compound imaging (SCI) is an ultrasound setting that uses beam steering to acquire and average several overlapping scans of an object from different view angles, creating a compound image that is updated in real time. The impact of insonation angle and SCI on renal cortical echogenicity was evaluated *ex vivo* in eight kidneys from four dogs. Significant angle-dependent differences in cortical echogenicity were detected with both microconvex and linear transducers ($P <$

0.0001). Furthermore, the angle-dependent echogenicity differences persisted when SCI mode was used. Our finding that echogenicity was increased using a perpendicular insonation angle (90°) relative to the tubules, compared to a parallel insonation angle (0°) should assist in the interpretation of ultrasonographic images of the dog kidney.

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ULTRASONOGRAPHIC FINDINGS RELATED TO PROGNOSIS IN CANINE TRANSITIONAL CELL CARCINOMA.

Hanazono K, Fukumoto S, Endo Y, Ueno H, Kadosawa T, Uchide T.

In human bladder cancer patients, ultrasonography is extensively used not only to identify tumor masses but also to evaluate tumor size, shape, echogenicity, location, and degree of tumor invasion into the bladder wall. The information revealed by ultrasonography delineates the tumor's biological features and facilitates prediction of prognosis. However, in veterinary medicine the feasibility of using ultrasonography for these purposes has not been fully investigated. In this retrospective study, we reviewed cases of dogs with histologically confirmed bladder mass lesions, including transitional cell carcinoma (n = 22) and polypoid cystitis (n = 5), to determine whether ultrasonography could reliably predict bladder wall involvement. By following patients with transitional cell carcinoma until death, we also determined whether ultrasonographic tumor size, shape, echogenicity, and mass location were related to prognosis. Wall involvement as revealed by ultrasound was significantly (P = 0.00005) associated with histological muscular layer involvement with a sensitivity of 93% (95% Confidence interval, 79-98%) and specificity of 92% (95% Confidence interval, 76-98%). Ultrasonographic wall involvement (P = 0.03, vs. noninvolvement), heterogeneous mass (P = 0.02, vs. homogeneous mass), and trigone location (P = 0.01, vs. other locations) characteristics were significantly associated with shorter survival times in transitional cell carcinoma cases. Findings indicated that ultrasonographic characteristics such as wall involvement, heterogeneous mass, and trigone location could be reliable prognostic indicators in canine transitional cell carcinoma.

The Veterinary Record

Vet Rec. 2013 Feb 16;172(7):181. doi: 10.1136/vr.101100. Epub 2012 Nov 23.

A novel tetravalent *Leptospira* bacterin protects against infection and shedding following challenge in dogs.

Klaasen HL, van der Veen M, Molkenboer MJ, Sutton D.

Recent evidence based on the current epidemiological situation suggests that vaccines against canine leptospirosis in Europe should be directed against infection with *Leptospira interrogans* (sensu lato) serogroups Canicola, Icterohaemorrhagiae, Grippotyphosa and Australis. In the eight studies presented here, dogs were vaccinated with Nobivac L4 (MSD Animal Health), a new tetravalent inactivated vaccine containing antigen from four strains representing these four serogroups. The dogs were then challenged, together with unvaccinated control dogs, using heterologous strains from the same four serogroups. In four of the studies, pups without agglutinating antibodies against the four serogroups were vaccinated with Nobivac L4 vaccine. In a further four studies, Nobivac L4 vaccine was given 48 hours after administration of antiserum from vaccinated dogs designed to mimic the serological status of pups with maternally derived antibodies against these serogroups. In all eight studies, vaccine efficacy was assessed in terms of antibody response, clinical signs, fever, thrombocyte count, frequency of positive isolation of challenge organisms from blood, urine and kidney and frequency of interstitial nephritis. The results demonstrate that Nobivac L4 vaccine induces sterile immunity against leptospirosis and renal infection with strains of serogroups Canicola, Icterohaemorrhagiae and Grippotyphosa, and induces sterile immunity against leptospirosis with a strain of serogroup Australis. Since sterile immunity was achieved in pups pretreated with antiserum as well, it can be concluded that this vaccine is also likely to be efficacious in the face of maternally derived antibodies in pups from the age of six weeks.

Vet Rec. 2013 Apr 6;172(14):363. doi: 10.1136/vr.101056. Epub 2013 Feb 8.

Recent shifts in the global proportions of canine uroliths.

Lulich JP, Osborne CA, Albanan H, Koehler LA, Ulrich LM, Lekcharoensuk C.

Epidemiological surveys are important tools to identify emerging trends in disease. The Minnesota Urolith Centre has been tracking the occurrence of uroliths for over 30 years. To evaluate global changes in the frequencies of canine uroliths, submissions to the Minnesota Urolith Centre in 1999 and 2000 (n = 39,965) were compared with submissions in 2009 and 2010 (n = 99,598). The proportion of calcium oxalate uroliths rose on every continent except in Europe. Seventy-five per cent of dogs with calcium oxalate uroliths were between 5 and 11 years old. The proportion of struvite uroliths decreased on every continent except in Australia-Oceania. Seventy-seven per cent of all struvite formers were between two and eight years old. The proportion of purine uroliths has declined slightly. Worldwide, uroliths composed of cystine, calcium phosphate, calcium phosphate carbonate and silica remain uncommon. Epidemiological studies of urolithiasis are essential for constructing effective experimental designs and selecting appropriate cases and controls to conduct clinical trials with meaningful results.

Vet Rec. 2013 Jun 22;172(25):663. doi: 10.1136/vr.100662. Epub 2013 May 28.

Short-term outcome following concurrent surgical treatment of ureteral ectopia and intrapelvic urinary bladder in nine neutered bitches.

Treback P, Jurka P.

Vet Rec. 2013 Jul 13;173(2):41. doi: 10.1136/vr.101326. Epub 2013 Jun 19.

Comparison of terazosin and prazosin for treatment of vesico-urethral reflex dyssynergia in dogs.

Haagsman AN, Kummeling A, Moes ME, Mesu SJ, Kirpensteijn J.

Nineteen dogs with vesico-urethral reflex dyssynergia (VURD) were treated with prazosin or terazosin 0.5 mg/kg twice daily to compare efficacy and side effects. Dogs were referred because of signs of (partial) urethral obstruction. Physical examination, abdominal ultrasonography, urinalysis and a radiographic contrast study of bladder and urethra (urethrocytography) were routinely performed. If no mechanical causes of obstruction or disease of the distal urinary tract were observed, the diagnosis VURD was presumed and the dogs were included in our study. Follow-up information was obtained from owners or referring veterinarians. Significantly more side effects were seen in the dogs treated with terazosin (n=14; 93 per cent) compared with the dogs treated with prazosin (n=5; 20 per cent; P=0.002). Effects of the treatment were comparable between prazosin and terazosin. Labradors and dogs that were castrated surgically had a significant better survival (P<0.01) compared with other breeds and animals that were castrated chemically. There was a moderate to good effect in 60 per cent of the dogs treated with prazosin, and in 64 per cent of the dogs treated with terazosin.

Vet Rec. 2013 Sep 7;173(9):219. doi: 10.1136/vr.101237. Epub 2013 Aug 2.

The effect of disease on the urinary purine metabolite concentrations in dogs.

Rivara CM, Johnson CR, Lulich JP, Osborne CA, Murtaugh M.

This prospective study was designed to determine the urinary concentrations of purine metabolites in healthy and diseased dogs. The goals were to test the hypothesis that urine concentrations of terminal purine metabolites will identify dogs with diseases that disturb purine degradation. Five hundred and sixty-three client-owned dogs admitted sequentially to the veterinary medical centre were included. Dogs were divided into groups on the basis of their disease. Urine concentrations of xanthine, uric acid, allantoin and creatinine were measured by high-pressure liquid chromatography. Xanthine and uric acid to creatinine ratios were significantly increased in dogs with chronic kidney

disease ($p = 0.01$). The uric acid to creatinine ratio was significantly increased in dogs with cancer compared with clinically healthy dogs ($p = 0.04$), and significantly increased in dogs receiving chemotherapy for their disease ($p < 0.01$). Compared to clinically healthy dogs, xanthine and uric acid to creatinine ratios were significantly increased in dogs with hyperadrenocorticism ($p < 0.01$, and 0.04 , respectively). Therefore, the results of this study found that the urinary concentrations of purine metabolites in dogs are significantly impacted by systemic disease. Cancer, chronic kidney disease, and hyperadrenocorticism are associated with altered concentrations of urinary purine metabolites in dogs.

Vet Rec. 2013 Dec 7;173(22):549. doi: 10.1136/vr.101482. Epub 2013 Oct 24.

Prevalence and antimicrobial resistance of canine urinary tract pathogens.

Hall JL, Holmes MA, Baines SJ.

This study aims to describe the incidence and risk factors for positive urinary tract culture, the prevalence of urinary tract pathogens in single organism and mixed cultures and changes in their antimicrobial resistance over 10 years. A retrospective review of computer records detailing canine urine samples submitted between August 1999 and September 2009 for culture and sensitivity in a UK tertiary referral hospital is described. 17.5 per cent of 5923 samples (670 of 4530 dogs) were positive cultures. 85.3 per cent of cultures yielded a single isolate. The prevalence of bacterial species differed between mixed and single isolate cultures. Entire and neutered female dogs were more likely to return positive cultures than male dogs (OR=2.5 and 1.5, respectively). *Escherichia coli* was most commonly isolated (53.9 per cent) and affected female dogs, older dogs and neutered dogs more. There was an increase in the antimicrobial resistance of *Enterococcus faecalis* and *Pseudomonas Aeruginosa*, and a decrease in the effectiveness of enrofloxacin, cephalexin and oxytetracycline. The prevalence of urinary bacterial isolates is described for a large group of dogs. Monitoring changes in antimicrobial efficacy and microbial resistance guides the empirical use of antimicrobials for the treatment of urinary tract infection and helps formulate strategic plans to limit drug resistance.

Veterinary Surgery

Vet Surg. 2013 Jan;42(1):12-8. doi: 10.1111/j.1532-950X.2012.01043.x. Epub 2012 Nov 19.

Outcome after placement of an artificial urethral sphincter in 27 dogs.

Reeves L, Adin C, McLoughlin M, Ham K, Chew D.

OBJECTIVE: To evaluate the safety and efficacy of an adjustable artificial urethral sphincter (AUS) in a population of dogs with acquired or congenital urinary incontinence.

STUDY DESIGN: Case series.

ANIMALS: Dogs ($n = 27$) with naturally occurring urinary incontinence.

METHODS: Medical records (January 2009-July 2011) of dogs that had AUS implantation for treatment of urinary incontinence were reviewed and owners were interviewed by telephone to assess outcome. Continence was scored using a previously established analogue scale, with 1 representing constant leakage and 10 representing complete continence.

RESULTS: Twenty-four female and 3 male dogs had AUS implantation. Causes of incontinence included urethral sphincter mechanism incompetence ($n = 18$), continued incontinence after ectopic ureter repair (6), and pelvic bladder (3). Medical therapy was unsuccessful in 25 dogs before AUS implantation. Surgery was performed without major complications in 25 dogs; 2 developed partial urethral obstruction after 5 and 9 months. Median (interquartile range) follow-up for the other 25 dogs was 12.5 (6-19) months. Continence scores were significantly improved ($P < .0001$) between the preoperative period (2 [1-4]) and last follow-up (9 [8-10]). Overall, 22 owners described themselves as very satisfied, 2 as satisfied, and 3 as unsatisfied.

CONCLUSIONS: AUS implantation was successful in restoring continence in male and female dogs with both congenital and acquired urinary incontinence. Dogs that develop partial urethral obstruction may require AUS removal.

Vet Surg. 2013 May;42(4):440-7. doi: 10.1111/j.1532-950X.2012.01040.x. Epub 2013 Jan 8.

Use of a percutaneously controlled urethral hydraulic occluder for treatment of refractory urinary incontinence in 18 female dogs.

Currao RL, Berent AC, Weisse C, Fox P.

OBJECTIVE: To evaluate the efficacy and safety of a percutaneously controlled urethral hydraulic occluder (HO) device for the treatment of refractory urinary incontinence (RUI) in female dogs with various urogenital anomalies.

STUDY DESIGN: Case series.

ANIMALS: Female dogs with RUI (n = 18).

METHODS: Retrospective evaluation of dogs after a silicone ring (HO) was surgically placed around the proximal urethra. The ring was connected to a subcutaneous injection port with actuating tubing. Residual incontinence was treated with percutaneous infusion of sterile saline into the device to provide extraluminal urethral compression. Dogs were assessed for continence (owner-assessed 10-point continence scale) and complications at standard time points.

RESULTS: All 18 dogs had significantly improved continence scores ($P < .001$) after HO placement (median and mean score pre-HO = 2.8 and 3.3; post-HO = 10 and 8.9, respectively) with a median follow-up time of 32 months. "Functional" continence (score ≥ 9) was achieved in 67% of dogs after HO placement, though only 13/18 clients were compliant with inflations. Of dogs belonging to compliant owners, 12 (92%) had a functional continence score. Six dogs (33%) did not require inflation to achieve continence. Urethral obstruction occurred as a complication in 3 dogs.

CONCLUSIONS: Use of an HO device was an effective long-term treatment for RUI when traditional options failed. The technique was associated with some complications, and these risks should be considered before use.

Vet Surg. 2013 Jun;42(5):565-71. doi: 10.1111/j.1532-950X.2013.01092.x. Epub 2013 Feb 1.

Experimental and clinical evaluation of transperitoneal laparoscopic ureteronephrectomy in dogs.

Mayhew PD, Mehler SJ, Mayhew KN, Steffey MA, Culp WT.

To report a surgical technique for transperitoneal laparoscopic ureteronephrectomy (TLU) in dogs and describe complications and outcome in a cohort of dogs.

Experimental study and case series.

Purpose-bred research dogs (n = 3) and canine clinical cases (9).

In 11 of 12 dogs, a 3 port laparoscopic approach was used and in 1 dog a 4-port approach was used. Incision through the retroperitoneal space was followed by early dissection of the ureter to aid retraction and elevation of the renal hilus. Dissection was performed principally by use of a vessel-sealing device. Ligation of the renal hilar vessels was accomplished using laparoscopic hemoclips. Experimental dogs were euthanatized and necropsied.

In 3 experimental dogs, no intraoperative complications occurred and conversion to an open approach was unnecessary. Of 9 clinical cases, conversion to an open approach was required in 2 dogs, because of severe hydroureter obscuring observation in 1, and uncontrollable retroperitoneal hemorrhage in the other dog. In 1 dog hemorrhage from the renal capsule and renal vein was controlled laparoscopically. No other major complications occurred. All dogs were discharged. Transperitoneal laparoscopic ureteronephrectomy is feasible in dogs although conversion to an open approach should be considered when uncontrollable hemorrhage is encountered or the view is obscured by anatomic alteration.

Vet Surg. 2013 Jun;42(5):579-85. doi: 10.1111/j.1532-950X.2013.01097.x. Epub 2013 Feb 1.

Laparoscopic-assisted placement of a peritoneal dialysis catheter with partial omentectomy and omentopexy in dogs: an experimental study.

Dupré G, Coudek K.

To describe a technique of laparoscopic-assisted placement of a peritoneal dialysis (PD) catheter with simultaneously performed partial omentectomy and omentopexy.

Pilot experimental study.

Beagle dogs (n = 6).

After placement of 1 sub-umbilical laparoscope portal and 1 instrument portal in the left cranial abdominal quadrant, laparoscopic-assisted partial omentectomy, and omentopexy were performed, and a modified Tenckhoff PD catheter was placed under laparoscopic guidance. A modified dialysis protocol was used twice daily for 4 days. The feasibility of the procedure, surgical duration, operative complications, and dialysis efficacy were evaluated. Postoperative pain and inflammation were graded (0-3).

The procedure was successfully performed in all dogs with a median operating time of 25 minutes. No operative complications occurred. Procedure-related postoperative pain and inflammation were minimal. Eight consecutive PD procedures were successfully performed, and no leakage or obstruction was observed.

Laparoscopic-assisted partial omentectomy and omentopexy can be performed at the same time as PD catheter placement with minimal morbidity.

Vet Surg. 2013 Sep 3. doi: 10.1111/j.1532-950X.2013.12052.x. [Epub ahead of print]

Evaluation of percutaneously adjustable hydraulic urethral sphincters with and without induced mechanical failure.

Tong K, Nelson LL, Hauptman J, Nelson NC.

To describe (1) the radiographic appearance of intact hydraulic urethral sphincters (HUS) and (2) the success of leak detection using clinically feasible methods.

Prospective, blinded in vitro study.

Thirty HUS devices (10 each of 8, 10, and 12 mm diameter sizes).

All devices were inflated with saline (0.9% NaCl) solution to complete occlusion, inspected, and weighed over a 24-hour period for manufacturing defects. HUS phantoms were created to mimic surrounding soft tissues. One randomly selected HUS of each size was evaluated radiographically at different inflation volumes and angles. All HUS systems were then evaluated in random order before and after puncture with volumetry, manometry, radiography, and contrast fluoroscopy. Volumetry was the total volume (mL) retrieved from each HUS system. Manometry was the pressure (cm H₂O) within each HUS system. The HUS devices were filled to a known volume before each measurement. When all HUS sizes were considered, volumetry did not reveal significant differences before and after puncture, but manometry was significantly different (P < .001). Radiography was 63.8% sensitive and 88.3% specific for puncture diagnosis, with inter-observer agreement of 0.58. Contrast fluoroscopy was 78.4% sensitive and 100% specific, with inter-observer agreement of 0.97.

Of those methods tested, contrast fluoroscopy was the most sensitive, specific, and consistent method of leak detection. Manometry was also helpful, but may be difficult to use clinically.

Volumetry and radiography were relatively poor indicators of leakage in this model.