

ESVNU READING LIST NEPHROLOGY / UROLOGY 2011

American Journal of Veterinary Research

Am J Vet Res. 2011 Jan;72(1):146-51.

Evaluation of the effects of thiopental, propofol, and etomidate on glomerular filtration rate measured by the use of dynamic computed tomography in dogs.

Chang J, Kim S, Jung J, Lee H, Chang D, Lee Y, Lee I, Yoon J, Choi M.

OBJECTIVE: To evaluate the effects of thiopental, propofol, and etomidate on glomerular filtration rate (GFR) measured by the use of dynamic computed tomography in dogs.

ANIMALS: 17 healthy Beagles.

PROCEDURES: Dogs were randomly assigned to receive 2 mg of etomidate/kg (n = 5), 6 mg of propofol/kg (7), or 15 mg of thiopental/kg (5) during induction of anesthesia; anesthesia was subsequently maintained by isoflurane evaporated in 100% oxygen. A 1 mL/kg dosage of a 300 mg/mL solution of iohexol was administered at a rate of 3 mL/s during GFR measurement. Regions of interest of the right kidney were manually drawn to exclude vessels and fatty tissues and highlight the abdominal portion of the aorta. Iohexol clearance per unit volume of the kidney was calculated by use of Patlak plot analysis.

RESULTS: Mean \pm SD weight-adjusted GFR of the right kidney after induction of anesthesia with thiopental, propofol, and etomidate was 2.04 ± 0.36 mL/min/kg, 2.06 ± 0.29 mL/min/kg, and 2.14 ± 0.43 mL/min/kg, respectively. However, no significant differences in weight-adjusted GFR were detected among the treatment groups.

CONCLUSIONS AND CLINICAL RELEVANCE: Results obtained for the measurement of GFR in anesthetized dogs after anesthetic induction with etomidate, propofol, or thiopental and maintenance with isoflurane did not differ significantly. Therefore, etomidate, propofol, or thiopental can be used in anesthesia-induction protocols that involve the use of isoflurane for maintenance of anesthesia without adversely affecting GFR measurements obtained by the use of dynamic computed tomography in dogs.

Am J Vet Res. 2011 Mar;72(3):345-9.

Evaluation of triphasic helical computed tomography of the kidneys in clinically normal dogs.

Lee S, Jung J, Chang J, Yoon J, Choi M.

OBJECTIVE: To determine computed tomography (CT) delay times by use of a sequential scan and identify the normal enhancement pattern in each phase of a triphasic CT scan of the kidneys in dogs.

ANIMALS: 14 healthy Beagles.

PROCEDURES: A sequential CT scan was used for investigating delay time, and a triphasic helical CT scan was used for identifying the normal enhancement pattern and determining Hounsfield unit values in the kidneys of dogs.

RESULTS: In the cine scan (single-slice dynamic scan), the optimal delay times were 10 seconds in the corticomedullary phase and 44 seconds in the nephrographic phase, after contrast medium injection. By use of triphasic CT images, Hounsfield unit values were acquired in each phase.

CONCLUSIONS AND CLINICAL RELEVANCE: Triphasic CT of the kidneys in clinically normal dogs was established by acquisition of delay times in a cine scan and may become an important imaging modality in the diagnosis of renal diseases and in treatment planning in dogs.

Am J Vet Res. 2011 Apr;72(4):578-82.

Urodynamic evaluation of female cats with idiopathic cystitis.

Wu CH, Buffington CA, Fraser MO, Westropp JL.

OBJECTIVE: To compare values of urodynamic measurements of cats with idiopathic cystitis (IC) with previously published data for healthy female cats.

ANIMALS: 11 female cats with IC.

PROCEDURES: 2 sequential cystometrograms and 2 urethral pressure profiles were obtained for each cat. All tracings were evaluated for evidence of overactive urinary bladder (OAB). Maximum urethral pressure (MUP), maximum urethral closure pressure (MUCP), and functional profile length were recorded.

RESULTS: Only 3 cats had obvious micturition events. None of the 11 cats had evidence of OAB.

Although not significant, threshold pressure was lower in cats with IC than in healthy cats (mean \pm SD, 89.0 ± 12.0 cm H₂O vs 75.7 ± 16.3 cm H₂O, respectively); however, the total volume infused was significantly lower in cats with IC (4.8 ± 2.1 mL/kg vs 8.3 ± 3.2 mL/kg). The MUCP was significantly higher in cats with IC than in healthy cats (158.0 ± 47.7 cm H₂O vs 88.9 ± 23.9 cm H₂O, respectively). The MUP was also significantly higher in all portions of the urethra in cats with IC.

CONCLUSIONS AND CLINICAL RELEVANCE: No evidence of OAB was identified in any cat evaluated; therefore, medications used to target this abnormality did not appear justified. The high MUCP in cats with IC suggested that $\alpha(1)$ -adrenoceptor antagonists or skeletal muscle relaxants may be useful in this disease, and if these data were applicable to male cats, then $\alpha(1)$ -adrenoceptor antagonism may help prevent recurrent obstructive IC. Further studies are indicated to determine the effects, if any, these drugs might have in cats with IC.

Am J Vet Res. 2011 Jun;72(6):843-50.

Effects of oral administration of N-acetyl-d-glucosamine on plasma and urine concentrations of glycosaminoglycans in cats with idiopathic cystitis.

Panchaphanpong J, Asawakarn T, Pusoonthornthum R.

OBJECTIVE: To determine the effects of once-daily oral administration of N-acetyl-d-glucosamine (NAG) on plasma and urine glycosaminoglycan (GAG) concentrations in cats with idiopathic cystitis (IC).

ANIMALS: 19 cats with IC and 10 clinically normal cats.

PROCEDURES: Cats with IC were randomly assigned to receive 250 mg of NAG in capsule form orally once daily for 28 days ($n = 12$) or a placebo (capsule containing cellulose) orally once daily for the same period (7). In cats with IC, plasma and urine GAG concentrations and urine creatinine concentration were measured on days 0 (immediately before first dose), 7, 14, 21, 28, and 56. For purposes of comparison, those variables were measured in 10 clinically normal cats on day 0.

RESULTS: Mean \pm SEM urine GAG-to-creatinine concentration ratios (day 0 data) for cats with IC and clinically normal cats differed significantly (3.11 ± 0.62 μ g/mL and 14.23 ± 3.47 μ g/mL, respectively). For cats with IC, mean plasma GAG concentration in NAG-treated cats (39.96 ± 5.34 μ g/mL) was higher than that in placebo-treated cats (24.20 ± 3.35 μ g/mL) on day 21. In the NAG-treated cats, plasma GAG concentration on days 21 (39.96 ± 5.34 μ g/mL) and 28 (39.91 ± 6.74 μ g/mL) differed significantly from the day 0 concentration (27.46 ± 3.90 μ g/mL).

CONCLUSIONS AND CLINICAL RELEVANCE: Cats with IC have lower urinary GAG-to-creatinine concentration ratios than did clinically normal cats. Administration of NAG (250 mg, PO, q 24 h) significantly increased plasma GAG concentrations in cats with IC after 21 days of treatment.

Am J Vet Res. 2011 Jul;72(7):918-23.

Effect of water content in a canned food on voluntary food intake and body weight in cats.

Wei A, Fascetti AJ, Villaverde C, Wong RK, Ramsey JJ.

Objective-To determine whether water content in a canned food diet induces decreases in voluntary energy intake (EI) or body weight (BW) in cats fed ad libitum. **Animals-**16 sexually intact male domestic shorthair cats. **Procedures-**Maintenance EI was determined for 2 months in 10 weight-

stable cats consuming a control diet (typical colony diet). Cats were allocated into 2 groups of equal BW and fed a canned diet (with-water [WW] diet) or a freeze-dried version of the canned diet (low-water [LW] diet) twice daily. Diets were identical in nutrient profile on a dry-matter basis. Each dietary treatment period of the crossover experiment lasted 3 weeks, with a 3-week washout period between diets. Body composition measurements were determined by use of deuterium oxide at the end of each dietary treatment. Daily food intake was measured for determination of dry-matter intake and EI. Six other cats were used in preference tests for the 3 diets. Results-EI was significantly decreased for the WW diet (mean \pm SD, 1,053.0 \pm 274.9 kJ/d), compared with EI for the LW diet (1,413.8 \pm 345.8 kJ/d). Cats had a significant decrease in BW during consumption of the WW diet. Body composition was unaltered by diet. In short-term preference tests, cats ate significantly more of the WW than the LW diet. Conclusions and Clinical Relevance-Bulk water in the WW diet stimulated decreases in EI and BW in cats. The impact of water content on energy density and food consumption may help promote weight loss in cats.

Am J Vet Res. 2011 Sep;72(9):1276-82.

Evaluation of glomerular filtration rate by use of dynamic computed tomography and Patlak analysis in clinically normal cats.

Chang J, Ahn S, Choi S, Lee H, Chang D, Choi H, Lee Y.

OBJECTIVE: To obtain quantitative variables of the abdominal aorta and both kidneys on the basis of time-attenuation curves (TACs) and to measure glomerular filtration rate (GFR) for each kidney and the global GFR in clinically normal cats by use of dynamic computed tomography (CT) and Patlak analysis.

ANIMALS: 9 healthy cats.

PROCEDURES: All the cats were anesthetized with propofol. Anesthesia was maintained by administration of isoflurane, and CT examination was performed in the anesthetized cats. The TACs and renal volume were measured by use of the baseline precontrast and single-slice dynamic scans. The CT-GFR of each kidney and the global CT-GFRs were calculated via Patlak plot analysis.

RESULTS: CT-GFR results from 7 cats were valid. Peak aortic enhancement was detected between 9.0 and 14.0 seconds after iohexol injection, and the initial peak time of renal parenchymal enhancement was 15 to 24 seconds after iohexol injection. Mean \pm SD global GFR was 2.06 \pm 0.62 mL/min/kg. Mean \pm SD CT-GFR of the right and left kidneys was 0.97 \pm 0.32 mL/min/kg and 1.05 \pm 0.31 mL/min/kg, respectively.

CONCLUSIONS AND CLINICAL RELEVANCE: The CT-GFR method can be rapidly and conveniently performed in clinically normal cats. This combined structural-functional approach provided physiologic and morphological information on the kidneys of cats.

Am J Vet Res. 2011 Oct;72(10):1407-15.

Comparison of urine protein profiles in cats without urinary tract disease and cats with idiopathic cystitis, bacterial urinary tract infection, or urolithiasis.

Lemberger SI, Deeg CA, Hauck SM, Amann B, Hirmer S, Hartmann K, Dorsch R.

OBJECTIVE: To characterize and compare the urine protein content in cats without urinary tract disease and cats with idiopathic cystitis (IdC), bacterial urinary tract infection (UTI), or urolithiasis.

ANIMALS: Control cats (n = 18) and cats with IdC (18), UTI (12), and urolithiasis (12) from which urine samples were obtained and 2 cats with obstructive IdC and 4 additional control cats from which postmortem urinary bladder biopsy specimens were obtained.

PROCEDURES: Protein contents in urine samples obtained via cystocentesis or catheterization were measured via the Bradford method. Urine proteins were separated by means of 1-dimensional gel electrophoresis. Evaluation of fibronectin content was performed via western blotting and immunohistochemical analysis. Urinary bladder biopsy specimens were examined histologically and analyzed immunohistochemically for fibronectin.

RESULTS: Urine fibronectin content was significantly greater in cats with IdC, compared with control cat findings. Urine fibronectin contents did not differ significantly among controls and cats with UTI or urolithiasis. Histologic examination of bladder biopsy specimens obtained from 2 cats with obstructive IdC revealed destruction of the urothelial lining of the urinary bladder and severe fibrosis; immunohistochemical analysis revealed few fluorescence signals for fibronectin, unlike findings in control bladder biopsy specimens.

CONCLUSIONS AND CLINICAL RELEVANCE: Results indicated that urine fibronectin content in cats with IdC was greater than that in controls, cats with UTI, or cats with urolithiasis. In cats with IdC, increased permeability of damaged urothelium may result in detachment and leakage of fibronectin into urine. Urine fibronectin might serve as a biomarker for diagnosis of IdC in cats.

Berliner und Münchner Tierärztliche Wochenschrift

Berl Munch Tierarztl Wochenschr. 2011 Jan-Feb;124(1-2):83-8.

Plasma and urine concentrations of marbofloxacin following single subcutaneous administration to cats.

Kietzmann M, Niedorf F, Kramer S, Hoffmann M, Schneider M, Vallé M, Pankow R.

The pharmacokinetic properties of marbofloxacin, a third generation fluoroquinolone, were investigated in 12 healthy adult cats after single subcutaneous (SC) administration of 2 mg/kg BW (Part I, n=8 cats) and 4 mg/kg BW (Part II, n=4 cats). In each part of the study blood and urine samples were collected before treatment and thereafter for 5 days. The plasma and urine concentrations of marbofloxacin were determined by HPLC with UV detection. Pharmacokinetic calculations were performed for each treated animal using an open one-compartment-model with first-order elimination after SC dosing. Marbofloxacin in plasma (means): Maximum concentrations (C_{max}) of about 1.2 and 3.0 microg/ml were measured 2.3 and 4 hours (t_{max}) after dosing of 2 and 4 mg/kg BW, respectively. Elimination from the body was low with a total clearance (Cl/F) of approximately 0.1 l/h/kg for both dosages. The half-life (t_{1/2}) for this process was calculated with 8-10 hours. AUC increased almost proportional when doubling the dose, i.e., 19.77 +/- 6.25 microg * h/ml (2 mg/kg BW) and 51.26 +/- 11.83 microg * h/ml (4 mg/kg BW). Plasma kinetics measured were in accordance with data from literature. Marbofloxacin in urine (means): Maximum drug concentrations were detected 4 and 8 hours after dosing with 70 microg/ml (2 mg/kg BW) and 160 microg/ml (4 mg/kg BW), respectively. Inhibitory effects of the urinary matrix on the antimicrobial activity of the drug were taken into account when performing PK/PD calculations. However, a concentration-dependent bactericidal activity (C_{max}/MIC > 8-10) which is claimed for fluoroquinolones was sufficiently met with focus on *Escherichia (E.) coli* (MIC₉₀ 0.5 microg/ml). In the same matrix a threshold value of 1.0 microg/ml was undercut 82 and 116 hours after SC dosing, respectively. Hence, a time-dependent bacteria killing kinetic (T > MIC) which may be of relevance for some Gram-positive germs like *Staphylococcus* spp. (MIC₉₀ 1.0 microg/ml) should be covered, too.

The Canadian Veterinary Journal

Can Vet J. 2011 Feb;52(2):162-4.

Urinary tract infection caused by methicillin-resistant *Staphylococcus pseudintermedius* in a dog.

Rubin JE, Gaunt MC.

A young neutered male pug dog was presented for evaluation of acute onset pollakiuria and hematuria. Culture and susceptibility testing of urine identified a methicillin-resistant *Staphylococcus pseudintermedius*, which was susceptible to only tetracycline among commonly used antimicrobials. Treatment with doxycycline led to bacteriological cure and resolution of clinical signs.

Can Vet J. 2011 Feb;52(2):177-80; quiz 180.

Clinical and computed tomography features of secondary renal hyperparathyroidism.

Vanbrugge B, Blond L, Carioto L, Carmel EN, Nadeau ME.

An atypical case of secondary renal hyperparathyroidism was diagnosed in a 9-year-old miniature schnauzer after a skull computed tomography (CT) showed the presence of 2 bilateral and symmetrical soft tissue maxillary masses, and osteopenia of the skull.

Can Vet J. 2011 May;52(5):501-5.

Clinical evaluation of a single daily dose of phenylpropanolamine in the treatment of urethral sphincter mechanism incompetence in the bitch.

Claeys S, Rustichelli F, Noël S, Hamaide A.

The objective of this retrospective study was to determine the efficacy of a single daily oral dose of phenylpropanolamine (PPA) in the treatment of urethral sphincter mechanism incompetence (USMI) in bitches. Nine bitches diagnosed with USMI were treated with a single daily dose [1.5 mg/kg body weight (BW)] of PPA for at least 1 month. Urethral pressure profiles (UPP) were performed in 7 dogs before treatment and repeated in 4 of them after treatment. Treatment with PPA resulted in long-term continence in 8/9 bitches. One dog did not respond to PPA and was treated surgically later. Recheck UPPs showed a significant increase in maximal urethral closure pressure in the 4 bitches after treatment with PPA compared to before treatment. In conclusion, long-term continence can be achieved in bitches affected with USMI after administration of a single daily dose of PPA (1.5 mg/kg BW).

Can Vet J. 2011 Jun;52(6):645-9.

Multicystic dysplastic kidney disease in a dog.

Kim J, Choi H, Lee Y, Jung J, Yeon S, Lee H, Lee H.

A 1-year-old female mongrel dog was evaluated for anorexia and vomiting of 4 days duration. Abdominal ultrasonographic findings revealed small kidneys with multiple anechoic cysts. The dog was euthanized due to poor prognosis. A full necropsy was performed, and the histopathologic findings were consistent with multicystic dysplastic kidney disease.

In Practice

In Practice 32: 468-476

Minimally invasive soft tissue surgery in dogs and cats : 2. Thoracoscopy and urethrocystoscopy.

Alasdair Hotston Moore

In Practice 33(+):12-19. doi:10.1136/inp.c7446

Clinical practice, Companion animal practice: **Urinalysis in practice – an update.**

Jelena Ristic, Niki Skeldon

In Practice 33(5): 194-202.

Clinical practice: **Antimicrobial use: Evidence-based use of antimicrobials in veterinary practice.**

Ana Mateus, David Brodbelt, Katharina Stärk

Journal of Comparative Pathology

J Comp Pathol. 2011 Jan;144(1):41-7. Epub 2010 Jun 11.

Renal podocyte apoptosis in Zucker diabetic fatty rats: involvement of methylglyoxal-induced oxidative DNA damage.

Kim J, Sohn E, Kim CS, Kim JS.

Methylglyoxal (MGO) is a cytotoxic metabolite produced by in-vivo glycolysis that may result in diabetic complications. The aim of this study was to determine whether MGO and oxidative stress caused apoptosis of renal podocytes in the Zucker diabetic fatty (ZDF) rat, an animal model of type 2 diabetes mellitus. Male ZDF rats aged 21 weeks developed marked hyperglycaemia with proteinuria and albuminuria. Immunohistochemical evaluation of sections of kidney demonstrated expression of MGO and 8-hydroxydeoxyguanosine (8-OHdG) in the podocytes of both normoglycaemic and diabetic rats. Podocyte apoptosis was shown through application of the TUNEL method. These findings suggest that expression of MGO and 8-OHdG is caused by hyperglycaemia, and that this expression is associated with the observed apoptosis of podocytes and is related to diabetic nephropathy.

J Comp Pathol. 2011 Feb-Apr;144(2-3):212-3. Epub 2010 Sep 29.

Lipoma of the urinary bladder in a cat.

Khodakaram-Tafti A, Shirian S, Vesal N, Hadadi Sh.

A 7-year-old male Persian cat was referred for necropsy examination with a history of progressive abdominal distention, dysuria, polyuria, colic and death. At necropsy examination, a raised white unencapsulated mass (3×6×4cm) was found on the mucosal surface of the bladder. The mass was lobulated with soft consistency similar to that of adipose tissue. Microscopical examination revealed cells identical to those of normal adipose tissue. On the basis of the gross and microscopical findings, the lesion was diagnosed as a lipoma. This tumour has not been recorded previously in the urinary bladder of a cat.

J Comp Pathol. 2011 May;144(4):308-11. Epub 2010 Oct 18.

Overexpression of vimentin in canine prostatic carcinoma.

Rodrigues MM, Rema A, Gärtner F, Soares FA, Rogatto SR, De Mour VM, Laufer-Amorim R.

Canine prostatic tumours exhibit similarities to those of man and may represent a useful model system to explore the mechanisms of cancer progression. Tumour progression to malignancy requires a change from an epithelial phenotype to a fibroblastic or mesenchymal phenotype. Vimentin expression is associated with the invasive phenotype of human prostate cancer cells. The aim of the present study was to characterize immunohistochemically the expression of vimentin by canine prostatic carcinomas. Primary carcinomas and metastatic tumour foci both showed vimentin expression. This finding suggests that the acquisition of the epithelial-mesenchymal transition phenotype in canine prostatic carcinoma may be characterized by the presence of mesenchymal intermediate filament (vimentin) that could lead to a higher likelihood of metastasis.

J Comp Pathol. 2011 Jul;145(1):59-67. Epub 2011 Jan 17.

Post-mortem findings in Irish culled hounds.

Jahns H, Callanan JJ, McElroy MC, Sammin DJ, Bassett HF.

Little is known of the common diseases of hunting dogs or of the reasons why they are culled. To address these questions, necropsy examinations were conducted on 52 hounds aged 1.5-12 years (mean 6.5 ± 2.5 years) and culled from 10 Irish hunting kennels over a 3-year period. Progressive systemic disease was seen in six dogs only and encompassed individual cases of tuberculosis caused by *Mycobacterium bovis*, bronchioalveolar carcinoma with metastasis to regional lymph nodes, renal amyloidosis, suppurative pneumonia, extramedullary plasmacytoma in the atrial wall of the heart and foreign body-induced hepatitis with focal peritonitis. Single or multiple localized tumours were identified in five dogs and, apart from the aforementioned, included two cutaneous haemangiomas, a trichoepithelioma, a lipoma and a mammary ductal adenoma. Three dogs were culled for lameness; one of these dogs had torn musculature, another had cellulitis and the third had a healed fracture of

the tibia and fibula. Chronic renal changes were present in 48% of the dogs and included focal proliferative, exudative or crescentic glomerulonephritis (33%) or low-grade interstitial inflammatory changes (50%). The most frequently diagnosed skin lesions reported in this study were mild healed decubitus ulcers (33%), scars (33%) and stereotypic dermatitis (13%). These findings indicate that hounds are likely to be culled for reasons other than the presence of disease in most cases. In addition, this survey highlights different disease patterns in hounds than are typically observed in pet dogs.

J Comp Pathol. 2011 Aug-Oct;145(2-3):220-5. Epub 2011 Mar 8.

Expression of nephrin, podocin, α -actinin-4 and α 3-integrin in canine renal glomeruli.

Kobayashi R, Kamiie J, Yasuno K, Ogihara K, Shirota K.

The biological features of podocytes that contribute to the pathogenesis of proteinuria have not been investigated in dogs. The aim of this study was to investigate the expression and localization of nephrin, podocin, α -actinin-4 and α 3-integrin in canine renal glomeruli. Renal cortical tissue was collected from the kidneys of five normal adult beagles. Western blotting and immunofluorescence microscopy revealed specific expression and localization of the four proteins in canine glomeruli. Expression of genes encoding the four molecules in isolated glomeruli was detected by reverse transcriptase polymerase chain reaction. The results of this study will permit future exploration of podocyte injury and its involvement in protein leakage from the capillary wall in canine glomerular diseases.

Journal of Feline Medicine and Surgery

J Feline Med Surg. 2011 Jan;13(1):25-34.

Feline systemic hypertension: Classification and pathogenesis.

Jepson RE.

PRACTICAL RELEVANCE: the increased availability of indirect blood pressure monitoring devices in clinical practice over the past decade has highlighted the significance of systemic hypertension in the feline population. Without routine monitoring and appropriate intervention, cats with undiagnosed systemic hypertension may first be presented with sudden-onset blindness as a consequence of either hyphaema or retinal detachment. **CLINICAL CHALLENGES:** the primary aim in the early diagnosis and treatment of systemic hypertension is prevention of hypertensive target organ damage (with respect to the eye, kidney, cardiovascular and central nervous systems, in particular). A prerequisite is a knowledge of the pathophysiological mechanisms and disease conditions that may contribute to the development of hypertension. This allows the clinician to determine those cases in which blood pressure assessment and longitudinal monitoring is essential and can assist in determining appropriate therapeutic strategies for control of blood pressure. Recent studies have also begun to explore the relationship that systemic hypertension may have with proteinuria and the progression of kidney disease. **PATIENT GROUP:** the geriatric cat appears most susceptible to the development of systemic hypertension, and monitoring of systolic blood pressure is often advocated as part of a routine health screen in cats over 9-12 years old. Consideration must also be given to cats suspected of having an underlying disease such as chronic kidney disease or hyperthyroidism, or which are receiving therapeutic agents, irrespective of their age. **EVIDENCE BASE:** much of our understanding of the pathogenesis of feline hypertension is extrapolated from studies performed in experimental animal models or in human patients, and interspecies differences are often poorly understood.

J Feline Med Surg. 2011 Jan;13(1):35-43.

Feline systemic hypertension: Diagnosis and management.

Stepien RL.

PRACTICAL RELEVANCE: the clinical importance of feline hypertension has been recognised for many years and most feline practitioners are quite familiar with this syndrome. Once systemic hypertension is identified, long-term management of the patient is needed to avoid catastrophic (eg, blindness due to retinal detachment) or subtle (eg, accelerated renal damage) target organ damage. **PATIENT GROUP:** feline systemic hypertension is most commonly a complication of renal disease and hyperthyroidism, both diseases of older feline patients. By 15 years of age, the probability of having at least one of these two diseases is high. As well cared for cats are living longer, optimal long-term management of feline hypertension in patients with concurrent diseases is an issue of clinical importance. **CLINICAL CHALLENGES:** obtaining accurate blood pressure measurements in patients that are anxious, fractious or just plain uncooperative remains a significant issue in feline medicine, as does confident analysis of results from these patients. **DIAGNOSTICS:** careful measurement of systolic blood pressure using Doppler or oscillometric techniques in conjunction with evaluation for evidence of hypertensive choroidopathy (fundoscopic examination) and hypertensive cardiac changes (thoracic auscultation) are essential to the diagnosis of systemic hypertension in cats. Other diagnostic techniques, including evaluation of renal and thyroid function, are needed to detect the underlying disease condition. **EVIDENCE BASE:** numerous well-designed clinical studies have greatly advanced our understanding of the most appropriate methods of diagnosis and therapy of feline hypertension.

J Feline Med Surg. 2011 Feb;13(2):101-8. Epub 2010 Dec 9.

Urethral obstruction in cats: predisposing factors, clinical, clinicopathological characteristics and prognosis.

Segev G, Livne H, Ranen E, Lavy E.

Feline lower urinary tract diseases in general, and urethral obstruction (UO) in particular, are common clinical conditions in cats. The aims of this study were to identify risk factors for UO, to characterise clinical and clinicopathological signs, outcome and recurrence, as well as risk factors for mortality and recurrence. Eighty-two cats with UO were compared to 82 sex and time matched controls. The mean age of cats with UO was significantly lower compared to controls, while the mean body weight was higher. The proportion of indoors-outdoors cats was significantly lower in the study group compared to the control group, and the proportion of cats consuming only dry food was higher. Overall mortality was 8.5%. Ionised calcium was significantly higher in survivors compared to non-survivors, and the prevalence of hypocalcaemia was lower. Recurrence in 6 months and 2 years were 22% and 24%, respectively. Cats with recurrence had significantly lower urine pH at presentation.

J Feline Med Surg. 2011 Feb;13(2):129-34. Epub 2010 Oct 30.

Use of bisphosphonates to treat severe idiopathic hypercalcaemia in a young Ragdoll cat.

Whitney JL, Barrs VR, Wilkinson MR, Briscoe KA, Beatty JA.

A 3-year-old Ragdoll cat was referred for investigation of polyuria, polydipsia, vomiting, weight loss and hypercalcaemia. Serum biochemical abnormalities included total and ionised hypercalcaemia and hypophosphataemia. Following clinical investigations a diagnosis of idiopathic hypercalcaemia was made. Because of the severity of the hypercalcaemia and the associated clinical signs, treatment for hypercalcaemia was commenced with pamidronate. Major electrolyte abnormalities were detected but, remarkably, were accompanied by minimal clinical signs. The cat was subsequently treated with oral alendronate and is clinically normal 15 months later. Reports of the use of bisphosphonates in cats are limited and close monitoring of patients is recommended.

J Feline Med Surg. 2011 Feb;13(2):152-4. Epub 2010 Dec 24.

Comparison of digital and optical hand-held refractometers for the measurement of feline urine specific gravity.

Bennett AD, McKnight GE, Dodkin SJ, Simpson KE, Schwartz AM, Gunn-Moore DA.

Measuring urine specific gravity (USG) is an important component of urine analysis as it evaluates renal concentrating capability. The objective of this study was to quantify the difference in USG values between a hand-held optical analogue refractometer and a cat-specific digital instrument. Urine samples from 55 cats were assessed. There was a statistically significant difference between these two refractometers ($P < 0.001$), with the optical refractometer (mean USG=1.031) consistently reading higher than the digital refractometer (mean USG=1.027). Results for a random subset of the samples ($n=10$) were compared with urine osmolality and both the optical and digital instruments demonstrated excellent correlation. While an accurate USG reading is important, it is unlikely that the statistical significance between the two instruments is clinically significant and, therefore, unlikely to result in a change in patient evaluation or treatment plans. While both the digital and optical refractometers are highly correlated to the urine osmolality, making both devices valid for assessment of USG in clinical practice, this digital device is easier to read and eliminates the variability of subjective interpretation.

J Feline Med Surg. 2011 Apr;13(4):272-5. Epub 2011 Jan 3.

Lingual and renal lymphoma in a cat.

Bound NJ, Priestnall SL, Cariou MP.

A domestic shorthair cat presented with a progressive history of polydipsia, lingual swelling and ulceration. The tongue was firm and grossly enlarged with associated regional lymphadenopathy. Surgical biopsies revealed lymphoma of the tongue. Following the procedure, the cat developed respiratory distress and was subsequently euthanased. Necropsy confirmed the diagnosis of lingual lymphoma and also identified lymphoma within the left kidney. This is the first report of lymphoma within the feline tongue in the literature.

J Feline Med Surg. 2011 Apr;13(4):291-5.

Minimal change glomerulopathy in a cat.

Backlund B, Cianciolo RE, Cook AK, Clubb FJ, Lees GE.

A 6-year-old domestic shorthair male castrated cat was evaluated for sudden onset of vomiting and anorexia. A diagnosis of hypereosinophilic syndrome (HES) was made, and the cat was treated with imatinib mesylate. The cat had an initial clinical improvement with the normalization of the peripheral eosinophil count. After approximately 8 weeks of treatment, lethargy and anorexia recurred despite the normal eosinophil count and a significant proteinuric nephropathy was identified. Treatment with imatinib was discontinued. Ultrasound guided renal biopsies exhibited histologic, ultrastructural, and immunostaining changes indicative of a minimal change glomerulopathy (MCG) which has not previously been reported in the literature in a cat. The proteinuria and HES initially improved while the cat was treated with more traditional medications; however, both the problems persisted for 30 months that the cat was followed subsequently. Previous studies demonstrating the safety and efficacy of imatinib in cats do not report any glomerular injury or significant adverse drug reactions, and the exact cause of this cat's proteinuric nephropathy is uncertain. Nonetheless, the possibility of an adverse drug reaction causing proteinuria should be considered when initiating treatment with imatinib in a cat.

J Feline Med Surg. 2011 May;13(5):347-61.

Management of pelvic trauma: neurological damage, urinary tract disruption and pelvic fractures.

Meeson R, Corr S.

PRACTICAL RELEVANCE: Cats commonly present with pelvic trauma following road traffic accidents (RTAs). A logical step-wise approach to diagnostics and subsequent management can significantly improve the prognosis in the majority of cases. This article provides a practical guide to assist decision-making and optimise management of these cats. **CLINICAL CHALLENGES:** Affected cats may have sustained trauma to several body systems and, hence, their management can be complex, requiring good clinical, diagnostic and surgical skills (often both soft tissue and orthopaedic!). **PATIENT GROUP:** Any cat allowed access to the outdoors is potentially at risk of being involved in an RTA and sustaining pelvic trauma. Young male cats are most commonly affected. **EVIDENCE BASE:** Many original articles and textbook chapters have been published on aspects of pelvic trauma. However, to the authors' knowledge, this is the first comprehensive overview of the assessment and management of the feline pelvic trauma case. The review begins by discussing initial triage and neurological examination, and then focuses, in turn, on assessment and management of the 'tail pull' injury, the diagnosis and management of urinary tract rupture, and the approach to managing specific pelvic fractures.

J Feline Med Surg. 2011 Jun;13(6):387-92. Epub 2011 Mar 25.

(99m)Tc-DMSA absolute and relative renal uptake in cats: procedure and normal values.

Vandermeulen E, Ham HR, Dobbeleir AA, De Sadeleer C, Piepsz A, Waelbers T, Vermeire ST, Slegers G, Peremans KY.

In this study we investigated the influence of technical factors (positioning, background (BG) correction and attenuation correction) on qualitative and quantitative (absolute (AU) and relative (RU) uptake) assessment of feline kidneys with (99m)technetium labelled dimercaptosuccinic acid ((99m)Tc-DMSA). Eleven healthy adult cats were included. Influence of BG and depth correction on quantitative assessment was evaluated. Depth correction was based on the geometric mean method (using dorsal and ventral images) and the use of two standards placed over each individual kidney. Visual evaluation showed superiority of dorsal and ventral over lateral positioning due to increased separation of the kidneys permitting region of interest (ROI) placement without overlap. No apparent influence of BG correction was found for RU. However, AU was systematically overestimated without BG correction. Depth correction did not seem to affect RU in most cases, however, in some cats the differences were not negligible. The values for AU without depth correction were lower compared to depth corrected values.

J Feline Med Surg. 2011 Jun;13(6):399-404. Epub 2011 Feb 1.

Normal Doppler velocimetry of renal vasculature in Persian cats.

Carvalho CF, Chammas MC.

Renal diseases are common in older cats. Decreased renal blood flow may be the first sign of dysfunction and can be evaluated by Doppler ultrasound. But previous studies suggest that the resistive index (RI) has a low sensitivity for detecting renal disease. Doppler waveforms of renal and intrarenal arteries demonstrate decreased blood flow before there are any changes in the RI. The purpose of this study was to evaluate the normal Doppler flowmetrics parameters of renal arteries (RAs), interlobar arteries (IAs) and abdominal aorta (AO) in adult healthy, Persian cats. Twenty-five Persian cats (13 females and 12 males with mean age of 30 months and an age range 12-60 months) with normal clinical examinations and biochemical tests and normal systemic blood pressure were given B-mode ultrasonographies in order to exclude all nephropathies, including polycystic kidney disease. All measurements were performed on both kidneys. Both kidneys (n=50) were examined by color mapping of the renal vasculature. Pulsed Doppler was used to examine both RAs, the IAs at cranial, middle and caudal sites, and the AO. The RI was calculated for all of the vessels. Early systolic acceleration (ESA) of RA and IA was obtained with Doppler spectral analysis. Furthermore, the ratio indices between RA/AO, and IA/RA velocities were calculated. The mean values of peak systolic velocity (PSV) and the diameter for AO were 53.17 ± 13.46 cm/s and 0.38 ± 0.08 cm, respectively. The

mean RA diameter for all 50 kidneys was 0.15 ± 0.02 cm. Considering the velocimetric values in both RAs, the mean PSV and RI that were obtained were 41.17 ± 9.40 cm/s and 0.54 ± 0.07 . The RA had a mean ESA of 1.12 ± 1.14 m/s² and the calculated upper limit of the reference value was 3.40 m/s². The mean renal-aortic ratio was 0.828 ± 0.296 . The IA showed PSV and RI values of 32.16 ± 9.33 cm/s and 0.52 ± 0.06 , respectively. The mean ESA of all IAs was 0.73 ± 0.61 m/s². The calculated upper limit of the reference value was 2.0m/s². The mean renal-interlobar artery ratio was 1.45 ± 0.57 . The RI values obtained in this study were similar to values reported in the literature. Some conditions that lead to a decrease in compliance and to an increase in vascular resistance can affect the Doppler spectral waveforms without changes in RI. To our knowledge, there are no studies that were directed toward to the normal ESA values of the renal vasculature in Persian cats. This study introduced a new ratio between the PSV of the RA and the IA. This index was developed based on the well-known effects of Doppler on the detection of stenosis, regardless of the cause. Further studies are necessary to verify the hemodynamic behavior of this index under pathological conditions in cats as well as the effect of aging, nephropathies and systemic pressure on Doppler velocimetric parameters.

J Feline Med Surg. 2011 Jun;13(6):405-9. Epub 2011 May 14.

Azodyl, a synbiotic, fails to alter azotemia in cats with chronic kidney disease when sprinkled onto food.

Rishniw M, Wynn SG.

The effect of probiotic therapy in chronic kidney disease (CKD) in cats is poorly defined, but gaining in popularity. However, cat owners often prefer to administer probiotics by combining them with food, rather than administering capsules intact, as is prescribed by the manufacturer. The efficacy of such non-recommended administration is unknown. In this double-blinded, controlled clinical trial, 10 cats with naturally-occurring CKD were randomized to receive either a probiotic-prebiotic combination (synbiotic) or psyllium husk (prebiotic only) for 2 months. Medications were sprinkled and mixed into food or given as a slurry. Blood urea nitrogen (BUN) and creatinine were measured twice prior to administration of medication, and then monthly for 2 months during the medication administration. Owners and clinicians were masked as to treatment. The maximal percentage change in BUN and creatinine was calculated for each cat. No differences in percentage change were detected between groups ($P=0.8$ for both BUN and creatinine). The synbiotic supplement used in this study, when applied to food or administered as a slurry fails to reduce azotemia in cats with CKD. Therefore, owners should not administer this synbiotic in this manner.

J Feline Med Surg. 2011 Jun;13(6):410-7. Epub 2011 Mar 25.

Causes of lower urinary tract disease in Norwegian cats.

Sævik BK, Trangerud C, Ottesen N, Sørum H, Eggertsdóttir AV.

A study was made on causes of lower urinary tract disease in cats, and to investigate whether demographic data and factors related to husbandry might influence the occurrence of a particular diagnosis. The study was a prospective, descriptive, and analytical study of primary cases of feline lower urinary tract disease (FLUTD) in Norway. Only cats sampled by cystocentesis were included in the present study. Of the 119 cats included, 28.6% were diagnosed with obstructive FLUTD. The majority of cats were diagnosed with feline idiopathic cystitis (FIC) (55.5%). Urethral plugs were the second most common diagnosis (21.0%), whereas bacterial cystitis and urolithiasis each were diagnosed in 11.8%. Nearly one-third (28.6%) of the cats diagnosed with urolithiasis had significant bacteriuria. Thus, significant bacteriuria was diagnosed in a total of 15.1% of the cats. There were no significant differences in the urine specific gravity, pH and amount of epithelial cells in the urine sediment in the different aetiological categories of FLUTD. There was a higher amount of red blood cells in the urine sediment in cats diagnosed with urethral plugs and urolithiasis, whereas cats with bacterial cystitis and urolithiasis had a higher amount of white blood cells in their sediment.

Regarding demographic data and factors related to husbandry, cats diagnosed with FLUTD were more often males and kept strictly indoors, when compared with a 'reference population'.

J Feline Med Surg. 2011 Jun;13(6):418-26. Epub 2011 Feb 22.

Evaluation of intrarenal mesenchymal stem cell injection for treatment of chronic kidney disease in cats: a pilot study.

Quimby JM, Webb TL, Gibbons DS, Dow SW.

The feasibility of autologous intrarenal mesenchymal stem cell (MSC) therapy in cats with chronic kidney disease (CKD) was investigated. Six cats (two healthy, four with CKD) received a single unilateral intrarenal injection of autologous bone marrow-derived or adipose tissue-derived MSC (bmMSC or aMSC) via ultrasound guidance. Minimum database and glomerular filtration rate (GFR) via nuclear scintigraphy were determined pre-injection, at 7 days and at 30 days post-injection. Intrarenal injection did not induce immediate or long-term adverse effects. Two cats with CKD that received aMSC experienced modest improvement in GFR and a mild decrease in serum creatinine concentration. Despite the possible benefits of intrarenal MSC injections for CKD cats, the number of sedations and interventions required to implement this approach would likely preclude widespread clinical application. We concluded that MSC could be transferred safely by ultrasound-guided intrarenal injection in cats, but that alternative sources and routes of MSC therapy should be investigated.

Feline Med Surg. 2011 Aug;13(8):588-93. Epub 2011 Apr 27.

Pseudomembranous cystitis, an unusual condition associated with feline urine outflow obstruction: Four cases.

Le Boedec K, Pastor ML, Lavoué R, Reynolds BS.

The clinical follow-up of four cats presumptively diagnosed with pseudomembranous cystitis is described. All presented with acute urine outflow obstruction and acute renal failure. Urethral catheterisation was performed without difficulty but ultrasonography and contrast radiography consistently revealed abnormal bladder wall and content. One cat was euthanased, the remaining three underwent an exploratory cystotomy. Abundant inflammatory and necrotic tissue covering an ulcerated bladder mucosa was removed. All cats recovered uneventfully. No definitive cause was identified but the clinical course of the disease was not typical of idiopathic cystitis.

J Feline Med Surg. 2011 Aug;13(8):597-601. Epub 2011 May 6.

Use of a self-expanding metallic stent for the treatment of a urethral stricture in a young cat.

Hadar EN, Morgan MJ, Morgan OD.

A 4-month-old intact male domestic shorthair cat was evaluated for urinary outflow obstruction after several weeks of medical management for traumatic urethral rupture. Positive-contrast retrograde urethrography and anterograde cystoscopy performed 4 weeks after the initial urethral injury confirmed a stricture approximately 1cm distal to the bladder trigone at the site of the initial urethral tear. A self-expanding metallic urethral stent (SEMS) was placed under fluoroscopic guidance to relieve the urethral stricture and re-establish luminal patency. After stent placement, the cat was able to void urine normally with minimal urinary incontinence noted. This resolved several months post-stent placement. No known clinical complications persisted other than mild intermittent hematuria.

J Feline Med Surg. 2011 Aug;13(8):602-5. Epub 2011 May 14.

Suspected epidural morphine analgesia induced chronic urinary and bowel dysfunction in a cat.

Song RB, Cross JR, Golder FJ, Callan MB.

A 12-year-old male castrated domestic shorthair developed chronic urinary retention, constipation and a decreased perineal reflex following a single lumbo-sacral epidural injection of morphine during general anesthesia. Similar adverse effects have been reported in humans following epidural analgesia, but this is the first reported case of both urinary and bowel dysfunction in a cat purportedly from an epidural. The cat was medically managed with manual bladder expressions, intermittent enemas, and various medications including bethanechol, cisapride and stool softeners. The cat continues to have long-term neurologic dysfunction 15 months post-onset. This case report describes a rare but serious potential risk of lumbo-sacral epidural injections in cats.

J Feline Med Surg. 2011 Sep;13(9):629-40.

Anemia of renal disease: what it is, what to do and what's new.

Chalhoub S, Langston C, Eatroff A.

PATIENT GROUP: It is estimated that 15-30% of geriatric cats will develop chronic kidney disease (CKD), and that 30-65% of these cats will develop anemia as their renal disease worsens. Anemia of renal disease is multifactorial in its pathogenesis, but the main cause is reduced production of erythropoietin, a renal hormone that controls the bone marrow's production of red blood cells, as kidney disease progresses. **PRACTICAL RELEVANCE:** It is important to recognize the presence of anemia of renal disease so that adequate treatment may be instituted to improve quality of life and metabolic function. Erythrocyte-stimulating agents (ESAs), such as epoetin alfa, epoetin beta and darbepoetin alfa, have been developed to counteract the effects of decreased erythropoietin production by the kidneys. These treatments, which are the focus of this review, have 83% similarity in amino acid sequence to the feline hormone. On average, the target packed cell volume (>25%) is reached within 3-4 weeks of ESA therapy. **CLINICAL CHALLENGES:** The use of ESAs has been associated with a number of complications, such as iron deficiency, hypertension, arthralgia, fever, seizures, polycythemia and pure red cell aplasia (PRCA). Darbepoetin has a prolonged half-life compared with epoetin and thus can be given only once a week, instead of three times a week. The incidence of PRCA appears to be decreased with darbepoetin use when compared with epoetin use in cats. **EVIDENCE BASE:** There is limited published evidence to date to underpin the use of ESAs in cats. This review draws on the relevant publications that currently exist, and the authors' personal experience of using these therapies for over 5 years.

J Feline Med Surg. 2011 Sep;13(9):651-60.

Cats and calcium oxalate: strategies for managing lower and upper tract stone disease.

Palm C, Westropp J.

PRACTICAL RELEVANCE: Calcium oxalate (CaOx) containing stones are among the most common of the urinary tract stones identified in cats.

RISK FACTORS: Risk factors for CaOx stone formation include such things as breed, gender and diet; stress and obesity have also been hypothesized to be risk factors for this disease.

MANAGEMENT APPROACH: A tailored, individual management strategy for preventing CaOx stone recurrence is important and should include addressing the diet, environment and any other comorbid conditions present. Increasing the cat's moisture intake is one of the key mechanisms for preventing recurrence. **CLINICAL CHALLENGES:** CaOx ureterolithiasis has emerged as a difficult and sometimes life-threatening problem for cats. In those cats where stones are found incidentally, periodic monitoring may be required to assess for disease progression. Interventional procedures such as ureteral stent placements are now increasingly being performed for recurrent cases or those with larger stone burdens. Periodic radiographs for more severe cases and frequent client communication can help ensure successful outcomes for cats with lower and upper CaOx stone disease. **EVIDENCE BASE:** Limited evidence-based studies are published regarding management of feline upper and lower urinary tract CaOx stone disease, making this a difficult condition to manage in some cats. Studies designed to evaluate the relationship to dietary modifications, medical

management, stress, obesity and surgical techniques are warranted in cats with upper and lower urinary tract CaOx stones.

J Feline Med Surg. 2011 Oct;13(10):698-704. Epub 2011 Jul 14.

Effects of dietary protein content on renal parameters in normal cats.

Backlund B, Zoran DL, Nabity MB, Norby B, Bauer JE.

This study evaluates the effect of dietary protein content on renal parameters in 23 healthy spayed female cats. The objective was to determine if cats eating diets high in protein will have higher serum urea nitrogen (UN) and creatinine values without a detectable change in kidney function, as assessed by urinalysis. A single random cross-over design was used. Cats were fed a standard maintenance diet for at least 1 month prior to the dietary trial. They were fed in two phases. For the first phase, cats were randomly assigned to receive either a high protein [HP=46% metabolizable energy (ME)] or low protein (LP=26% ME) diet. For the second phase, cats were fed whichever diet they were not fed during the phase I period. Blood and urine samples were collected at 2-week intervals for the duration of the study (10 weeks). UN, albumin, alanine aminotransferase and urine specific gravity were significantly higher, and creatinine and phosphorus were significantly lower ($P<0.05$) when cats were fed the HP diet as compared to when they were fed the LP diet, although none of the mean values were found to be outside of the corresponding reference interval. Dietary intake can result in clinically significant changes in UN and statistically significant changes in several other biochemical analytes, although all analytes are likely to remain within normal reference intervals. Therefore, an accurate dietary history is necessary to help determine if renal parameters are being influenced by diet in a particular patient.

J Feline Med Surg. 2011 Oct;13(10):752-61. Epub 2011 Sep 9.

Retrospective case-control study of the effects of long-term dosing with meloxicam on renal function in aged cats with degenerative joint disease.

Gowan RA, Lingard AE, Johnston L, Stansen W, Brown SA, Malik R.

Medical records (2005-2009) of a feline-only practice were searched for cats with degenerative joint disease (DJD) treated using meloxicam. DJD was diagnosed by the presence of at least two of the following: (i) altered mobility (observed by the owner), (ii) abnormal physical findings, (iii) characteristic radiographic changes. The primary study cohort consisted of cats older than 7 years that had received meloxicam for variable intervals in excess of 6 months, and for which complete records were available. These cats were subdivided according to whether detectable chronic kidney disease (CKD) was present ('renal group'), or not ('non-renal group'), and, for the 'renal group', according to the cat's IRIS category. Serum biochemistry, urinalysis (including urine specific gravity [USG]), body mass and condition score were monitored regularly. Progression of CKD in the 'renal group' and 'non-renal group' of cats was compared to two groups of age- and IRIS-matched control cats not receiving meloxicam (from the same clinic, over the same time period). The study was thus a case-control design, with two study groups. Thirty-eight cats with DJD receiving long-term meloxicam therapy met the inclusion criteria. Of these, 22 cats had stable CKD at the start of treatment (stage 1, eight cats; stage 2, 13 cats; stage 3, one cat). No cats initially had an elevated urinary protein to creatinine ratio. The remaining 16 cats initially had normal renal analytes and adequately concentrated urine. The median age of the 'renal' and 'non-renal' meloxicam groups was 15.5 and 13.4 years, respectively. The median treatment duration was 467 days in the 'renal group' and 327 days in the 'non-renal group'. After titration (to the lowest effective dose), the median maintenance dose was 0.02 mg/kg/day in both groups (range 0.015-0.033 mg/kg/day). There was no difference in sequential serum creatinine concentration or USG measurements between the 'non-renal group' treated with meloxicam compared to control cats not treated with meloxicam. There was less progression of renal disease in the 'renal group' treated with meloxicam compared to the age- and IRIS-matched cats with CKD not given meloxicam. These results suggest that a long-term

maintenance dose of 0.02 mg/kg of meloxicam can be safely administered to cats older than 7 years even if they have CKD, provided their overall clinical status is stable. Long-term meloxicam therapy may slow the progression of renal disease in some cats suffering from both CKD and DJD. Prospective studies are required to confirm these findings.

J Feline Med Surg. 2011 Oct;13(10):768-71. Epub 2011 Jul 26.

Vaginourethroplasty as a salvage procedure for management of traumatic urethral rupture in a cat.
Halfacree ZJ, Tivers MS, Brockman DJ.

This report describes a cat that suffered pelvic urethral rupture associated with multiple pelvic fractures. A vaginourethroplasty was performed as a salvage procedure, via intrapelvic anastomosis of the proximal urethra to the caudal vagina, following failure of a primary urethral anastomosis. Urinary diversion was achieved via tube cystostomy and a vagino-urethral catheter was maintained for 3 days postoperatively. Anterograde cystourethrography was performed at 7 days and 14 days postoperatively. Absence of contrast leakage from the vagino-urethral anastomosis was documented at 14 days postoperatively and the tube cystostomy was removed. An *Escherichia coli* urinary tract infection was treated following removal of the tube cystostomy and subsequent urine culture revealed no evidence of urinary tract infection. The cat retained normal urinary continence and elimination behaviour during the 7-month follow-up period. Vaginourethroplasty could be considered as a salvage option for management of traumatic pelvic urethral rupture in the neutered female cat.

J Feline Med Surg. 2011 Oct;13(10):800-3.

Occurrence of occult bacteriuria in healthy cats.

Eggertsdóttir AV, Sævik BK, Halvorsen I, Sørnum H.

Knowledge of the occurrence of bacteriuria in adult, healthy cats is scarce in the scientific literature. A study was designed to investigate the occurrence of bacteriuria in healthy cats without current or previous signs of lower urinary tract disease. The study included 108 cats, 53 males (49.5%) and 55 females (50.5%). The cats ranged in age between 7 months and 18 years, with a mean age of 4.4 years and a median age of 4.0 years. Urine was obtained by cystocentesis from all the cats, and was submitted for bacteriological analyses. Urine and urine sediment was cultured on separate blood agar plates for quantification and species identification by standard procedures. Detection of $\geq 10^3$ colony forming units (cfu) per ml urine was defined as significant bacteriuria. Significant bacteriuria exceeding 10^5 cfu/ml was detected in one sample with a combination of *Enterococcus* species and *Staphylococcus* species. There was no bacterial growth in the urine samples from 107 cats (99.1%). Results from our study indicate that the prevalence of bacteriuria in clinically healthy, adult cats is low. Also, that contamination of samples is rare when urine is collected by cystocentesis.

J Feline Med Surg. 2011 Dec;13(12):967-75. Epub 2011 Nov 9.

Risk factors and clinical presentation of cats with feline idiopathic cystitis.

Defauw PA, Van de Maele I, Duchateau L, Polis IE, Saunders JH, Daminet S.

Feline idiopathic cystitis (FIC) is the most common cause of feline lower urinary tract disease (FLUTD). This retrospective, case-controlled study evaluated possible risk factors associated with FIC and compared different clinical presentations in 64 cats with FIC. Several risk factors known to be involved in FLUTD were identified as playing a role in FIC. Of the stressful situations considered, most did not occur with increased frequency in cats with FIC compared to controls, except for a house move. The presence of pyuria, haematuria and an increased urine protein:creatinine ratio were significantly higher in obstructed males compared with non-obstructed males. An obstruction was significantly more likely in cats with struvite crystalluria compared with cats without struvite crystalluria. These findings suggest that urethral plugs might be an important cause or contributing

factor of obstruction in FIC. Episodes of FIC seem to occur mainly in susceptible cats in combination with a deficient environment.

The Journal of Small Animal Practice

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Prostatic cavitory lesions containing urine in dogs.

Bokemeyer J, Peppler C, Thiel C, Failing K, Kramer M, Gerwing M.

OBJECTIVES: The purpose of this retrospective study was to determine the proportion of urine-containing prostatic cavitory lesions ("urinary cysts") in dogs and to describe their clinical management.

METHODS: The study included dogs with clinically relevant prostatic-retention cyst/abscess (n=87) treated initially by percutaneous ultrasound-guided drainage of the prostatic cavity. Based on a prostatic fluid:serum creatinine ratio, the study population was divided into two groups: group 1 (n=16) with and group 2 (n=71) without evidence of urine within the lesion. Medical records of both the groups were reviewed.

RESULTS: Cavitory lesions containing urine were observed in 16 of the 87 dogs (18.4%; group 1). In 10 (62.5%) of the group 1 dogs, abdominal surgery was recommended, because of recurrent filling during follow-up. In group 2, abdominal surgery was recommended in only 11 of 71 cases (15.5%).

CLINICAL SIGNIFICANCE: In dogs, 18.4% (95% confidence interval, 10.9 to 28.1%) of the prostatic cavitory lesions contain urine. Measurement of creatinine within the prostatic cavity fluid is a helpful tool in diagnosing a presurgical intra-prostatic urethral fistulation, and these dogs tend to require a more aggressive surgical therapy than percutaneous drainage alone.

J Small Anim Pract. 2011 Mar;52(3):146-51. doi: 10.1111/j.1748-5827.2011.01041.x.

Computed tomography of the prostate gland in apparently healthy entire dogs.

Lee KJ, Shimizu J, Kishimoto M, Kadohira M, Iwasaki T, Miyake YI, Yamada K.

OBJECTIVES: To describe the computed tomography (CT) features of the prostate gland and determine prostate size using CT in entire male dogs.

METHODS: The prostate gland was evaluated in 35 dogs. Morphological features including homogeneity, delineation, shape and intraprostatic differentiation were assessed. Height, length, width, area, volume and attenuation values of the prostate gland were measured. Ratios of prostatic height (rH), length and width to the sixth lumbar vertebral body length were calculated. Relationships of prostatic dimensions with body weight and age were evaluated.

RESULTS: The prostate gland was homogeneous in 29 dogs on non-contrast images and 18 of 24 dogs on postcontrast images. Transverse images revealed a semi-oval prostate gland in 29 dogs and irregularly shaped prostate gland in 6 dogs. A prominent median septum was observed in postcontrast images. Significant positive correlations were found between body weight and age and all prostatic dimensions except between age and rH. The mean \pm sd values for attenuation were 59.3 \pm 9.1 and 121.3 \pm 22.7 HU in non-contrast and postcontrast image, respectively.

CLINICAL SIGNIFICANCE: CT can be useful for evaluating morphological features of the prostate gland. Prostatic length or width is a better measure than height for computed tomographic estimation of prostate size.

J Small Anim Pract. 2011 Apr;52(4):190-4. doi: 10.1111/j.1748-5827.2011.01045.x.

Extraction of urethral calculi by transabdominal cystoscopy and urethroscopy in nine dogs.

Liebermann SV, Doran IC, Bille CR, Bomassi EG, Rattez EP.

OBJECTIVES: To describe a minimally invasive technique for treating urethral obstructions in male dogs and to review the postoperative results.

METHODS: All dogs (n=9) had urethral obstruction due to calculi. Obstructions were verified by radiographic and ultrasonographic examinations. Dogs with impaired kidney function were not included in the study. A 5-mm diameter trocar and cannula were placed in the ventral midline, 2 cm cranial to the umbilicus, allowing placement of a 10-mm diameter cannula under visual guidance, adjacent to the apex of the bladder. The bladder was then partially exteriorised and sutured to the skin. A 5-mm diameter cystoscopy sheath was introduced into the bladder lumen and advanced into the urethra. Continuous retrograde flushing was used to dislodge the calculi from the site of obstruction and collect them upstream.

RESULTS: The nine dogs were followed up for a minimum of 6 months. No major postoperative complications were identified. One dog exhibited transient macroscopic haematuria (for 3 weeks postoperatively). All urethral calculi were removed in the nine dogs. No recurrence was found during the follow-up period.

CLINICAL SIGNIFICANCE: A minimally invasive approach is used to treat urethral obstructions resulting from calculi in the male dogs.

J Small Anim Pract. 2011 Jul;52(7):340-6. doi: 10.1111/j.1748-5827.2011.01067.x. Epub 2011 Jun 14.

Occurrence of systemic hypertension in dogs with acute kidney injury and treatment with amlodipine besylate.

Geigy CA, Schweighauser A, Doherr M, Francey T.

Objectives: To describe the occurrence of systemic hypertension in dogs with acute kidney injury and the efficacy of amlodipine besylate for its treatment. **Methods:** This retrospective study included 52 dogs with acute kidney injury (2007 to 2008) grouped based on the use of amlodipine in their treatment. Systemic blood pressure was measured with an oscillometric device at admission, before, during, and after amlodipine therapy. **Results:** Occurrence of systolic systemic hypertension (≥ 160 mmHg) and severe systolic systemic hypertension (≥ 180 mmHg) was 37% and 15% at admission and increased with hospitalisation to 81% and 62%, respectively. Twenty-two dogs were treated with amlodipine, at a median daily dosage of 0.38 mg/kg (interquartile range 0.28 to 0.49) divided in one to two applications per day. Amlodipine therapy was associated with a decrease in systolic systemic blood pressure of 24 mmHg (12 to 34) and a correction of severe systemic hypertension in 10 of 11 dogs within 24 hours. Overall, 73% of the dogs survived with a significantly lower proportion of survivors in treated compared to non-treated dogs (59% versus 83%, respectively, $P=0.05$). **Clinical Significance:** Results of this study reveal that systemic hypertension is common in canine acute kidney injury and that treatment with amlodipine is beneficial in reducing systemic hypertension. The potential effect of amlodipine on global outcome requires prospective assessment.

J Small Anim Pract. 2011 Oct;52(10):510-4. doi: 10.1111/j.1748-5827.2011.01102.x.

The effect of boric acid on bacterial culture of canine and feline urine.

Rowlands M, Blackwood L, Mas A, Cripps P, Crompton C, Burrow R.

OBJECTIVE: To identify the optimal method of submission of canine and feline urine for bacterial culture.

METHODS: Cystocentesis samples from 250 animals (200 dogs, 50 cats) suspected of having urinary tract infections were collected. The reference aliquot, without preservative, was processed on site within 2 hours. Two further aliquots (one without preservative, one with boric acid) were stored at room temperature for up to 7 hours and then posted by guaranteed next day delivery to a commercial laboratory for analysis.

RESULTS: Forty-seven of the samples were positive on culture in the reference test. There was no significant difference between reference test results and those of samples posted without preservative ($P=0.39$), but samples posted in boric acid were significantly less likely to give a positive result ($P=0.01$). Samples posted without preservative had a sensitivity of 82% and a specificity of 98%; for boric acid, sensitivity was 73% and specificity 99%.

CLINICAL SIGNIFICANCE: Postal urine samples should be submitted to the laboratory in a plain sterile tube.

J Small Anim Pract. 2011 Oct;52(10):544-6. doi: 10.1111/j.1748-5827.2011.01107.x.

Traumatic urothorax in a dog: a case report.

Klainbart S, Merchav R, Ohad DG.

Pleural effusion caused by post-traumatic extravasation of urine from the abdominal cavity to the pleural cavity (urothorax) is an uncommon complication following traumatic injury. To the authors' knowledge, this is the first report of a case of traumatic urothorax in a dog presented with pleural and abdominal urine effusion. Combined urothorax and uroabdomen should be included in the differential-diagnosis list for dogs with recent trauma and a bicavitary effusion. The diagnosis can be confirmed by elevated creatinine concentrations in both effusates, compared to its serum concentration.

J Small Anim Pract. 2011 Dec;52(12):665. doi: 10.1111/j.1748-5827.2011.01135.x.

Histiocytic sarcoma of the urinary bladder in a dog.

Amores-Fuster I, Elliott JW, Freeman AI, Blackwood L.

Journal of the American Animal Hospital Association

J Am Anim Hosp Assoc. 2011 Mar-Apr;47(2):122-8. Epub 2011 Feb 10.

Polycythemia and inappropriate erythropoietin concentrations in two dogs with renal T-cell lymphoma.

Durno AS, Webb JA, Gauthier MJ, Bienzle D.

Two dogs presented with suspected renal disease and polycythemia. Abdominal ultrasound examinations performed on both dogs revealed coalescing masses causing bilateral renomegaly. Serum erythropoietin (EPO) concentrations were physiologically inappropriate. Postmortem examinations revealed renal T-cell lymphoma in both dogs. One of the two dogs also had involvement of the liver and mesentery. EPO-immunohistochemistry on tissue samples demonstrated positive staining in tumor cells and occasional normal renal cells. This report illustrates that paraneoplastic EPO production may induce polycythemia. The pattern of EPO-immunohistochemistry staining suggested that the mechanism of production was due to tumor production of EPO and local hypoxia-induced EPO production from compression of normal renal cells and vasculature.

J Am Anim Hosp Assoc. 2011 Mar-Apr;47(2):138-44. Epub 2011 Feb 10.

Diagnosis and management of ureterocele in two female dogs.

Green TA, Arble JB, Chew DJ, Dudley RM.

Two intact female dogs were examined for refractory pollakiuria and stranguria. One of these two dogs also exhibited urinary incontinence. Ectopic ureterocele was diagnosed via ultrasonography and cystoscopy in both dogs. Both dogs were taken to surgery for ureterocele resection and neoureterostomy, resulting in complete resolution of clinical signs. Although uncommonly reported in the veterinary literature, ectopic ureterocele can be associated with recurrent lower urinary tract infection with and without urinary incontinence. With a correct diagnosis and appropriate treatment, prognosis for ectopic ureterocele can be good provided there is not a concurrent significant loss of renal function.

J Am Anim Hosp Assoc. 2011 May-Jun;47(3):151-60. Epub 2011 Apr 15.

Iron homeostasis and disorders in dogs and cats: a review.

McCown JL, Specht AJ.

Iron is an essential element for nearly all living organisms and disruption of iron homeostasis can lead to a number of clinical manifestations. Iron is used in the formation of both hemoglobin and myoglobin, as well as numerous enzyme systems of the body. Disorders of iron in the body include iron deficiency anemia, anemia of inflammatory disease, and iron overload. This article reviews normal iron metabolism, disease syndromes of iron imbalance, diagnostic testing, and treatment of either iron deficiency or excess. Recent advances in diagnosing iron deficiency using reticulocyte indices are reviewed.

J Am Anim Hosp Assoc. 2011 May-Jun;47(3):196-202. Epub 2011 Apr 15.

Clinical outcomes of surgically managed ectopic ureters in 33 dogs.

Ho LK, Troy GC, Waldron DR.

Factors that predict postoperative continence and incontinence were evaluated in 33 female dogs with surgically corrected ectopic ureters. The current study found that intramural or extramural, left- or right-sided, and unilateral or bilateral ectopic ureters were not significant factors influencing postoperative incontinence in affected dogs. The presence of either hydroureter or urinary tract infection was also not significantly associated with postoperative incontinence. Dogs with ectopic ureters that were incontinent postsurgically tended to remain unresolved.

J Am Anim Hosp Assoc. 2011 Jul-Aug;47(4):258-61. Epub 2011 Jun 14.

Chronic prostatitis, cystitis, pyelonephritis, and balanoposthitis in a cat.

Pointer E, Murray L.

An adult, intact male domestic shorthair presented for preputial swelling and urinary incontinence. A caudal abdominal mass was palpated. A transabdominal ultrasound examination showed severe prostatomegaly with abnormal tissue extending along the urethra. The cat was euthanized due to the owner's financial constraints and the veterinarians' suspicion of a poor long-term prognosis. Biopsies showed chronic active inflammation of the prostate, bladder, kidneys, ureters, penis, and prepuce most consistent with a chronic infectious process. Reports of feline prostatic disease of any kind are rare. Chronic prostatitis may have a more favorable prognosis than feline prostatic adenocarcinoma, currently the most commonly reported disease of the feline prostate.

J Am Anim Hosp Assoc. 2011 Sep-Oct;47(5):351-5. Epub 2011 Aug 18.

Spontaneous urethral catheter kinking or knotting in male dogs: four cases.

Basdani E, Papazoglou LG, Kazakos GM, Bright RM.

Four dogs were diagnosed with urethral catheter malfunction. The catheter was kinked in three dogs and knotted in one dog. In two dogs, kinking of the catheter was associated with presence of urethroliths in the perineal urethra. Diagnosis was based on the difficulty encountered retrieving the catheter in all dogs and swelling in the scrotal or perineal area in two dogs. Diagnosis of catheter kinking or knotting was confirmed after catheter retrieval. Catheter removal was achieved in two dogs after traction under anesthesia, whereas scrotal or perineal urethrotomy were used in the other two dogs. No complications associated with urination were reported in any of the dogs after 7 to 12 mo.

J Am Anim Hosp Assoc. 2011 Sep-Oct;47(5):e71-6. Epub 2011 Aug 18.

Delayed urethral obstruction after uterine torsion in a pregnant dog.

Reynolds D, Campbell BG.

A 4 yr old pregnant female shih tzu was presented with abdominal discomfort and bloody vulvar discharge. The nonpregnant uterine horn was reflected caudally over the trigone, obstructing urine outflow. A cesarian section and ovariohysterectomy were performed. Postoperatively, the hematuria and pollakiuria resolved. Seventeen days later, the pelvic urethra was completely obstructed by a soft tissue mass that was identified by rectal palpation, blocked catheterization attempts, contrast radiography, ultrasonography, and surgery. Management included temporary cystostomy tube and definitive prepubic urethrostomy. Histologic diagnosis was severe, multifocal, necrosuppurative urethritis with fibroplasia, fibrosis, and cellulitis, apparently secondary to ischemia. Delayed urethral obstruction is a potential complication of canine uterine torsion.

Am Anim Hosp Assoc. 2011 Nov-Dec;47(6):391-8.

Pilot evaluation of a vacuum-assisted biopsy instrument for percutaneous renal biopsy in dogs.

Manashirova M, Pressler BM, Gelb HR, Heng HG, Lenz SD, Ochoa-Acuna HG, Freeman LJ.

Kidney biopsies in dogs are commonly obtained using automated spring-loaded biopsy instruments. Interpretation of biopsies from dogs with glomerular disease requires examination of at least 5-10 glomeruli, with at least two biopsies usually required for full evaluation. The purpose of this study was to compare quality and interpretability of renal biopsies obtained from healthy dogs with a large-gauge, vacuum-assisted biopsy instrument versus two biopsies obtained with a spring-loaded biopsy needle. Twenty dogs were randomized into two groups, and percutaneous, ultrasound-guided renal biopsies were evaluated using standard criteria. There were no significant differences in the number of biopsies that contained renal tissue, cortex, or medulla. Biopsies obtained with either instrument contained an adequate number of glomeruli and an equivalent number of arterioles and severity of tissue compression. Differences included easier penetration of the renal capsule and collection of sufficient tissue for interpretation with only one instrument pass when using the vacuum-assisted device (vs two passes required with the spring-loaded instrument). Before use in client-owned dogs, future studies should evaluate whether these differences are clinically relevant advantages in the diagnostic evaluation of dogs with kidney disease, and determine the prevalence and severity of complications when using this larger gauge device.

Journal of the American Veterinary Medical Association

J Am Vet Med Assoc. 2011 Jan 15;238(2):183-8.

Assessment of exposure to *Leptospira* serovars in veterinary staff and dog owners in contact with infected dogs.

Barmettler R, Schweighauser A, Bigler S, Grooters AM, Francey T.

OBJECTIVE: To assess patterns of seroreactivity to *Leptospira* serovars in veterinary professional staff and dog owners exposed to dogs with acute leptospirosis and to contrast these patterns in people with those observed in dogs.

DESIGN: Cross-sectional study.

SAMPLE POPULATION: Human subjects consisted of 91 people (50 veterinarians, 19 technical staff, 9 administrative personnel, and 13 dog owners) exposed to dogs with leptospirosis. Canine subjects consisted of 52 dogs with naturally occurring leptospirosis admitted to the University of Bern Vetsuisse Faculty Small Animal Clinic in 2007 and 2008.

PROCEDURES: People were tested for seroreactivity to regionally prevalent *Leptospira* serovars by use of a complement fixation test. A questionnaire designed to identify risk factors associated with seropositivity was used to collect demographic information from each study participant. Dogs were tested for seroreactivity to *Leptospira* serovars by use of a microscopic agglutination test.

RESULTS: On the basis of microscopic agglutination test results, infected dogs were seropositive for antibodies against *Leptospira* serovars as follows (in descending order): Bratislava (43/52 [83%]), Australis (43/52 [83%]), Grippotyphosa (18/52 [35%]), Pomona (12/52 [23%]), Autumnalis (6/52

[12%]), Icterohemorrhagiae (4/52 [8%]), Tarassovi (2/52 [4%]), and Canicola (1/52 [2%]). All 91 people were seronegative for antibodies against *Leptospira* serovars. Therefore, statistical evaluation of risk factors and comparison of patterns of seroreactivity to *Leptospira* serovars between human and canine subjects were limited to theoretical risks.

CONCLUSIONS AND CLINICAL RELEVANCE: Seroreactivity to *Leptospira* serovars among veterinary staff adhering to standard hygiene protocols and pet owners exposed to dogs with acute leptospirosis was uncommon.

J Am Vet Med Assoc. 2011 Mar 1;238(5):618-24.

Spinal cord nephroblastoma in dogs: 11 cases (1985-2007).

Brewer DM, Cerda-Gonzalez S, Dewey CW, Diep AN, Van Horne K, McDonough SP.

OBJECTIVE: To evaluate clinical features and outcome of dogs with a confirmed spinal cord nephroblastoma and to describe the use of Wilms tumor-1 (WT-1) immunohistochemical staining to confirm a diagnosis of nephroblastoma in dogs.

DESIGN: Retrospective case series. Animals-11 dogs with a spinal cord nephroblastoma.

PROCEDURES: Medical records of dogs with a spinal cord nephroblastoma were reviewed.

Information extracted included signalment, history, clinical signs, results of diagnostic testing, tumor location, treatment, and outcome. The diagnosis was confirmed through histologic review and WT-1 immunohistochemical staining of a tumor sample. In dogs with negative results for staining with WT-1, staining for cytokeratin, vimentin, and glial fibrillar acidic protein was performed.

RESULTS: 11 dogs had a spinal cord tumor with a histologic appearance and immunohistochemical staining consistent with a nephroblastoma. Positive results for staining with WT-1 were detected in 9 of 11 dogs. Age at admission ranged from 5 to 48 months (median, 14 months). Nine dogs were female. All had progressive paraparesis, paraplegia, or ataxia. Duration of clinical signs ranged from 2 to 60 days (median, 14 days). Median survival time was 30 days from the time of diagnosis. Median survival time in dogs treated via surgical resection was 70.5 days.

CONCLUSIONS AND CLINICAL RELEVANCE: The prognosis for dogs with a spinal cord nephroblastoma appeared to be poor, although combined surgical resection and radiation therapy may provide a good functional outcome. Results for staining with WT-1 can be used to support a diagnosis of nephroblastoma.

J Am Vet Med Assoc. 2011 Apr 1;238(7):915-21.

Ocular lesions associated with systemic hypertension in dogs: 65 cases (2005-2007).

Leblanc NL, Stepien RL, Bentley E.

OBJECTIVE: To characterize ocular findings in hypertensive dogs, determine prevalence of hypertension in dogs with ocular disease suggestive of hypertension, and examine possible relationships between degree of hypertension and ocular disease.

DESIGN: Retrospective case series.

ANIMALS: 65 dogs initially referred for blood pressure measurement (n = 22), ophthalmic examination (25), or both (18).

PROCEDURES: Medical records were reviewed to identify dogs examined at the teaching hospital that underwent a complete ophthalmic examination and blood pressure measurement within a 24-hour period between January 1, 2005, and December 31, 2007. Signalment, history, blood pressure measurements, ophthalmic examination findings, and any vasoactive drug treatments were recorded. Ocular lesions considered likely to be associated with systemic hypertension included retinal hemorrhage, retinal detachment, hyphema, tortuous vessels, and subretinal edema.

RESULTS: Of the 65 dogs, 42 were hypertensive (systolic blood pressure \geq 160 mm Hg) and 23 were normotensive. Sixty-two percent (26/42) of hypertensive dogs had \geq 1 type of ocular lesion identified. Retinal hemorrhage was the most common ocular lesion in hypertensive dogs (17/42 [40%]). The presence of \geq 1 type of ocular lesion had moderate sensitivity and specificity of 62% and

61 %, respectively, for identification of hypertension. Fifteen of the 25 (60%) dogs referred for blood pressure measurement after initial ophthalmic examination were found to be hypertensive.

CONCLUSIONS AND CLINICAL RELEVANCE: Ocular lesions are common in dogs with systemic hypertension. Dogs with hypertension or diseases associated with hypertension should be monitored carefully for evidence of ocular target organ damage, and hypertension should be systematically ruled out in dogs with characteristic ocular lesions.

J Am Vet Med Assoc. 2011 Apr 15;238(8):1004-10.

Toxic effects and antitumor response of gemcitabine in combination with piroxicam treatment in dogs with transitional cell carcinoma of the urinary bladder.

Marconato L, Zini E, Lindner D, Suslak-Brown L, Nelson V, Jeglum AK.

OBJECTIVE: To investigate whether combined treatment with gemcitabine and piroxicam in dogs with transitional cell carcinoma (TCC) of the urinary bladder is tolerated and provides an advantage in terms of survival time over previously reported treatments.

DESIGN: Clinical trial. Animals-38 dogs with TCC of the urinary bladder.

PROCEDURES: Dogs were treated with gemcitabine (800 mg/m², IV over 30 to 60 minutes, q 7 d) and piroxicam (0.3 mg/kg [0.14 mg/lb], PO, q 24 h). Complete blood cell counts were monitored prior to each gemcitabine treatment. All toxic effects of gemcitabine in dogs were recorded. Primary tumors were ultrasonographically reevaluated after 4 gemcitabine treatments.

RESULTS: Dogs received a median of 8 gemcitabine treatments (range, 1 to 38 treatments/dog). In response to treatment, 10 of 38 (26.3%) dogs had grade 1 gastrointestinal tract signs, 11 (28.9%) had grade 2, and 5 (13.2%) had grade 3. Grade 1 neutropenia developed in 6 (15.8%) dogs and grade 2 and 3 neutropenia in 2 (5.3%) dogs each. Thrombocytopenia was rare. All dogs had improvement of clinical signs of disease. Two dogs had a complete tumor response, 8 had a partial response, 19 had stable disease, and 8 had progressive disease. Median survival time with treatment was 230 days.

CONCLUSIONS AND CLINICAL RELEVANCE: Administration of gemcitabine in combination with piroxicam treatment failed to provide a longer overall survival time in dogs with TCC of the urinary bladder, compared with previously reported treatment strategies. However, this combination of chemotherapy did provide a new treatment alternative with fewer adverse effects.

J Am Vet Med Assoc. 2011 Apr 15;238(8):1017-25.

Use of indwelling, double-pigtail stents for treatment of malignant ureteral obstruction in dogs: 12 cases (2006-2009).

Berent AC, Weisse C, Beal MW, Brown DC, Todd K, Bagley D.

OBJECTIVE: To determine the outcome of minimally invasive ureteral stent placement for dogs with malignant ureteral obstructions. **DESIGN-**Retrospective case series.

ANIMALS: 12 dogs (15 ureters) with ureteral obstruction secondary to a trigonal urothelial carcinoma.

PROCEDURES: In all patients, indwelling, double-pigtail ureteral stents were placed by means of percutaneous antegrade needle and guide wire access under ultrasound and fluoroscopic guidance.

RESULTS: Stents were successfully placed in all patients. In 11 of 12 patients, percutaneous antegrade access was accomplished. One patient required access via laparotomy because percutaneous access could not be achieved. The median survival time from the date of diagnosis was 285 days (range, 10 to 1,571 days), with a median survival time of 57 days (range, 7 to 337 days) from the date of stent placement. Three complications occurred in 1 patient. Seven patients required concurrent urethral stent placement for relief of urethral obstruction. All animals were discharged from the hospital (median hospitalization time after stent placement, 18 hours [range, 4 hours to 7 days]) with an indwelling, double-pigtail ureteral stent (3 bilateral and 9 unilateral) in place. All stents evaluated 0.25 to 11 months after placement were considered patent.

CONCLUSIONS AND CLINICAL RELEVANCE: Findings suggested that ureteral stent placement was safe, effective, and well tolerated in patients with malignant ureteral obstructions. Stents could be reliably placed in a minimally invasive manner and remain patent long-term. Ureteral stent placement should be considered as early as possible in patients with neoplasia, prior to the development of permanent renal damage.

J Am Vet Med Assoc. 2011 May 1;238(9):1173-5.

Successful replacement of an obstructed ureter with an ileal graft in a cat.

Brouman JD.

CASE DESCRIPTION: A 10-year-old spayed female domestic shorthair cat with a 1-week history of vomiting, lethargy, and anorexia was examined.

CLINICAL FINDINGS: Abdominal radiography and ultrasonography revealed that calculi and a nonpatent stricture obstructed the right ureter, which resulted in secondary dilatation of the ureter proximal to the obstruction and severe hydronephrosis. The left kidney was small and suspected to be failing. Concentrations of BUN and creatinine were elevated. Despite administration of fluids, azotemia persisted.

TREATMENT AND OUTCOME: Surgery was performed. The obstructed right ureter was replaced with a vascularized segment of ileum. Azotemia resolved, and the cat improved with regard to clinical signs. The cat was clinically normal for > 36 months after the surgery.

CLINICAL RELEVANCE: An ileal graft can successfully be used as a surgical option for ureteral obstruction in cats.

J Am Vet Med Assoc. 2011 Aug 1;239(3):344-9.

Transvesicular percutaneous cystolithotomy for the retrieval of cystic and urethral calculi in dogs and cats: 27 cases (2006-2008).

Runge JJ, Berent AC, Mayhew PD, Weisse C.

OBJECTIVE: To describe the use of transvesicular percutaneous cystolithotomy for the retrieval of cystic and urethral calculi and to report the outcome in dogs and cats.

DESIGN: Retrospective case series.

ANIMALS: 23 dogs and 4 cats.

PROCEDURES: Medical records were reviewed for signalment, procedure time, stone number, stone location, pre- and postoperative radiographs, procedure-associated complications, and short-term outcome. A ventral midline approach was made into the abdomen over the urinary bladder apex. A screw cannula was inserted at the bladder apex for normograde rigid and flexible cystourethroscopy. All uroliths were removed via a stone basket device and retrograde flushing and suction. Long-term follow-up (1 year after surgery) information was obtained by telephone or e-mail contact with owners.

RESULTS: 27 animals with cystic and urethral calculi were included. Median patient weight was 8.3 kg (18.3 lb; range, 1.8 to 42.6 kg [4.0 to 93.7 lb]). Urolith number ranged from 1 to > 35 (median, 7). Urolith size ranged from < 1 to 30 mm (median, 4.5 mm). Fifteen of the 27 animals had a previous cystotomy (range, 1 to 5 procedures). Median procedure time was 66 minutes (range, 50 to 80 minutes). All patients were discharged within 24 hours. No postoperative complications were reported at the time of suture removal. At the time of long-term follow-up, the 22 clients that could be contacted were satisfied with the procedure.

CONCLUSIONS AND CLINICAL RELEVANCE: Transvesicular percutaneous cystolithotomy may decrease the need for urethrotomy, serial transurethral endoscopic procedures, and abdominal insufflation associated with other minimally invasive interventions currently available. This procedure also provided excellent visualization for bladder and urethral luminal inspection.

J Am Vet Med Assoc. 2011 Aug 1;239(3):350-6.

Results of biopsy via transurethral cystoscopy and cystotomy for diagnosis of transitional cell carcinoma of the urinary bladder and urethra in dogs: 92 cases (2003-2008).

Childress MO, Adams LG, Ramos-Vara JA, Freeman LJ, He S, Constable PD, Knapp DW.

OBJECTIVE: To assess the diagnostic utility of transurethral cystoscopic biopsy in dogs with histologically confirmed transitional cell carcinoma (TCC) of the urinary bladder and urethra.

DESIGN: Retrospective case series.

ANIMALS: 92 dogs with histologically confirmed TCC.

PROCEDURES: Information on sex, breed, neuter status, body weight, tumor location, biopsy method, number of biopsy procedures, experience level of clinician performing biopsy, and quality of biopsy sample was obtained from medical records. The association of variables with likelihood of achieving a diagnostic-quality biopsy sample was evaluated by use of logistic regression.

RESULTS: If used as the initial biopsy method, cystoscopic biopsy samples were of diagnostic quality in 65% of male dogs and 96% of female dogs with histologically confirmed TCC. Cystoscopic biopsy samples were significantly more likely to be of diagnostic quality in female dogs than in male dogs.

CONCLUSIONS AND CLINICAL RELEVANCE: Cystoscopic biopsy is an effective method to obtain biopsy samples in dogs with TCC of the bladder and urethra. Cystoscopy is more likely to produce a diagnostic-quality biopsy sample in female dogs with TCC than in male dogs with TCC. Cystoscopy should be considered as a primary means of biopsy in male and female dogs with masses of the urinary bladder or urethra.

J Am Vet Med Assoc. 2011 Aug 1;239(3):370-3.

Bladder inversion and secondary hematuria in a 6-month-old domestic shorthair cat.

Adin CA, Chew DJ, Heng HG, Townsend KL, Karnik K.

CASE DESCRIPTION: A 6-month-old female domestic shorthair cat was admitted for evaluation of intermittent clinical signs of hematuria and inappropriate urination for the past 2 months.

CLINICAL FINDINGS: Transabdominal ultrasonography revealed a multilayered mass in the urinary bladder apex consistent with full-thickness invagination of the bladder wall.

TREATMENT AND OUTCOME: Exploratory surgery was performed, and partial inversion of the urinary bladder was confirmed. The invaginated bladder apex was manually reduced, and partial cystectomy was performed to remove the invaginated section of bladder wall. Histologic findings were consistent with vascular congestion and edema secondary to partial invagination. Bacterial culture of a section of the bladder mucosa demonstrated concurrent bacterial urinary tract infection. Clinical signs resolved following surgical resection of the bladder apex and antimicrobial treatment for the concurrent urinary tract infection.

CLINICAL RELEVANCE: Partial invagination of the urinary bladder should be considered in the differential diagnosis for cats with clinical signs of hematuria, stranguria, and inappropriate urination. A diagnosis may be made on the basis of detection of invaginated tissue in the bladder apex during abdominal ultrasonography.

J Am Vet Med Assoc. 2011 Sep 15;239(6):818-22.

Dysuria caused by a partially obstructing urethral membrane in a female dog.

Lechner ES, Cooke KL.

CASE DESCRIPTION: A 3.5-year-old spayed female Labrador Retriever was examined for dysuria of unknown duration.

CLINICAL FINDINGS: Urogenital examination revealed a recessed vulva and a persistent hymen. The hymen was broken down digitally. Results of urinalysis at the referral examination were unremarkable, and no clinically relevant abnormalities were detected on clinicopathologic analysis of blood and serum samples or cytologic evaluation of a vaginal smear. After clinical signs persisted, retrograde contrast vaginourethrocytography was performed; results were considered normal.

During uroendoscopic examination, a translucent membranous structure was detected that partially obstructed the urethral lumen near the junction of the urethra and bladder.

TREATMENT AND OUTCOME: Passage of the endoscope into the urinary bladder ruptured the membranous structure. The dog recovered from the procedure uneventfully and was treated with colchicine (0.03 mg/kg [0.014 mg/lb], PO, q 24 h for 14 days). One month later, the owner reported resolution of clinical signs. Fourteen months later, the patient was evaluated for recurrence of dysuria of several months' duration. Uroendoscopic examination revealed a membranous structure similar to that originally detected; this tissue was also ruptured during endoscopy. The patient was discharged and the owner was instructed to administer colchicine at the same dosage. Recurrence of dysuria was reported again 10 months following the second procedure.

CLINICAL RELEVANCE: To the authors' knowledge, this type of membranous urethral obstruction has not been previously described in a dog. Administration of colchicine did not prevent recurrence, but potential effects of drug administration on time to recurrence could not be evaluated.

J Am Vet Med Assoc. 2011 Oct 1;239(7):972-80.

Vaginal resection and anastomosis for treatment of vestibulovaginal stenosis in 4 dogs with recurrent urinary tract infections.

Kieves NR, Novo RE, Martin RB.

CASE DESCRIPTION-4 dogs were evaluated because of recurrent urinary tract infections. **CLINICAL FINDINGS-**All dogs had recurrent urinary tract infections and similar clinical signs; 3 dogs had urinary incontinence. Digital vaginal examination revealed vestibulovaginal stenosis in all dogs, which was confirmed by results of contrast vaginourethrography. From image measurements, the vestibulovaginal ratio (ratio of the height of the vestibulovaginal junction to the maximum height of the vagina on a lateral vaginourethrogram) was calculated for each dog. Three dogs had severe stenosis (vestibulovaginal ratio, < 0.20; severe stenosis is defined as a vestibulovaginal ratio < 0.20), whereas the fourth dog had moderate stenosis (vestibulovaginal ratio, 0.24; ratio range for moderate stenosis is 0.20 to 0.25). **TREATMENT AND OUTCOME-**All dogs were anesthetized for surgical correction of the vestibulovaginal stenosis. Vaginal resection and anastomosis of the stenosis was performed in all 4 dogs, with 1 dog also undergoing episiotomy. Complete resolution of clinical signs was apparent in 3 dogs; 1 dog had postoperative complications including pollakiuria and stranguria, which resulted in rectal and vaginal prolapse. This dog underwent ovariohysterectomy, after which clinical signs resolved. All dogs had resolution of urinary tract infections at the time of follow-up (6 to 8 months after surgery). **CLINICAL RELEVANCE-**Resection and anastomosis may resolve recurrent urinary tract infections in dogs with severe or moderate vestibulovaginal stenosis. Episiotomy was not necessary for success of surgical treatment, and overall, that procedure increased morbidity, the severity of intraoperative hemorrhage, and duration of surgery.

J Am Vet Med Assoc. 2011 Oct 15;239(8):1084-9.

Antitumor effects of deracoxib treatment in 26 dogs with transitional cell carcinoma of the urinary bladder.

McMillan SK, Boria P, Moore GE, Widmer WR, Bonney PL, Knapp DW.

OBJECTIVE-To evaluate the antitumor activity and toxic effects of deracoxib, a selective cyclooxygenase-2 inhibitor, in dogs with transitional cell carcinoma (TCC) of the urinary bladder. **DESIGN-**Clinical trial. **Animals-**26 client-owned dogs with naturally occurring, histologically confirmed, measurable TCC of the urinary bladder. **PROCEDURES-**Dogs were treated PO with deracoxib at a dosage of 3 mg/kg/d (1.36 mg/lb/d) as a single-agent treatment for TCC. Tumor response was assessed via radiography, abdominal ultrasonography, and ultrasonographic mapping of urinary bladder masses. Toxic effects of deracoxib administration in dogs were assessed through clinical observations and hematologic and biochemical analyses. **RESULTS-**Of 24 dogs for which tumor response was assessed, 4 (17%) had partial remission, 17 (71%) had stable disease, and 3 (13%) had

progressive disease; initial response could not be assessed in 2 of 26 dogs. The median survival time was 323 days. Median time to progressive disease was 133 days. Renal, hepatic, and gastrointestinal abnormalities attributed to deracoxib administration were noted in 4% (1/26), 4% (1/26), and 19% (5/26) of dogs, respectively. **CONCLUSIONS AND CLINICAL RELEVANCE**-Results indicated that deracoxib was generally well tolerated by dogs and had antitumor activity against TCC.

J Am Vet Med Assoc. 2011 Dec 1;239(11):1463-9.

Phenylpropanolamine toxicosis in dogs: 170 cases (2004-2009).

Peterson KL, Lee JA, Hovda LR.

OBJECTIVE: To evaluate signalment, clinical signs, dose ingested, treatment requirements, duration of hospitalization, and outcome of dogs exposed to phenylpropanolamine.

DESIGN: Retrospective case series.

ANIMALS: 170 dogs with potential PPA toxicosis evaluated between 2004 and 2009.

PROCEDURES: Dogs with potential PPA toxicosis were identified by reviewing the electronic database of an animal poison control center.

RESULTS: 66 of the 170 (39%) dogs reportedly did not develop any clinical signs. Clinical signs reported in the remaining 104 (61%) dogs included agitation (n = 40), vomiting (27), mydriasis (19), lethargy (17), tremor or twitching (16), panting (15), bradycardia (13), tachycardia (12), hypertension (11), and erythema (8). Median dose ingested for all dogs was 29 mg/kg (13.2 mg/lb). Dogs developing clinical signs had a significantly higher median dose ingested (373 mg/kg [170 mg/lb]) than did dogs that did not develop clinical signs (18 mg/kg [8.2 mg/lb]). Likewise, median dose ingested for the 123 dogs treated as inpatients (36.9 mg/kg [16.8 mg/lb]) was significantly higher than the median dose for the 14 dogs treated as outpatients (20.5 mg/kg [9.3 mg/lb]). Median duration of hospitalization was 18 hours (range, 4 to 72 hours), and hospitalization time increased as the dose ingested increased. Survival rate was 99.4% (169/170); the dog that died had ingested a dose of 145 mg/kg (65.9 mg/lb).

CONCLUSIONS AND CLINICAL RELEVANCE: Results suggested that with supportive care, the prognosis for dogs that had ingested an overdose of phenylpropanolamine was excellent.

Journal of Veterinary Diagnostic Investigation

J Vet Diagn Invest. 2011 Jan;23(1):171-5.

Hypertrophic osteopathy associated with a renal adenoma in a cat.

Johnson RL, Lenz SD.

Hypertrophic osteopathy is a hyperostotic syndrome of the appendicular skeleton that is most commonly associated with intrathoracic neoplasia or inflammation. The condition is rarely associated with intra-abdominal lesions. The majority of cases have occurred in dogs and human beings, with fewer cases reported in cats, horses, and other species. A 15-year-old male neutered Domestic Shorthair cat presented for swollen limbs and difficulty in ambulation. Radiographs and gross postmortem revealed severe periosteal hyperostosis of the diaphysis and metaphysis of all 4 limbs, including the humerus, radius, ulna, carpi, metacarpi, femur, tibia, tarsi, metatarsi, and phalanges. The axial skeleton was spared. Hyperostotic lesions were characterized microscopically by lamellar bony trabeculae separated by adipocytes and scant hematopoietic tissue. In several areas, fibrovascular connective tissue, woven bone, and islands of cartilage were also present. A 2.5 cm × 2.5 cm perirenal neoplasm compressed the left kidney and adrenal gland. This mass consisted of well-differentiated tubules of cuboidal epithelial cells and was most consistent with a renal tubular adenoma, because mitotic figures were rare, and no distant metastases were found. Thoracic pathology was absent. Hyperostosis was consistent with hypertrophic osteopathy secondary to the renal adenoma. The pathogenesis of hypertrophic osteopathy is uncertain, but predominant theories point to increased peripheral circulation and angiogenesis as a key initiating event. Recent literature

highlights the potential role of vascular endothelial growth factor and platelet-derived growth factor in the human condition. The mechanism by which this renal adenoma caused hypertrophic osteopathy is unknown.

J Vet Diagn Invest. 2011 Mar;23(2):316-20.

Assessment of urine solute and matrix effects on the performance of an enzyme-linked immunosorbent assay for measurement of interleukin-6 in dog urine.

Wood MW, Nordone SK, Vaden SL, Breitschwerdt EB.

Measurement of cytokine concentrations within body fluids is a means of recognizing subclinical and/or unresolved, infectious and inflammatory states in patients. In the urinary tract, such information may be useful for identifying patients with pyelonephritis, asymptomatic bacteriuria, recurrent infections, and cystitis. One such cytokine, interleukin-6 (IL-6), is recognized as a primary cytokine that is produced following exposure of the urothelium to bacterial virulence factors. Complicating reliable testing for this and other cytokines is the nature of urine itself. Urine varies widely in its composition as indicated by the range of pH and urine specific gravity (USG) observed in healthy patients. An additional variable is the protein and carbohydrate matrix capable of hindering immunologic testing modalities, such as enzyme-linked immunosorbent assays (ELISAs). The purpose of the current study was to examine the role of urine pH, USG, and matrix while optimizing a canine-specific chemiluminescent ELISA for the measurement of IL-6 in the urine of dogs. Urine spiked with IL-6 obtained maximal IL-6 quantitative recoveries of only $55 \pm 10\%$ (mean ± 1 standard deviation) when an ELISA optimized for cell culture supernatants was used. The urine matrix and variations in USG were determined to be contributing to this poor IL-6 recovery. Using specific matrix inhibitors and optimal dilutions improved the IL-6 quantitative recovery to $91 \pm 5\%$. Urine pH (5.5-9.5) had no effect. The current work underscores the importance of critically optimizing testing modalities for biomarkers, particularly if they are immunologic in origin.

J Vet Diagn Invest. 2011 Jul;23(4):682-90. Epub 2011 Jun 13.

High-resolution gel electrophoresis and sodium dodecyl sulphate-agarose gel electrophoresis on urine samples for qualitative analysis of proteinuria in dogs.

Giori L, Tricomi FM, Zatelli A, Roura X, Paltrinieri S.

The aims of the current study were to assess whether sodium dodecyl sulphate-agarose gel electrophoresis (SDS-AGE) and high-resolution electrophoresis (HRE) can identify dogs with a urinary protein-to-creatinine ratio (UPC ratio) >0.2 and whether HRE can provide preliminary information about the type of proteinuria, using SDS-AGE as a reference method. HRE and SDS-AGE were conducted on 87 urine samples classified according to the International Renal Interest Society as non-proteinuric (NP; UPC ratio: <0.20 ; 32/87), borderline proteinuric (BP; UPC ratio: 0.21-0.50; 15/87), or proteinuric (P; UPC ratio: >0.51 ; 40/87). SDS-AGE and HRE were positive in 14 out of 32 and 3 out of 32 NP samples and in 52 out of 55 and 40 out of 55 samples with a UPC ratio >0.20 , respectively. The concordance between HRE or SDS and UPC ratio was comparable ($\kappa = 0.59$; $\kappa = 0.55$). However, specificity (90%) and positive likelihood ratio (7.76) were higher for HRE than for SDS-AGE (56% and 2.16) while sensitivity was lower (73% vs. 94%). The analysis of HRE results revealed that a percentage of albumin $>41.4\%$ and an albumin/ $\alpha(1)$ -globulin ratio (alb/ $\alpha(1)$ ratio) >1.46 can identify samples classified by SDS-AGE as affected by glomerular proteinuria while a percentage of $\alpha(1)$ -globulin $>40.8\%$ and an alb/ $\alpha(1)$ ratio <0.84 can identify samples classified by SDS-AGE as affected by tubular proteinuria. In conclusion, both SDS-AGE and HRE could misclassify samples with a UPC ratio higher or lower than 0.20. Therefore, UPC ratio must always be determined before conducting these tests. The percentage of albumin and $\alpha(1)$ -globulin or the alb/ $\alpha(1)$ ratio determined by HRE can provide preliminary information about the origin of proteinuria.

J Vet Diagn Invest. 2011 Jul;23(4):710-5. Epub 2011 Jun 15.

C-reactive protein concentrations in serum of dogs with naturally occurring renal disease.

Raila J, Schweigert FJ, Kohn B.

The current study was undertaken to investigate the relation between serum C-reactive protein (CRP) concentrations and parameters of renal function in dogs with naturally occurring renal disease. Dogs were assigned to groups according to plasma creatinine concentration, urinary protein-to-creatinine ratio (UP/UC), and exogenous plasma creatinine clearance (P-CI(Cr)) rates. Group A (healthy control dogs; n = 8): non-azotemic (plasma creatinine <125 µmol/l) and nonproteinuric (UP/UC <0.2), with P-CI(Cr) rates >90 ml/min/m²); group B (n = 11): non-azotemic, nonproteinuric dogs with reduced P-CI(Cr) rates (50-89 ml/min/m²); group C (n = 7): azotemic, borderline proteinuric dogs (P-CI(Cr) rates: 22-67 ml/min/m²); and group D (n = 6): uremic, proteinuric dogs (not tested for P-CI(Cr)). The serum CRP concentrations were measured via commercial enzyme-linked immunosorbent assay. The CRP concentrations in the clinically healthy dogs (group A) ranged from 2.09 mg/l to 8.60 mg/l (median: 3.21 mg/l). In comparison with dogs of group A, median CRP concentrations were significantly (P < 0.01) elevated in dogs of group B (17.6 mg/l, range: 17.0-19.2 mg/l), group C (24.8 mg/l, range: 18.0-32.5 mg/l), and group D (59.7 mg/l, range: 17.7-123 mg/l). Serum CRP was significantly related to P-CI(Cr) (r = -0.83; P < 0.001), plasma creatinine (r = 0.81; P < 0.001), UP/UC (r = 0.70; P < 0.001), and leukocytes (r = 0.49; P < 0.01). The significant relations between serum CRP concentrations and biochemical parameters of kidney function in plasma and urine suggest that a stimulation of the acute phase response is implicated in the pathogenesis of canine renal disease.

Journal of Veterinary Emergency and Critical Care

J Vet Emerg Crit Care (San Antonio). 2010 Dec;20(6):601-10. doi: 10.1111/j.1476-4431.2010.00596.x.

Presumptive pseudohypoaldosteronism secondary to chronic urinary tract obstruction from sloughed urinary bladder mucosa and urinary tract infection in a cat.

Mahlum LM, Rollings C, Basseches J, Bracker K.

OBJECTIVE: To describe a case of presumptive secondary pseudohypoaldosteronism (PHA) in a cat with urinary tract infection and chronic urethral obstruction. The obstruction was believed to have resulted from sloughed urinary bladder mucosa secondary to pressure necrosis. **CASE SUMMARY:** A 5-year-old, 4 kg, castrated male Siamese cat presented for vomiting and stranguria. Medical history included a perineal urethrostomy for urethral obstruction. Physical examination revealed a large, painful, nonexpressible urinary bladder. Point-of-care testing demonstrated electrolyte derangements consistent with a postrenal azotemia and metabolic acidosis. Results of urine culture was positive for bacterial growth. Diagnostic imaging revealed presence of retroperitoneal fluid, marked urinary bladder wall thickening, bilateral hydronephrosis, mild bilateral pyelectasia, and small nephroliths. The patient was treated for a urinary tract obstruction and infection. In the 3 weeks following initial discharge, the patient was evaluated on multiple occasions for lethargy, intermittent vomiting, inappropriate urination, and progressive polyuria and polydipsia. Although the urinary bladder was easily expressed during repeat examinations, it was persistently distended and subjectively thickened upon palpation. Repeat ultrasound of the urinary tract showed evidence of sloughed tissue in the bladder lumen, likely secondary to chronic urethral obstruction and pressure necrosis. A cystotomy was performed to remove the necrotic tissue, and a revised perineal urethrostomy was done due to a partial urethral stricture. Bladder biopsies were obtained at this time. Postoperatively, the cat was reported by the owners to be urinating normally but continued to be polyuric and polydipsic in the week following discharge. One week after surgery, the cat presented in hypovolemic shock with laboratory findings consistent with a presumptive diagnosis of secondary PHA. **NEW OR UNIQUE INFORMATION PROVIDED:** PHA has not been reported previously in a cat. This case report suggests that aldosterone resistance should be considered in cats with

consistent laboratory findings and a history of documented obstructive uropathy and urinary tract infection.

J Vet Emerg Crit Care (San Antonio). 2011 Apr;21(2):77-8. doi: 10.1111/j.1476-4431.2011.00629.x.

Possible or impossible?

Weisse C.

J Vet Emerg Crit Care (San Antonio). 2011 Apr;21(2):79-85. doi: 10.1111/j.1476-4431.2011.00630.x.

Introduction to interventional radiology for the criticalist.

Weisse C.

OBJECTIVES: To introduce the basic equipment necessary to perform interventional radiology (IR) techniques in the veterinary setting, particularly those procedures of interest to the criticalist.

DATA SOURCES: Veterinary and human literature as well as author's experience.

HUMAN DATA SYNTHESIS: Since the 1950s, diagnostic angiography has played an important role in human medicine. However, over the last 2-3 decades, this once purely diagnostic modality has become a subspecialty in human medicine with vast applications throughout the body. These techniques have replaced more invasive surgeries as the standard-of-care in many circumstances.

VETERINARY DATA SYNTHESIS: Although comparable data are not available in the veterinary literature, many IR and interventional endoscopy techniques are poised to replace more invasive procedures in veterinary medicine. In addition, these techniques have already been shown to offer treatment options for patients in whom more traditional therapies have failed, have been declined, or are not indicated due to comorbidities or substantial risk to patient health.

CONCLUSIONS: Like our human medical counterparts, the use of IR techniques will likely play and increasingly important role in the care of veterinary patients. With this in mind, it is important to become familiar with both the equipment used in these techniques as well as their applications both currently in clinical cases and in the near future.

J Vet Emerg Crit Care (San Antonio). 2011 Apr;21(2):86-103. doi: 10.1111/j.1476-4431.2011.00628.x.

Ureteral obstructions in dogs and cats: a review of traditional and new interventional diagnostic and therapeutic options.

Berent AC.

OBJECTIVE: To describe and review both traditional and newer diagnostic and therapeutic options for canine and feline ureteral obstructions currently being performed clinically in veterinary medicine.

DATA SOURCES: A Medline search with no date restrictions was used for this review.

HUMAN DATA SYNTHESIS: The human literature would support the use of minimally invasive endourological techniques for the treatment of nearly all causes of ureteral obstructions, whenever possible. This typically includes extracorporeal shockwave lithotripsy, intracorporeal lithotripsy via retrograde ureteroscopy or antegrade percutaneous nephroureterolithotomy, ureteral stenting, percutaneous nephrostomy tube placement, and laparoscopic endopyelotomy. Typically open surgery is only suggested in cases of ureteral or gynecological malignancy when en bloc resection is considered a good option, or when various methods of endourological techniques have failed.

VETERINARY DATA SYNTHESIS: The veterinary literature is scarce on the use of interventional endourological techniques for the treatment of ureteral obstructions and has been growing over the last 5 years. The current literature reports the use of extracorporeal shockwave lithotripsy for ureteral stones, as well as the use of ureteral stents for the treatment of trigonal obstructive transitional cell carcinoma, ureterolithiasis, and ureteral strictures. Traditional surgical interventions, like ureterotomy, ureteronephrectomy, and ureteral reimplantation is more vastly reported and accepted. This review will focus on new clinical data using interventional endourological techniques for ureteral obstructions.

CONCLUSIONS: Various treatment options for ureteral obstructions are now available for veterinary patients, and the trend away from traditional surgical techniques will hopefully be followed now that they are technically and clinically available for dogs and cats.

J Vet Emerg Crit Care (San Antonio). 2011 Jun;21(3):268-72. doi: 10.1111/j.1476-4431.2011.00638.x.

4-Methylpyrazole as a treatment in naturally occurring ethylene glycol intoxication in cats.

Tart KM, Powell LL.

OBJECTIVE: To describe the clinical experience and therapeutic use of fomepizole (4-methylpyrazole [4-MP]) in 3 cats with naturally occurring ethylene glycol (EG) toxicity. CASE OR SERIES SUMMARY: All cats were documented to be EG positive by an ethylene glycol test kit. This report describes the dose of 4-MP used, available clinicopathological data, and clinical progression during hospitalization. All patients survived to discharge. NEW OR UNIQUE INFORMATION PROVIDED: IV use of 4-MP at 125 mg/kg as an initial dose and 31.25 mg/kg at 12, 24, and 36 hours is safe and effective for treatment of naturally occurring EG toxicity in cats. Increased HCO₃ concentrations were noted after IV use of 4-MP. This is the first report documenting the successful treatment of naturally occurring EG intoxication in cats with 4-MP.

J Vet Emerg Crit Care (San Antonio). 2011 Aug;21(4):387-94. doi: 10.1111/j.1476-4431.2011.00644.x.

Colonic, ureteral, and vascular injuries secondary to stick impalement in a dog.

Menard J, Schoeffler GL.

OBJECTIVE: To report the surgical repair, case management, and outcome of a dog with sepsis and severe intraabdominal trauma secondary to a penetrating stick injury. CASE OR SERIES SUMMARY: A 1.5-year-old, spayed female, mixed-breed dog was presented to the emergency service after incurring a small laceration on the medial aspect of the left pelvic limb while running in the woods. The wound was surgically explored and a primary closure achieved. The patient was discharged the same day with oral antimicrobial therapy. The following morning the dog was represented to the emergency service for acute vomiting. Abdominal radiographs were performed and demonstrated loss of serosal detail and pneumoperitoneum. An emergency celiotomy was performed and revealed distal colonic perforation, left ureteral laceration, and lacerations of the left common iliac vein. Ureteronephrectomy, as well as primary closure of the distal colonic perforation and left common iliac vein lacerations, were performed. The patient recovered and was ultimately discharged from the hospital 5 days later. Follow-up 1 year later revealed no significant physical exam or biochemical abnormalities. NEW OR UNIQUE INFORMATION PROVIDED: A seemingly benign penetrating stick injury initially deemed to be superficial in nature was later demonstrated to have resulted in sepsis following severe intraabdominal trauma that included lacerations of the distal colon, left ureter, and left common iliac vein in a dog. Successful surgical management and intensive care led to a full recovery without any residual impairment noted a year later.

J Vet Emerg Crit Care (San Antonio). 2011 Dec;21(6):587-8. doi: 10.1111/j.1476-4431.2011.00701.x.

It's a 'kidney' not a 'renal'.

Labato MA.

J Vet Emerg Crit Care (San Antonio). 2011 Dec;21(6):648-57. doi: 10.1111/j.1476-4431.2011.00689.x.

Characterization of acute kidney injury in hospitalized dogs and evaluation of a veterinary acute kidney injury staging system.

Toen ME, Kerl ME.

OBJECTIVE: To retrospectively apply standards characterizing acute kidney injury (AKI) used in human medicine to a population of critically ill hospitalized dogs in order to identify dogs with potential AKI based on subtle increases in plasma creatinine concentration.

DESIGN: Retrospective study.

SETTING: University Veterinary Medical Teaching Hospital.

ANIMALS: One hundred and sixty-four client-owned dogs admitted to the intensive care unit.

INTERVENTIONS: None.

MEASUREMENTS AND MAIN RESULTS: Medical records of 164 dogs meeting the study inclusion criteria were reviewed to identify age, results of creatinine measurements, discharge status, length of stay, performance of general anesthesia, number of diagnoses, and calculated survival prediction index scores (SPI2). A veterinary AKI (VAKI) staging system was retrospectively applied to classify dogs based on increase in creatinine concentration from baseline as follows: stage 0 (S0; <150%), stage 1 (S1; 150-199% or $\geq 26.5 \mu\text{mol/L}$ [$\geq 0.3 \text{ mg/dL}$]), stage 2 (S2; 200-299%), or stage 3 (S3; $\geq 300\%$). Of the dogs evaluated, 140/164 were VAKI stage S0, 19/164 were classified as S1, 3/164 as S2, and 2/164 were S3. Mortality rate was greater for S1-3 (13/24; 54.2%) compared to S0 dogs (22/140; 15.7%) ($P < 0.0001$). Length of stay, general anesthesia, and number of diagnoses were not associated with survival. In a logistic regression model, stage and age were jointly, significantly associated with mortality ($P = 0.0002$ and $P = 0.0330$, respectively). Mean SPI2 scores were not different between S0 (0.52) and S1 (0.59) dogs ($P = 0.23$). Only 4/19 (21%) of S1 dogs had a peak plasma creatinine concentration above the laboratory reference interval.

CONCLUSIONS: Dogs meeting VAKI stage 1-3 criteria were less likely to survive to discharge. Small increases in plasma creatinine concentration may be clinically relevant even when absolute values are within reference intervals.

J Vet Emerg Crit Care (San Antonio). 2011 Dec;21(6):679-83. doi: 10.1111/j.1476-4431.2011.00688.x.

Propylene glycol intoxication in a dog.

Claus MA, Jandrey KE, Poppenga RH.

OBJECTIVE: To describe the clinical course, treatment, and outcome of a dog with propylene glycol intoxication. CASE SUMMARY: An adult castrated male Australian cattle dog presented to an emergency clinic for an acute onset of ataxia and disorientation after roaming a construction site unsupervised. He tested positive for ethylene glycol using a point-of-care test kit. Treatment for ethylene glycol intoxication included intermittent intravenous boluses of 20% ethanol and hemodialysis. Predialysis and postdialysis blood samples were submitted to the toxicology lab to assess for both ethylene and propylene glycol. The patient tested negative for ethylene glycol and positive for propylene glycol at 1100 mg/dL predialysis and 23 mg/dL postdialysis. The dog made a full recovery. NEW OR UNIQUE INFORMATION PROVIDED: To the authors' knowledge, this is the first report of documented propylene glycol intoxication in a dog, as well as the first report to describe hemodialysis as treatment for propylene glycol intoxication in a dog.

Journal of Veterinary Internal Medicine

J Vet Intern Med. 2011 Jan-Feb;25(1):1-13. doi: 10.1111/j.1939-1676.2010.0654.x. Epub 2010 Dec 13.

2010 ACVIM small animal consensus statement on leptospirosis: diagnosis, epidemiology, treatment, and prevention.

Sykes JE, Hartmann K, Lunn KF, Moore GE, Stoddard RA, Goldstein RE.

This report offers a consensus opinion on the diagnosis, epidemiology, treatment, and prevention of leptospirosis in dogs, an important zoonosis. Clinical signs of leptospirosis in dogs relate to development of renal disease, hepatic disease, uveitis, and pulmonary hemorrhage. Disease may follow periods of high rainfall, and can occur in dogs roaming in proximity to water sources, farm animals, or wildlife, or dogs residing in suburban environments. Diagnosis is based on acute and convalescent phase antibody titers by the microscopic agglutination test (MAT), with or without use of polymerase chain reaction assays. There is considerable interlaboratory variation in MAT results, and the MAT does not accurately predict the infecting serogroup. The recommended treatment for

optimal clearance of the organism from renal tubules is doxycycline, 5 mg/kg p.o. q12h, for 14 days. Annual vaccination can prevent leptospirosis caused by serovars included in the vaccine and is recommended for dogs at risk of infection.

J Vet Intern Med. 2011 Jan-Feb;25(1):14-9. doi: 10.1111/j.1939-1676.2010.0655.x. Epub 2010 Dec 13.

Peritoneal dialysis in cats with acute kidney injury: 22 cases (2001-2006).

Cooper RL, Labato MA.

BACKGROUND: Peritoneal dialysis (PD) has been described for use in animals with acute kidney injury refractory to fluid therapy. However, no study has examined the use of PD in a large group of cats.

HYPOTHESIS: PD is an important adjunctive therapy to treat acute kidney injury in cats.

ANIMALS: The medical records of 22 cats with acute kidney injury that had received PD were examined. Animals were excluded if acute uremia was a result of postrenal causes such as uroabdomen or urethral obstruction.

METHODS: Medical records were reviewed for the following: indication for PD, outcome, number of cycles performed, survival time, and predialysis and postdialysis results for blood urea nitrogen (BUN), creatinine, potassium, chloride, sodium, phosphorus, total protein, and albumin concentrations, and urine output.

RESULTS: Indications for PD include acute-on-chronic kidney injury, acute kidney injury caused by toxins, bilateral ureteroliths, bilateral ureteral ligation as a complication of ovariohysterectomy, and unknown causes. The median survival time for all cats on PD was 4 days, although the median survival time for the cats that were discharged was 774 days. The most common complications were dialysate retention and sequestration of dialysate SC. There was a significant ($P < .05$) decrease between predialysis and postdialysis results for BUN, creatinine, potassium, phosphorus, total protein, and albumin concentrations. There was a significant ($P < .05$) difference in survival times between sexes.

CONCLUSIONS AND CLINICAL IMPORTANCE: PD is an effective option for treatment of cats with acute kidney injury refractory to fluid therapy.

J Vet Intern Med. 2011 Mar-Apr;25(2):206-14. doi: 10.1111/j.1939-1676.2010.0669.x.

Comparison of signalment, clinicopathologic findings, histologic diagnosis, and prognosis in dogs with glomerular disease with or without nephrotic syndrome.

Klosterman ES, Moore GE, de Brito Galvao JF, DiBartola SP, Groman RP, Whittemore JC, Vaden SL, Harris TL, Byron JK, Dowling SR, Grant DC, Grauer GF, Pressler BM.

BACKGROUND: Nephrotic syndrome (NS) develops most commonly in people with glomerular diseases associated with marked albuminuria. Hyponatremia, hypertension, and progressive renal failure are more prevalent in nephrotic than nonnephrotic human patients.

HYPOTHESIS/OBJECTIVES: Dogs with NS have higher serum cholesterol, triglyceride, and sodium concentrations, higher urine protein:creatinine ratios (UPC) and systolic blood pressure, and lower serum albumin concentrations than dogs with nonnephrotic glomerular disease (NNGD). NS is associated with membranous glomerulopathy and amyloidosis. Affected dogs are more likely to be azotemic and have shorter survival times.

ANIMALS: Two hundred and thirty-four pet dogs (78 NS dogs, 156 NNGD dogs).

METHODS: Multicenter retrospective case-control study comparing time-matched NS and NNGD dogs. NS was defined as the concurrent presence of hypoalbuminemia, hypercholesterolemia, proteinuria, and extravascular fluid accumulation. Signalment, clinicopathologic variables, histopathologic diagnoses, and survival time were compared between groups.

RESULTS: Age, serum albumin, chloride, calcium, phosphate, creatinine, and cholesterol concentrations, and UPC differed significantly between NS and NNGD dogs. Both groups were equally likely to be azotemic at time of diagnosis, and NS was not associated with histologic diagnosis. Median survival was significantly shorter for NS (12.5 days) versus NNGD dogs (104.5 days). When

subgrouped based on serum creatinine (< or ≥ 1.5 mg/dL), survival of NS versus NNGD dogs was only significantly different in nonazotemic dogs (51 versus 605 days, respectively).

CONCLUSIONS AND CLINICAL IMPORTANCE: Presence of NS is associated with poorer prognosis in dogs with nonazotemic glomerular disease. Preventing development of NS is warranted; however, specific interventions were not evaluated in this study.

J Vet Intern Med. 2011 Mar-Apr;25(2):199-205. doi: 10.1111/j.1939-1676.2011.0685.x.

Nested case-control study of feline calicivirus viruria, oral carriage, and serum neutralizing antibodies in cats with idiopathic cystitis.

Larson J, Kruger JM, Wise AG, Kaneene JB, Miller R, Fitzgerald SD, Kiupel M, Maes RK.

BACKGROUND: The epidemiology of feline calicivirus (FCV) infection in cats with idiopathic cystitis (FIC) has not been investigated by contemporary molecular biologic methods.

OBJECTIVES: To determine the prevalence of and evaluate risk factors for FCV viruria, oral carriage, and virus neutralizing (VN) antibodies in cats with and without FIC.

ANIMALS: Cats with nonobstructive FIC (n = 47), obstructive FIC (n = 22), and FCV upper respiratory tract infection (URI; n = 25), and healthy client-owned (n = 18) and colony-housed (n = 24) cats.

METHODS: Oropharyngeal secretions and urine were evaluated with a FCV p30 gene-based real-time reverse-transcriptase polymerase chain reaction (RT-PCR) assay. Serum VN antibody titers were determined by a modified microtiter assay. Associations of risk factors with log-transformed antibody titers were determined by multivariable generalized linear regression.

RESULTS: FCV viruria was detected in 4 (6%) and 3 (12%) cats with FIC and URI, respectively. In 3 FIC cats, viruria was unassociated with detectable oral virus carriage. Oral FCV carriage was detected in 7 (10%) FIC cats. Median antibody titers were significantly higher in cats with obstructive FIC (1:256), nonobstructive FIC (1:128), and URI (1:512) compared with healthy client-owned (1:16) and colony-housed (1:4) cats (P < .001). Other than disease, multivariate analysis did not identify any other explanatory variables for increased titers in cats with FIC or URI.

CONCLUSIONS AND CLINICAL IMPORTANCE: FCV viruria was detected in cats with FIC and URI, however, its etiologic significance is uncertain. Serologic results suggest increased FCV exposure in FIC cats compared with controls. Further investigations are needed to clarify the potential role of FCV in FIC.

J Vet Intern Med. 2011 Mar-Apr;25(2):222-9. doi: 10.1111/j.1939-1676.2011.0679.x.

Feline ureteral strictures: 10 cases (2007-2009).

Zaid MS, Berent AC, Weisse C, Caceres A.

BACKGROUND: Feline ureteral obstructions have emerged as a common problem. Ureteral strictures rarely are reported as a cause and the predisposing factors and clinical course of this condition have not been described.

OBJECTIVES: Evaluate cases of feline ureteral strictures and characterize historical features, clinical signs, diagnostic imaging, surgical and endoscopic findings, histopathology, treatment modalities, and short- and long-term outcomes.

ANIMALS: Ten cats diagnosed with ureteral strictures based on compatible findings from at least 2 of the following: ultrasonography, ureteropyelography, surgical exploration, or histopathology.

METHODS: Retrospective study.

RESULTS: Median age, serum creatinine concentration, and size of the renal pelvis were 12 years, 3.7 mg/dL, and 11.75 mm, respectively. Six of 10 cats had hyperechoic periureteral tissue on ultrasound examination at the stricture site. Four cats had evidence of a circumcaval ureter at surgery. Eight cats had an intervention including ureteral stent placement (n = 6) and traditional surgery (n = 2). Seven of 8 cats had decreases in serum creatinine concentration and renal pelvic parameters preceding discharge and 6 had persistently improved results at their last examination. All patients survived to discharge. Median survival time was > 294 days (range, 14 to > 858 days) with 6/10 cats still alive.

CONCLUSIONS AND CLINICAL IMPORTANCE: Ureteral strictures may occur in cats secondary to ureteral surgery, inflammation, a circumcaval ureter, impacted ureterolithiasis, or for unknown causes. With appropriate and timely intervention, the prognosis for long-term survival is good. In addition to ureteral reimplantation or ureteronephrectomy, ureteral stenting or SC ureteral bypass may be considered as future therapeutic options.

J Vet Intern Med. 2011 May-Jun;25(3):426-32. doi: 10.1111/j.1939-1676.2011.0704.x.

Variability in results of the microscopic agglutination test in dogs with clinical leptospirosis and dogs vaccinated against leptospirosis.

Miller MD, Annis KM, Lappin MR, Lunn KF.

BACKGROUND: The microscopic agglutination test (MAT) is commonly used for the diagnosis of canine leptospirosis. In dogs it is sometimes suggested that the serogroup with the highest MAT titer is the infecting serogroup; however, this is not true in humans with confirmed leptospirosis. We sought to investigate the value of MAT results in predicting the infecting serogroup by comparing results across several laboratories and within individual dogs over time.

OBJECTIVES: To examine the variability in MAT results across different laboratories in dogs recently vaccinated against leptospirosis, and in dogs with clinical leptospirosis, and to investigate variability over time in MAT results in individual dogs with leptospirosis.

ANIMALS: Eighteen dogs from a research colony, 9 of which had been vaccinated against leptospirosis, and 17 dogs clinically diagnosed with leptospirosis.

METHODS: Serum samples were submitted to up to 5 veterinary diagnostic laboratories for MAT titers from each dog on at least 1 occasion. MAT results also were followed over time in 6 dogs diagnosed with leptospirosis.

RESULTS: MAT results were discordant across different laboratories in dogs recently vaccinated against leptospirosis and in dogs with clinical leptospirosis. MAT results varied over time in individual dogs with the disease.

CONCLUSIONS AND CLINICAL IMPORTANCE: The MAT is a valuable test for the diagnosis of leptospirosis in dogs, but it is unlikely that test results can be used to predict the infecting serogroup. Laboratories offering the MAT should consider participation in a proficiency scheme.

J Vet Intern Med. 2011 Jul-Aug;25(4):784-96. doi: 10.1111/j.1939-1676.2011.0732.x.

Idiopathic cystitis in domestic cats--beyond the lower urinary tract.

Buffington CA.

Signs of lower urinary tract (LUT) disease in domestic cats can be acute or chronic, and can result from variable combinations of abnormalities within the lumen of the LUT, the parenchyma of the LUT itself, or other organ system(s) that then lead to LUT dysfunction. In the majority of cats with chronic signs of LUT dysfunction, no specific underlying cause can be confirmed after standard clinical evaluation of the LUT, so these cats typically are classified as having idiopathic cystitis. A syndrome in human beings commonly known as interstitial cystitis (IC) shares many features in common with these cats, permitting comparisons between the two species. A wide range of similarities in abnormalities has been identified between these syndromes outside as well as inside the LUT. A variety of potential familial and developmental risk factors also have been identified. These results have permitted generation of the hypothesis that some of these people have a disorder affecting the LUT rather than a disorder of the LUT. This perspective has suggested alternative diagnostic strategies and novel approaches to treatment, at least in cats. The purpose of this review is to summarize research investigations into the various abnormalities present in cats, to compare some of these findings with those identified in human beings, and to discuss how they might modify perceptions about the etiopathogenesis, diagnosis, and treatment of cats with this disease.

Dedication: I dedicate this contribution to Professor Dennis J. Chew, whose collaboration, patience, and support made it all possible.

The pharmacokinetics of mirtazapine in cats with chronic kidney disease and in age-matched control cats.

Quimby JM, Gustafson DL, Lunn KF.

BACKGROUND: Cats with chronic kidney disease (CKD) often experience inappetence, and may benefit from administration of mirtazapine, an appetite stimulant. The pharmacokinetics of mirtazapine in CKD cats is unknown.

HYPOTHESIS: CKD delays the clearance/bioavailability (CL/F) of mirtazapine.

ANIMALS: Six CKD cats and 6 age-matched controls (AMC) were enrolled. Two CKD cats each from International Renal Interest Society (IRIS) stage II, III and IV were included.

METHODS: Blood samples were collected before and 0.5, 1, 1.5, 2, 4, 8, 24, and 48 hours after a single PO dose of 1.88 mg of mirtazapine. Mirtazapine concentrations were measured by liquid chromatography coupled to tandem mass spectrometry. Non-compartmental pharmacokinetic modeling was performed.

RESULTS: Mean age was 11 years (CKD cats) and 10.8 years (AMC cats). Mean serum creatinine concentration \pm standard deviation (SD) was 3.8 ± 1.6 mg/dL (CKD) and 1.3 ± 0.4 mg/dL (AMC). Mean half-life \pm SD was 15.2 ± 4.2 hours (CKD) and 12.1 ± 1.1 hours (AMC). Mean area under the curve (AUC) \pm SD was 770.6 ± 225.5 ng/mL•hr (CKD) and 555.5 ± 175.4 ng/mL•hr (AMC). Mean CL/F \pm SD was 0.6 ± 0.1 L/hr/kg (CKD) and 0.8 ± 0.16 L/hr/kg (AMC). A Mann-Whitney test indicated statistically significant differences in AUC ($P = 0.01$) and CL/F ($P = 0.04$) between groups. Calculated accumulation factor for 48-hour dosing in CKD cats was 1.15.

CONCLUSION: CKD may delay the CL/F of mirtazapine. A single low dose of mirtazapine resulted in a half-life compatible with a 48-hour dosing interval in CKD cats.

Evaluation of kidney injury in dogs with pyometra based on proteinuria, renal histomorphology, and urinary biomarkers.

Maddens B, Heiene R, Smets P, Svensson M, Aresu L, van der Lugt J, Daminet S, Meyer E.

BACKGROUND: Proteinuria is a feature of pyometra-associated renal dysfunction, but its prevalence and clinical relevance are not well characterized.

OBJECTIVES: To define which subset of dogs with pyometra has clinically relevant kidney injury by quantification of proteinuria; light, immunofluorescence, and electron microscopic examination of kidney biopsy specimens; and measurement of urinary biomarkers.

ANIMALS: Forty-seven dogs with pyometra. Ten clinically healthy intact bitches of comparable age.

Methods: Prospective study. Routine clinicopathological variables including urinary protein to creatinine ratio (UPC) were analyzed. Validated assays were used to quantify urinary biomarkers for glomerular (urinary albumin, urinary immunoglobulin G, urinary C-reactive protein, urinary thromboxane B(2)) and tubular function (urinary retinol-binding protein, urinary N-acetyl- β -d-glucosaminidase). Kidney biopsy specimens from 10 dogs with pyometra and dipstick urine protein concentrations of 2+ or 3+ were collected during ovariohysterectomy. Urinalysis was repeated within 3 weeks after surgery in 9 of the 10 dogs.

RESULTS: UPC (median, range) was significantly higher in dogs with pyometra (0.48, 0.05-8.69) compared with healthy bitches (0.08, 0.02-0.16) ($P < .01$). Twenty-two of 47 dogs with pyometra had UPC > 0.5, 12 had UPC > 1.0, and 7 had UPC > 2.0. Glomerulosclerosis and tubulointerstitial nephritis were common kidney biopsy findings in proteinuric dogs with pyometra. Dogs with glomerulosclerosis (5/10), either global or focal and segmental, had UPC > 1.0 at ovariohysterectomy and afterward. Dogs with structural glomerular and tubular changes mostly had urinary biomarker to creatinine ratios above the 75th percentile.

CONCLUSION: Dogs with pyometra and UPC>1.0 or high ratios of urinary biomarkers appear likely to have clinically relevant renal histologic lesions and require monitoring after ovariohysterectomy. Future studies should evaluate the role of pyometra-associated pathogenic mechanisms in causing or exacerbating focal and segmental glomerulosclerosis in dogs.

J Vet Intern Med. 2011 Nov-Dec;25(6):1306-11. doi: 10.1111/j.1939-1676.2011.00805.x.

Association between body condition and survival in dogs with acquired chronic kidney disease.
Parker VJ, Freeman LM.

BACKGROUND: Obesity in people with chronic kidney disease (CKD) is associated with longer survival. The purpose of this study was to determine if a relationship exists between body condition score (BCS) and survival in dogs with CKD.

HYPOTHESIS/OBJECTIVES: Higher BCS is a predictor of prolonged survival in dogs with CKD.

ANIMALS: One hundred dogs were diagnosed with CKD (International Renal Interest Society stages II, III or IV) between 2008 and 2009.

METHODS: Retrospective case review. Data regarding initial body weight and BCS, clinicopathologic values and treatments were collected from medical records and compared with survival times.

RESULTS: For dogs with BCS recorded (n = 72), 13 were underweight (BCS = 1-3; 18%), 49 were moderate (BCS = 4-6; 68%), and 10 were overweight (BCS = 7-9; 14%). For dogs with at least 2 body weights recorded (n = 77), 21 gained weight, 47 lost weight, and 9 had no change in weight. Dogs classified as underweight at the time of diagnosis (median survival = 25 days) had a significantly shorter survival time compared to that in both moderate (median survival = 190 days; P < .001) and overweight dogs (median survival = 365 days; P < .001). There was no significant difference in survival between moderate and overweight dogs (P = .95).

CONCLUSIONS AND CLINICAL IMPORTANCE: Higher BCS at the time of diagnosis was significantly associated with improved survival. Further research on the effects of body composition could enhance the management of dogs with CKD.

J Vet Intern Med. 2011 Nov-Dec;25(6):1385-90. doi: 10.1111/j.1939-1676.2011.00796.x.

Clinical trial of vinblastine in dogs with transitional cell carcinoma of the urinary bladder.
Arnold EJ, Childress MO, Fourez LM, Tan KM, Stewart JC, Bonney PL, Knapp DW.

BACKGROUND: Transitional cell carcinoma (TCC) of the urinary bladder of dogs can be a difficult cancer to treat, and effective therapies are limited. Vinblastine has been used in humans with TCC and has potent anti-proliferative effects against canine TCC cells in vitro.

OBJECTIVES: To determine the antitumor activity and toxicoses of vinblastine in dogs with urinary bladder TCC.

ANIMALS: Animals selected were 28 privately owned dogs that presented to the Purdue University Veterinary Teaching Hospital (PUVTH) with measurable, histologically confirmed TCC.

METHODS: Prospective clinical trial: The starting vinblastine dosage was 3.0 mg/m² i.v. every 2 weeks. Treatment continued until cancer progression or unacceptable toxicoses occurred. Complete evaluations (physical exam, complete blood count [CBC], serum biochemical profile, urinalysis, thoracic radiography, abdominal ultrasound [US]) were performed at 8-week intervals. Urinary tract US with bladder tumor mapping was performed monthly. Toxicoses were graded according to Veterinary Co-Operative Oncology Group (VCOG) criteria.

RESULTS: Tumor responses included 10 (36%) partial remission, 14 (50%) stable disease, and 4 (14%) progressive disease. The median progression free interval was 122 days (range, 28-399 days). The median survival time was 147 days (range, 28-476 days) from 1st vinblastine treatment to death and 299 days (range, 43-921 days) from diagnosis to death. The majority of dogs (27 of 28) did not have clinically relevant adverse effects. Seventeen of 28 (61%) dogs required dosage reductions because of neutropenia.

CONCLUSION AND CLINICAL IMPORTANCE: Vinblastine has antitumor activity against TCC in dogs and can be considered another treatment option for this cancer.

The Journal of Veterinary Medical Science

J Vet Med Sci. 2011 Jan;73(1):129-32. Epub 2010 Sep 3.

Progression of glomerulonephritis to end-stage kidney disease in a cat with nephrotic syndrome.

Kamiie J, Haishima A, Inoue K, Ogihara K, Ono M, Yasuno K, Kobayashi R, Aihara N, Ohmuro T, Shirota K.

A percutaneous renal biopsy was performed on a 3-year-old female Japanese domestic cat with pleural effusion, mild azotemia, hypoalbuminemia, hypercholesterolemia, and proteinuria. Glomerular lesions included mild diffuse hypercellularity and numerous capsular adhesions with segmental sclerosis/hyalinosis of glomerular tufts. Electron microscopy revealed many subendothelial dense deposits with characteristic outer protrusion of glomerular basement membrane. Diffuse and global granular deposits of IgG and C3 were detected along the capillary walls. Tubulo-interstitial changes were mild at the time of biopsy, but progression of the disease was predicted because of the many capsular adhesions of the glomerular tufts. The cat was fed a prescription diet without any other specific or symptomatic therapy after renal biopsy, and died 43 weeks after the biopsy. At necropsy, extensive tubulo-interstitial fibrosis and mononuclear cell infiltration had developed throughout the cortex and outer medulla, and most glomeruli had extensive global sclerosis or obsolescence with less prominent depositions of IgG and C3.

J Vet Med Sci. 2011 May;73(5):679-81. Epub 2010 Dec 22.

Development of correction formulas for canine and feline urine specific gravity measured using a Japanese refractometer.

Miyagawa Y, Tominaga Y, Toda N, Takemura N.

One of the most important functions of the kidney is to concentrate urine through the reabsorption of water. Urine specific gravity (USG) is used in routine tests of urine concentration and can be estimated using a refractometer. However, as the scale of Japanese refractometer is based on experimental data from healthy Japanese people, and human USG obtained by Japanese refractometers show higher values than that by refractometer produced in Europe or the U.S.A. The purpose of this study was to establish correction formulas for the USG of dogs and cats measured using Japanese refractometers. In this study, we found that Japanese refractometers overestimated USG in both dogs and cats. This study shows that the correlation formulas described in this study are useful for the accurate evaluation of USG.

J Vet Med Sci. 2011 Jul 5;73(6):801-3. Epub 2011 Jan 6.

Ganglioneuroma in the urinary bladder of a dog.

Sakai H, Yonemaru K, Takeda M, Niimi K, Murakami M, Hirata A, Yanai T.

An 11-year-old male Labrador retriever presented with chronic oliguria. Ultrasonography findings revealed a protruding mass at the neck of the urinary bladder. A cystotomy was performed, and the mass was removed by ligation with surgical sutures. Histopathological examination revealed conspicuous foci with a variable number of ganglion cells in the tumor and abundant interwoven bundles of schwannian cells with fine fibers. The ganglion cells were positive for neuron-specific enolase and neurofilament. The schwannian cells were positive for vimentin, S-100 protein, and glial fibrillary acidic protein. Thus, according to the classification of tumor with neuronal cell differentiation, the urinary tumor was diagnosed as a ganglioneuroma.

J Vet Med Sci. 2011 Jul 5;73(6):787-95. Epub 2011 Feb 7.

Age-related pathophysiological changes in rats with unilateral renal agenesis.

Amakasu K, Suzuki K, Katayama K, Suzuki H.

Affected rats of the unilateral urogenital anomalies (UUA) strain show renal agenesis restricted to the left side. To determine whether unilateral renal agenesis is a risk factor for the progression of renal insufficiency, we studied age-related pathophysiological alterations in affected rats. Although body growth and food intake were normal, polydipsia and polyuria with low specific gravity were present at 10 weeks and deteriorated further with age. Blood hemoglobin concentrations were normal, though there was slight erythropenia with increased MCV and MCH. Although hypoalbuminemia, hypercholesterolemia, azotemia, and hypermagnesemia were manifested after age 20 weeks, neither hyperphosphatemia nor hypocalcemia was observed. Plasma Cre and UN concentrations gradually increased with age. Cre clearance was almost normal, whereas fractional UN excretion was consistently lower than normal. Proteinuria increased with age, and albumin was the major leakage protein. In addition to cortical lesions, dilated tubules, cast formation, and interstitial fibrosis were observed in the renal medulla of 50 week-old affected rats. Renal weight was increased 1.7-fold and glomerular number 1.2-fold compared with normal rats. These findings show that the remaining kidney in UUA rats is involved not only in compensatory reactions but experiences pathophysiological alterations associated with progressive renal insufficiency.

J Vet Med Sci. 2011 Jul 5;73(6):821-6. Epub 2011 Jan 18.

Expressions of Lipid Oxidation Markers, N(ε)-Hexanoyl Lysine and Acrolein in Cisplatin-Induced Nephrotoxicity in Rats.

Sugiyama A, Sun J, Nishinohara M, Fujita Y, Masuda A, Ochi T, Takeuchi T.

The purpose of this study was to evaluate whether N(ε)-hexanoyl lysine (N(ε)-HEL) and acrolein reflect the severity of cisplatin-induced nephrotoxicity. Immunoexpression of N(ε)-HEL and acrolein in kidneys and their urinary concentration were examined up to day 4 post-cisplatin injection in rats. Cisplatin-induced tubular injury was observed histopathologically on days 2-4 after injection and became more severe time-dependently. On days 2-4, N(ε)-HEL and acrolein were immunostained in the cytoplasm of damaged tubular cells. Their immunostaining intensity and urinary levels increased as tubular injury became more severe. These results suggest that expressions of N(ε)-HEL and acrolein were associated with the pathogenesis of cisplatin-induced nephrotoxicity.

J Vet Med Sci. 2011 Dec;73(12):1579-84. Epub 2011 Jul 29.

Decreases in podocin, CD2-associated protein (CD2AP) and tensin2 may be involved in albuminuria during septic acute renal failure.

Kato T, Mizuno-Horikawa Y, Mizuno S.

Podocytes have a peculiar structure constituting slit diaphragm (SD) and foot process (FP), and play essential roles in the glomerular filtration barrier. There is now ample evidence that SD- and FP-associated molecules, such as podocin and CD2-associated protein (CD2AP), are down-regulated during albuminuria of chronic kidney disease. However, it is still unclear whether these molecules are altered during acute renal failure (ARF) with albuminuria. Using lipopolysaccharide (LPS)-treated mice as a model of septic ARF, we provide evidence that the expression of SD- and FP-associated molecules becomes faint, along with albuminuria. In the LPS-treated mice, urinary albumin levels gradually increased, associated with the elevation of blood urea nitrogen levels, indicating the successful induction of albuminuria during septic ARF. In this pathological process, glomerular podocin expression became faint, especially at 36 hr post-LPS challenge (i.e., a peak of albuminuria). Likewise, LPS treatment led to a significant decrease in CD2AP, an anchorage between podocin and F-actin. With regard to this, tensin2 is a novel molecule that stabilizes F-actin extension. Interestingly, glomerular tensin2 expression levels were also decreased during the albuminuric phase, associated with losses of glomerular F-actin and synaptopodin under septic states. As a result, there were some

lesions of podocytic FP effacement, as shown by electron microscopy. Based on these data, we emphasize the importance of concomitant decreases in podocin, CD2AP and tensin2 during septic ARF-associated proteinuria.

J Vet Med Sci. 2011 Dec;73(12):1669-75. Epub 2011 Aug 11.

Juvenile nephropathy in a Boxer dog resembling the human nephronophthisis-medullary cystic kidney disease complex.

Basile A, Onetti-Muda A, Giannakakis K, Faraggiana T, Aresu L.

A juvenile nephropathy in a 4-year-old male Boxer dog, closely resembling the Nephronophthisis (NPHP)-Medullary Cystic Kidney Disease Complex (MCKD) in humans is described. Gross examination of the kidneys revealed several multiple cysts at the corticomedullary junction and in the medulla. Histological examination was characterized by a widespread tubular atrophy and dilatation, with a marked thickening of the tubular basement membrane, interstitial lymphocytic infiltration and fibrosis. Ultrastructural studies revealed dilated tubules with irregular basement membrane thickening and splitting. Lectin histochemistry investigation revealed that the cysts originated in the distal convoluted tubule and collecting duct. Having excluded all other known cystic diseases of the kidney, and based on the lectin histochemistry results, the macroscopic and histological findings of our case are highly compatible with a diagnosis of the NPHP-MCKD complex. To our knowledge, this is the first report describing this particular lesion.

J Vet Med Sci. 2011 Dec;73(12):1625-8. Epub 2011 Jul 20.

Serum clearance of iodixanol for estimating glomerular filtration rate in calves.

Imai K, Yamagishi N, Kim D, Devkota B, Sato S, Murayama I, Furuhashi K.

To evaluate serum clearance of iodixanol, applicable to the estimation of glomerular filtration rate (GFR), clinically healthy and experimentally-induced nephropathy calves were prepared. Iodixanol was administered intravenously at 40 mg I/kg, and blood was withdrawn 60, 120, and 180 min later. Serum iodixanol concentration was determined by high-performance liquid chromatography. No statistical difference in GFR was noted between strains (Holstein vs. Japanese Black) or sexes, and the $\alpha(2)$ -adrenergic agonist xylazine increased GFR. In calves subjected to right renal vessel ligation, followed by a left nephrectomy, a marked reduction in GFR was observed with renal ischemic changes. These results suggest that the GFR estimation by serum iodixanol clearance is a ready-to-use tool in calf research and practice owing to the ease of monitoring serial renal function.

Journal of Veterinary Science

J Vet Sci. 2011 Mar;12(1):49-55.

Virulence factors and genetic variability of uropathogenic Escherichia coli isolated from dogs and cats in Italy.

Tramuta C, Nucera D, Robino P, Salvarani S, Nebbia P.

In this study, the association between virulence genotypes and phylogenetic groups among Escherichia (E.) coli isolates obtained from pet dogs and cats with cystitis was detected, and fingerprinting methods were used to explore the relationship among strains. Forty uropathogenic E. coli (UPEC) isolated from dogs (n = 30) and cats (n = 10) in Italy were analysed by polymerase chain reaction (PCR) for the presence of virulence factors and their classification into phylogenetic groups. The same strains were characterized by repetitive extragenic palindromic (REP)- and enterobacterial repetitive intergenic consensus (ERIC)-PCR techniques. We found a high number of virulence factors such as fimbriae A, S fimbriae (sfa) and cytotoxic necrotizing factor 1 (cnf1) significantly associated with phylogenetic group B2. We demonstrated a high correlation between α -hemolysin A and pyelonephritis C, sfa, and cnf1 operons, confirming the presence of pathogenicity islands in these

strains. In addition, UPEC belonging to group B2 harboured a greater number of virulence factors than strains from phylogenetic groups A, B1, and D. REP- and ERIC-PCR grouped the UPEC isolates into two major clusters, the former grouping E. coli strains belonging to phylogenetic group B2 and D, the latter grouping those belonging to groups A and B1. Given the significant genetic variability among the UPEC strains found in our study, it can be hypothesized that no specific genotype is responsible for cystitis in cats or dogs.

J Vet Sci. 2010 Dec;11(4):277-83.

Histopathological retrospective study of canine renal disease in Korea, 2003~2008.

Yhee JY, Yu CH, Kim JH, Im KS, Chon SK, Sur JH.

Renal disease includes conditions affecting the glomeruli, tubules, interstitium, pelvis, and vasculature. Diseases of the kidney include glomerular diseases, diseases of the tubules and interstitium, diseases of renal pelvis, and developmental abnormalities. Renal tissue samples (n = 70) submitted to the Department of Veterinary Pathology of Konkuk University from 2003 to 2008 were included in this study. Tissue histopathology was performed using light microscopy with hematoxylin and eosin stains. Masson's trichrome, Congo Red, and Warthin starry silver staining were applied in several individual cases. Glomerular diseases (22.9%), tubulointerstitial diseases (8.6%), neoplastic diseases (8.6%), conditions secondary to urinary obstruction (24.3%), and other diseases (35.7%) were identified. Glomerulonephritis (GN) cases were classified as acute proliferative GN (5.7%), membranous GN (4.3%), membranoproliferative GN (4.3%), focal segmental GN (2.9%), and other GN (4.2%). The proportion of canine GN cases presently identified was not as high as the proportions identified in human studies. Conversely, urinary obstruction and end-stage renal disease cases were relatively higher in dogs than in human populations.

J Vet Sci. 2011 Dec;12(4):393-9.

Assessment of glomerular filtration rate with dynamic computed tomography in normal Beagle dogs.

Chang J, Kim S, Jung J, Lee H, Choi H, Chang D, Lee Y, Yoon J, Choi M.

The objective of our study was to determine individual and global glomerular filtration rates (GFRs) using dynamic renal computed tomography (CT) in Beagle dogs. Twenty-four healthy Beagle dogs were included in the experiment. Anesthesia was induced in all dogs by using propofol and isoflurane prior to CT examination. A single slice of the kidney was sequentially scanned after a bolus intravenous injection of contrast material (iohexol, 1 mL/kg, 300 mgI/mL). Time attenuation curves were created and contrast clearance per unit volume was calculated using a Patlak plot analysis. The CT-GFR was then determined based on the conversion of contrast clearance per unit volume to contrast clearance per body weight. At the renal hilum, CT-GFR values per unit renal volume (mL/min/mL) of the right and left kidneys were 0.69 ± 0.04 and 0.57 ± 0.05 , respectively. No significant differences were found between the weight-adjusted CT-GFRs in either kidney at the same renal hilum ($p = 0.747$). The average global GFR was 4.21 ± 0.25 mL/min/kg and the whole kidney GFR was 33.43 ± 9.20 mL/min. CT-GFR techniques could be a practical way to separately measure GFR in each kidney for clinical and research purposes.

Research in Veterinary Science

Res Vet Sci. 2011 Feb;90(1):156-9. Epub 2010 Jun 12.

Urinary bladder wall substitution using autologous tunica vaginalis in male dogs.

Wongsetthachai P, Pramatinwai C, Banlunara W, Kalpravidh M.

Fresh autologous tunica vaginalis was experimentally used for partial substitution of the excised urinary bladder wall in ten male mongrel dogs. The substituted areas of two dogs were examined macroscopically and histologically at 2, 4, 6, 8, and 10 weeks after surgery. Two control dogs

underwent partial cystectomy and primary wall closure without substitution. The regenerated transitional epithelium completely covered the substituted portion and smooth muscle regeneration was present at 6 weeks. The bladder walls at the closure area of one control dog and at the substituted portions of two dogs at 10 weeks were indistinguishable macroscopically from the native bladder with all layers of the bladder wall present histologically. According to the macroscopic and histological findings and simplicity of the technique, tunica vaginalis can be used as an alternative graft for bladder wall substitution. Calcification and bone metaplasia observed were similar to those found after using other tissue grafts.

Theriogenology

Theriogenology. 2010 Nov;74(8):1450-66. Epub 2010 Aug 21.

Expression of prostaglandin E₂ receptor subtypes in the canine lower urinary tract varies according to the gonadal status and gender.

Ponglowhapan S, Church DB, Khalid M.

Locally-synthesised prostaglandin E₂ (PGE₂) is pivotal for the function of the lower urinary tract (LUT). This study aimed at investigating the expression and distribution pattern of the four PGE₂ receptor (EP) subtypes in the LUT of intact and gonadectomised male and female dogs. Expression for EP1, EP2, EP3, and EP4 and their mRNA (EP2, EP3, and EP4) was investigated. Twenty clinically healthy dogs were allotted into 4 groups based on their gonadal status and gender including 5 intact males, 5 anoestrous females, 4 castrated males, and 6 spayed females. In situ hybridization and immunohistochemistry showed variation in the expression of mRNA and protein for the EP subtypes among tissue layers (epithelium, sub-epithelial stroma, and muscle), regions (body and neck of the bladder as well as proximal and distal urethra) and between gonadal statuses and genders. The expression for the four EPs was intense in the luminal epithelium, intermediate to low in the muscle and the sub-epithelial stroma regardless of gonadal status or gender. Higher expression of all EPs and their mRNAs was observed in the proximal urethra compared to other regions in intact dogs. However, in gonadectomised dogs, the expression did not differ among different regions and was generally lower than in intact dogs particularly in the proximal urethra. Differences in the expression between genders were found and depended on EP subtypes. In conclusion, the results have shown that four subtypes of EP receptors and their mRNAs are present in the canine LUT and their expression was affected by the gonadal status and the gender. The results lead to suggest that an impaired LUT function post-neutering may partly be associated with differences in PGE₂ receptor expression between intact and gonadectomised dogs.

Theriogenology. 2011 Oct 15;76(7):1284-92. Epub 2011 Jul 20.

Effect of the gonadal status and the gender on glycosaminoglycans profile in the lower urinary tract of dogs.

Ponglowhapan S, Church DB, Khalid M.

Glycosaminoglycans (GAGs) form a functional component of connective tissues that affect the structural and functional integrity of the lower urinary tract (LUT). The specific GAGs of physiological relevance are both nonsulfated (hyaluronan) and sulfated GAGs (chondroitin sulphate [CS], dermatan sulphate [DS], keratan sulphate [KS], and heparan sulphate [HS]). As GAG composition in the LUT is hormonally regulated, we postulated that gonadectomy-induced endocrine imbalance alters the profile of GAGs in the canine LUT. Four regions of the LUT (body and neck of the bladder as well as the proximal and distal urethra) from 20 clinically healthy dogs (5 intact males, 5 intact anoestrous females, 4 castrated males, and 6 spayed females) were collected, wax-embedded and sectioned. Alcian blue staining at critical electrolyte concentrations was performed on the sections to determine total GAGs, hyaluronan, total sulfated GAGs, combined components of CS and DS, as well as KS and HS. The amount of staining was evaluated in 3 tissue layers, i.e., epithelium, subepithelial stroma and

muscle within a region. Overall, hyaluronan (67.1%) was the predominant GAG in the LUT. Among sulfated GAGs, a combined component of KS and HS was found to be 61.8% and 38.2% for CS and DS. Gonadal status significantly affected GAG profiles in the LUT ($P < 0.01$). All GAG components were lower ($P < 0.05$) in body of the bladder of gonadectomized dogs. Total sulfated GAGs and a combined component of KS and HS were lower ($P < 0.05$) in all 4 regions of gonadectomized dogs. Except for a combined component of CS and DS, decreases in all GAGs were found more consistently in the muscle compared to other tissue layers. Differences between genders became obvious only when considered along with the effect of gonadal status. In gonadectomized dogs, changes in GAG components in the LUT were more consistent in females compared to males; this may partly explain different levels of risk in the development of urinary incontinence between genders. Quantitative differences in GAG profiles found between intact and gonadectomized dogs indicate a potential role of gonadectomy-induced endocrine imbalance in modifying GAG composition in the canine LUT. Profound alteration in the pattern of GAGs in gonadectomized dogs may compromise structural and functional integrity of the LUT and is possibly involved in the underlying mechanism of urinary incontinence post neutering.

The Veterinary Journal

Vet J. 2011 Jan;187(1):18-22. Epub 2009 Dec 30.

Feline bacterial urinary tract infections: An update on an evolving clinical problem.

Litster A, Thompson M, Moss S, Trott D.

Although feline urine is increasingly submitted for bacterial culture and susceptibility testing as part of a more general diagnostic work-up for a range of presentations in veterinary practice, bacterial urinary tract infections (UTIs) are relatively uncommon due to a variety of physical and immunological barriers to infection. Culture positive urine is most often obtained from older female cats and the clinical history may include hematuria, dysuria and pollakiuria, or the infection may be occult. Urinalysis usually reveals hematuria and pyuria, and *Escherichia coli* and Gram-positive cocci are cultured most frequently. Most feline UTIs can be successfully treated using oral amoxicillin or amoxicillin/clavulanic acid administered for at least 14 days, but the prevalence of antimicrobial resistance amongst infecting bacterial species is a growing concern. There is currently no conclusive information on the safety and efficacy of alternative therapeutic agents for the treatment of feline UTIs.

Vet J. 2011 May;188(2):128-9. Epub 2010 Aug 23.

Assessing renal function: some significant improvements on the horizon.

Blomme EA.

Vet J. 2011 May;188(2):156-65. Epub 2010 Jun 11.

An overview of glomerular filtration rate testing in dogs and cats.

Von Henty-Willson VE, Pressler BM.

Determination of glomerular filtration rate (GFR) is a valuable, yet underused, diagnostic tool for evaluating renal function in dogs and cats. This article first reviews the hormonal and hemodynamic factors which contribute to GFR, followed by a description of considerations when selecting a pharmacokinetic model and methods of animal-to-animal standardization. The best-characterized existing GFR markers, including creatinine, radiolabeled markers, and iohexol, are reviewed in depth, as well as alternative but lesser used techniques. A weighted means analysis of reported GFR measurements in healthy dogs and cats and a review of selected studies that have examined GFR alterations in animals with naturally occurring and experimental diseases provide the reader with preliminary guidelines on expected GFR results in these species and disease conditions.

Vet J. 2011 May;188(2):228-30. Epub 2010 Aug 14.

Composition of uroliths in small domestic animals in the United Kingdom.

Rogers KD, Jones B, Roberts L, Rich M, Montalto N, Beckett S.

The mineral composition of 7819 small animal uroliths in the UK was determined by semi-quantitative X-ray diffraction over a period of 90 months from 2002 to 2010. Canine and feline uroliths constituted 97% of the study population and the mineral phase detected most frequently was struvite (43%), followed by calcium oxalate (41%). Uroliths from crossbreeds, Dalmatians, Yorkshire terriers and Shih Tzus accounted for almost 30% of all canine uroliths, with the highest frequency in Dalmatians, which had a predominance of urate uroliths. The average ages of dogs and cats with uroliths were 7.0 years and 7.4 years, respectively. The ratio of the number of dogs presenting with struvite compared to oxalate phases reached a maximum at 3 years of age.

Vet J. 2011 Sep;189(3):243-4. Epub 2011 Apr 1.

Assessing proteinuria in the cat: an innovative tip.

Mischke R.

Vet J. 2011 Sep;189(3):312-7. Epub 2010 Oct 2.

Screening for proteinuria in cats using a conventional dipstick test after removal of cauxin from urine with a *Lens culinaris* agglutinin lectin tip.

Miyazaki M, Fujiwara K, Suzuta Y, Wakamatsu N, Taira H, Suzuki A, Yamashita T.

Proteinuria is an important indicator of urinary tract disease and urine dipsticks are simple and sensitive tools to screen for this marker. However, the use of dipsticks to screen for proteinuria may not be appropriate in cats, since cauxin, a 70 kDa glycoprotein, is secreted by the kidneys in clinically normal animals of this species. To circumvent this problem, a *Lens culinaris* agglutinin (LCA) lectin tip was developed to remove cauxin from feline urine, followed by conventional urine dipstick testing for proteinuria. Sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) with Coomassie brilliant blue R-250 staining indicated that >90% cauxin in the urine of 13 clinically normal cats was trapped by the LCA lectin tip, so that the dipstick protein 'score' changed from 'positive' (≥ 30 mg/dL) for untreated urine to 'negative' (≤ 10 mg/dL) for lectin tip-treated urine. In contrast, SDS-PAGE indicated that lectin tip-treated samples from 20 animals with renal disease contained high concentrations of albumin and low-molecular weight proteins; dipstick testing of lectin tip-treated urine resulted in a consistently positive protein score. The accuracy of the dipstick method for detecting cats with abnormal proteinuria is enhanced if dipsticks are used with urine samples that have first been passed through the LCA lectin tip.

Vet J. 2011 Oct;190(1):11-2. Epub 2011 Apr 11.

Taking a close look at intractable urinary tract infections.

Freitag T.

Vet J. 2011 Oct;190(1):22-7. Epub 2011 Jan 15.

Canine bacterial urinary tract infections: new developments in old pathogens.

Thompson MF, Litster AL, Platell JL, Trott DJ.

Uncomplicated bacterial urinary tract infections (UTIs) occur commonly in dogs. Persistent or recurrent infections are reported less frequently. They typically occur in dogs with an underlying disease and are sometimes asymptomatic, especially in dogs with predisposing chronic disease. *Escherichia coli* is the organism most frequently cultured in both simple and complicated UTIs. Organisms such as *Enterococcus* spp. and *Pseudomonas* spp. are less common in uncomplicated UTI, but become increasingly prominent in dogs with recurrent UTI. The ability of bacteria to acquire resistance to antimicrobials and/or to evade host immune defence mechanisms is vital for

persistence in the urinary tract. Antimicrobial therapy limitations and bacterial strains with such abilities require novel control strategies. Sharing of resistant bacteria between humans and dogs has been recently documented and is of particular concern for E. coli O25b:H4-ST131 strains that are both virulent and multi-drug resistant. The epidemiology of complicated UTIs, pathogenic traits of uropathogens and new therapeutic concepts are outlined in this review.

Vet J. 2011 Oct;190(1):109-12. Epub 2010 Oct 13.

The effect of contrast-enhanced ultrasound on the kidneys in eight cats.

Leinonen MR, Raekallio MR, Vainio OM, Sankari S, O'Brien RT.

Contrast-enhanced ultrasound (CEUS) of the left kidney was performed on eight non-anesthetized, young, purpose bred, domestic shorthaired cats. Each cat underwent a physical examination before and 4h and 48h after CEUS. Complete blood count (CBC), serum biochemical analysis, urinalysis, including evaluation of the enzymatic activities of urinary N-acetyl- β -d-glucosaminidase (NAG) and gamma-glutamyl transferase (GGT), were also performed. No changes were observed in CBC or serum biochemical analyses, with the exception of a decrease in blood urea concentration at 48h post-contrast ultrasound. A small elevation in NAG (U/g creatinine) was observed with a mean (SD) increase from 0.53 (0.35) to 1.43 (0.59) U/g creatinine. The magnitude of the rise was less than the circadian variation reported earlier for healthy cats. These results suggest that CEUS can be safely used to assess kidney perfusion in cats. The changes observed in laboratory values after CEUS did not appear to be related to detrimental effects on the kidneys.

Vet J. 2011 Dec;190(3):301-2. Epub 2011 May 4.

Chronic kidney disease in cats: an ounce of prevention is worth a pound of cure.

Litster AL.

Vet J. 2011 Dec;190(3):317-22. Epub 2011 Jan 22.

Feline chronic kidney disease: can we move from treatment to prevention?

White JD, Malik R, Norris JM.

Chronic kidney disease (CKD) is arguably the most common disease of older domestic cats. Recent research has focused on treatment options and prognostic variables. Specifically, the roles of dietary protein, hypertension and proteinuria as potential causes of a progressive decline in kidney function have been evaluated. The value of prescription kidney diets and the prognostic value of proteinuria have been confirmed. However, in contrast to dogs, rodents and people, significant proteinuria is uncommon in the cat and hypertension is not a prognostic indicator. Despite significant progress, the cause of CKD in the overwhelming majority of cats remains unknown and fundamental questions remain unanswered. Treatment of feline CKD is limited to non-specific options until some of the causes and pathophysiological mechanisms that result in chronic tubulointerstitial nephritis are identified.

Topics in Companion Animal Medicine

Top Companion Anim Med. 2011 Aug;26(3):119-20.

Introduction: proteinuric renal disease.

Grauer GF.

Top Companion Anim Med. 2011 Aug;26(3):121-7.

Proteinuria: measurement and interpretation.

Grauer GF.

Proteinuria is a general term that describes the presence of any type of protein in the urine (e.g., albumin, globulins, mucoproteins, and Bence-Jones proteins); however, albumin is the predominate protein in urine in healthy dogs and cats as well as dogs and cats with renal disease. Proteinuria can arise from several different physiologic and pathologic causes, but persistent proteinuria associated with normal urine sediment is consistent with kidney disease. The urine dipstick colorimetric test is the usual first-line screening test for the detection of proteinuria, but false-positive reactions are common. When proteinuria of renal origin is suspected, the next diagnostic steps are quantitation and longitudinal monitoring via the urine protein/creatinine ratio. The recent availability of a species-specific albumin enzyme-linked immunosorbent assay technology that enables detection of low concentrations of canine and feline albuminuria has both increased diagnostic capability and stimulated discussion about what level of proteinuria/albuminuria is normal. Beyond being an important diagnostic marker, proteinuria is associated with kidney disease progression in both dogs and cats: the greater the magnitude of the proteinuria, the greater the risk of renal disease progression and mortality. Treatments that have attenuated proteinuria in dogs and cats have also been associated with slowed kidney disease progression and/or improved survival. For these reasons, screening for renal proteinuria and longitudinal assessment of renal proteinuria has recently received renewed interest.

Top Companion Anim Med. 2011 Aug;26(3):128-34.

Glomerular disease.

Vaden SL.

Glomerular diseases are a leading cause of chronic kidney disease in dogs but seem to be less common in cats. Glomerular diseases are diverse, and a renal biopsy is needed to determine the specific glomerular disease that is present in any animal. Familial glomerulopathies occur in many breeds of dogs. However, most dogs with glomerular disease have acquired glomerular injury that is either immune-complex mediated or due to systemic factors, both of which are believed to be the result of a disease process elsewhere in the body (i.e., neoplastic, infectious, and noninfectious inflammatory disorders). A thorough clinical evaluation is indicated in all dogs suspected of having glomerular disease and should include an extensive evaluation for potential predisposing disorders. Nonspecific management of dogs with glomerular disease can be divided into 3 major categories: (1) treatment of potential predisposing disorders, (2) management of proteinuria, and (3) management of uremia and other complications of glomerular disease and chronic kidney disease. Specific management of specific glomerular diseases has not been fully studied in dogs. However, it may be reasonable to consider immunosuppressive therapy in dogs that have developed a form of glomerulonephritis secondary to a steroid-responsive disease (e.g., systemic lupus erythematosus) or have immune-mediated lesions that have been documented in renal biopsy specimens. Appropriate patient monitoring during therapy is important for maximizing patient care. The prognosis for dogs and cats with glomerular disease is variable and probably dependent on a combination of factors. The purpose of this article is to discuss the general diagnosis and management of dogs with glomerular disease.

Top Companion Anim Med. 2011 Aug;26(3):135-42.

Nephrotic syndrome in dogs: clinical features and evidence-based treatment considerations.

Klosterman ES, Pressler BM.

Nephrotic syndrome (NS), defined as the concurrent presence of hypoalbuminemia, proteinuria, hyperlipidemia, and fluid accumulation in interstitial spaces and/or body cavities, is a rare complication of glomerular disease in dogs, cats, and people. Affected animals frequently have markedly abnormal urine protein:creatinine ratios because of urinary loss of large amounts of protein; however, hypoalbuminemia-associated decreased plasma oncotic pressure is insufficient to explain fluid extravasation in most laboratory models, and, instead, either aberrant renal tubule

retention of sodium with resultant increase in hydrostatic pressure or a systemic increase in vascular permeability may be the primary defects responsible for development of NS. Factors associated with NS in people (including "nephrotic-range" serum albumin concentration and urine protein concentration, and particular glomerular disease subtypes) have been assumed previously to also be important in dogs, although descriptions were limited to those patients included in case series of glomerular disease, and sporadic case reports. However, case-control comparison of larger cohorts of dogs with nephrotic versus nonnephrotic glomerular disease more recently suggests that predisposing factors and concurrent clinicopathologic abnormalities differ from those typically encountered in people with nephrotic syndrome, although case progression and negative effect on patient outcome are similar. This article briefly reviews major current theories and supporting evidence on the pathogenesis of NS, followed by an overview on the clinical features of this syndrome in dogs with glomerular disease. The authors also offer evidence-based and experience-based treatment recommendations that are based on minimizing the suspected dysregulation of the renin-angiotensin-aldosterone axis in affected dogs.

Top Companion Anim Med. 2011 Aug;26(3):143-53.

Renal biopsy and pathologic evaluation of glomerular disease.

Lees GE, Cianciolo RE, Clubb FJ Jr.

Presence of suspected primary glomerular disease is the most common and compelling reason to consider renal biopsy. Pathologic findings in samples from animals with nephritic or nephrotic glomerulopathies, as well as from animals with persistent subclinical glomerular proteinuria that is not associated with advanced chronic kidney disease, frequently guide treatment decisions and inform prognosis when suitable specimens are obtained and examined appropriately. Ultrasound-guided needle biopsy techniques generally are satisfactory; however, other methods of locating or approaching the kidney, such as manual palpation (e.g., in cats), laparoscopy, or open surgery, also can be used. Visual assessment of the tissue content of needle biopsy samples to verify that they are renal cortex (i.e., contain glomeruli) as they are obtained is a key step that minimizes the submission of uninformative samples for examination. Adequate planning for a renal biopsy also requires prior procurement of the fixatives and preservatives needed to process and submit samples that will be suitable for electron microscopic examination and immunostaining, as well as for light microscopic evaluation. Finally, to be optimally informative, renal biopsy specimens must be processed by laboratories that routinely perform the required specialized examinations and then be evaluated by experienced veterinary nephropathologists. The pathologic findings must be carefully integrated with one another and with information derived from the clinical investigation of the patient's illness to formulate the correct diagnosis and most informative guidance for therapeutic management of the animal's glomerular disease.

Veterinary Clinical Pathology

Vet Clin Pathol. 2010 Dec;39(4):513-4. doi: 10.1111/j.1939-165X.2010.00266.x. Epub 2010 Oct 29.

What is your diagnosis? Urine crystals in a dog.

Escobar C, Grindem CB

Vet Clin Pathol. 2010 Dec;39(4):517-8. doi: 10.1111/j.1939-165X.2010.00272.x. Epub 2010 Nov 11.

What is your diagnosis? Urine sediment from a southern California cat with weight loss.

Brandt LE, Blauvelt MM.

Vet Clin Pathol. 2011 Mar;40(1):89-94. doi: 10.1111/j.1939-165X.2011.00296.x. Epub 2011 Feb 3.

Paraneoplastic leukocytosis in a dog with a renal carcinoma.

Petterino C, Luzio E, Baracchini L, Ferrari A, Ratto A.

A 7-year-old male German Shepherd dog in poor body condition had a 3-month history of intermittent hematuria. Nonregenerative anemia, mild leukocytosis, marked hypoalbuminemia, and hematuria were observed. Subsequently, marked neutrophilia and moderate monocytosis were noted; anemia, hypoalbuminemia, and hematuria persisted; and the dog developed disseminated intravascular coagulation. Ultrasonographic examination of the abdomen revealed the presence of an enlarged and irregularly shaped right kidney with a large area of cavitation, and a nephrectomy was performed 30 days after initial examination. Cytologic examination of fine-needle aspirates and imprints of the right kidney revealed a neoplastic cell population suggestive of renal carcinoma. The histopathologic diagnosis was chromophobic cystic-papillary renal carcinoma. The tumor cells expressed granulocytic/macrophage-colony-stimulating factor (GM-CSF), detected by immunohistochemical staining, and elaboration of GM-CSF by the tumor may have mediated the leukocytosis in this dog. Following excision of the tumor, neutrophil and monocyte counts were only mildly increased. The dog died 135 days after initial presentation, and a necropsy was not permitted. Paraneoplastic neutrophilic leukocytosis is an uncommon finding and may be caused by elaboration of CSF by neoplastic cells.

Vet Clin Pathol. 2011 Jun;40(2):222-36. doi: 10.1111/j.1939-165X.2011.00307.x. Epub 2011 Mar 29.

Proteomic analysis of urine from male dogs during early stages of tubulointerstitial injury in a canine model of progressive glomerular disease.

Nabity MB, Lees GE, Dangott LJ, Cianciolo R, Suchodolski JS, Steiner JM.

BACKGROUND: Sensitive and specific noninvasive biomarkers for tubulointerstitial injury are lacking, and proteomic techniques provide a powerful tool for biomarker discovery.

OBJECTIVE: The aim of this study was to identify novel urinary biomarkers of early tubulointerstitial injury in canine progressive renal disease using both 2-dimensional differential in-gel electrophoresis (2-D DIGE), which identifies individual proteins, and surface-enhanced laser desorption ionization time-of-flight mass spectrometry (SELDI-TOF), which generates protein peak profiles.

METHODS: Urine was collected from 6 male dogs with X-linked hereditary nephropathy (XLHN) at 2 time points (TP): 1) the onset of overt proteinuria (urine protein:creatinine ratio>2) and 2) the onset of azotemia (creatinine \geq 1.2 mg/dL); corresponding renal biopsies were analyzed from 3 of the dogs. Urine samples from the 6 dogs were subjected to analysis by 2-D DIGE and SELDI-TOF. Urinary retinol-binding protein (RBP) was evaluated in 25 male dogs with XLHN and normal control dogs by Western blot analysis.

RESULTS: Clinical data and histologic evaluation revealed reduced renal function and increased tubulointerstitial fibrosis at TP 2. A number of urine proteins and protein peaks were differentially present at the 2 time points, with several known biomarkers of renal disease identified in addition to several promising new biomarkers. RBP was first detected in urine approximately 2 months before onset of azotemia (TP 2), but after onset of overt proteinuria, and amounts increased with progression of disease.

CONCLUSIONS: Proteomic techniques were successfully used to identify urinary biomarkers of renal disease in dogs with XLHN. Urinary RBP is a promising biomarker for early detection of tubulointerstitial damage and progression to end-stage renal disease.

Vet Clin Pathol. 2011 Jun;40(2):256-64. doi: 10.1111/j.1939-165X.2011.00314.x. Epub 2011 May 9.

Evaluation of modified Wright-staining of dried urinary sediment as a method for accurate detection of bacteriuria in cats.

Swenson CL, Boisvert AM, Gibbons-Burgener SN, Kruger JM.

BACKGROUND: Urinary sediment examination and quantitative urinary culture results are frequently discordant.

OBJECTIVES: The aims of this study were to compare accuracy of light microscopic examination of wet-mounted unstained (wet-unstained) and air-dried modified Wright-stained (dry-stained)

sedimented preparations of urine with results of quantitative aerobic bacterial culture for detection and characterization of bacteriuria in cats. In addition, the presence of pyuria detected by urinalysis and potential risk factors were assessed.

METHODS: A blinded prospective study was conducted on 472 urinary samples collected from 410 cats by cystocentesis. The age and sex of each cat were recorded. Complete urinalyses were performed and included quantification of WBCs. Quantity and morphology of bacteria in each specimen were determined by light microscopic examination of wet-unstained (performed by certified medical technologists) and dry-stained (performed by a veterinary clinical pathologist) sedimented preparations of urine and compared with results of quantitative bacterial cultures.

RESULTS: Of 472 urinary specimens, 29 were positive for bacteriuria by culture and considered true positives and 443 were considered true negatives. Compared with these results, examination of wet-unstained and dry-stained urines had sensitivities of 75.9% and 82.8%, specificities of 56.7% and 98.7%, and test efficiencies of 57.8% and 97.7%, respectively. Positive likelihood ratios were 1.8 and 63.7 and negative likelihood ratios were 0.42 and 0.17 for wet-unstained and dry-stained examinations, respectively. Compared with 29 culture-positive samples, the wet-unstained method had morphologic concordance and misclassification rates of 37.9% and 62.1%, respectively, whereas the dry-stained method had morphologic concordance and misclassification rates of 65.5% and 34.5%, respectively. Only 34% of samples with bacteriuria had pyuria. Frequency of bacteriuria was not significantly different based on age and sex of the cats, but there was a tendency for increased frequency in female cats and in cats >10 years old.

CONCLUSIONS: Staining dried urinary sediment with a modified Wright-stain significantly improved sensitivity, specificity, and test efficiency of microscopic detection and classification of bacteriuria compared with the wet-unstained method. Pyuria should not be a criterion for determining the presence or absence of bacteriuria.

The Veterinary Clinics of North America. Small Animal Practice.

Vet Clin North Am Small Anim Pract. 2011 Jan;41(1):xi-xii.

Preface: Kidney diseases and renal replacement therapies.

Acierno MJ, Labato MA.

Vet Clin North Am Small Anim Pract. 2011 Jan;41(1):1-14. Epub 2010 Dec 4.

Acute kidney injury in dogs and cats.

Ross L.

The term acute kidney injury (AKI) has replaced the historical term acute renal failure for renal damage occurring over a short period of time (hours to days) because it is thought to better describe the pathophysiologic changes and duration of the different phases of injury. There are many potential causes of AKI in dogs and cats, and the prognosis has been shown to vary with the cause as well as with therapy. This article reviews current concepts of the pathophysiology, causes, clinical presentation, approach to diagnosis, and medical management of AKI in dogs and cats.

Vet Clin North Am Small Anim Pract. 2011 Jan;41(1):15-30. Epub 2010 Dec 4.

Chronic kidney disease in small animals.

Polzin DJ.

Chronic kidney disease (CKD) affects multiple body systems and presents with a wide variety of clinical manifestations. Proper application of conservative medical management can profoundly affect the clinical course of CKD. Diagnosis and management is facilitated by staging CKD and applying therapies that are appropriate for the patient's stage of CKD. Therapy and follow-up of CKD are described, with emphasis on stage-based therapy to ameliorate clinical signs and slow progression.

Vet Clin North Am Small Anim Pract. 2011 Jan;41(1):31-62. Epub 2010 Dec 16.

Protein-losing nephropathy in small animals.

Littman MP.

Genetic and acquired defects of glomerular permselectivity may lead to proteinuria and protein-losing nephropathy (PLN). Morbidity and mortality from complications of PLN may be severe even before progression to azotemia and renal failure. Leakage of plasma proteins into the glomerular filtrate can damage tubular cells and the function of the entire nephron. Detection, localization, and treatment of proteinuria are important to decrease the clinical signs and complications of PLN and the likelihood of progression to renal failure. Thorough diagnostic work-ups help to identify subsets of glomerular disease and their response to specific treatment protocols.

Vet Clin North Am Small Anim Pract. 2011 Jan;41(1):63-89.

Hypertension in small animal kidney disease.

Syme H.

Kidney disease is commonly associated with hypertension in dogs, cats and other species. There are multiple mechanisms underlying the development of renal hypertension including sodium retention, activation of the renin-angiotensin system and sympathetic nerve stimulation. The relative importance of these and other mechanisms may vary both between species and according to the type of kidney disease that is present. Consideration of underlying disease mechanisms may aid in the rational choice of therapy in hypertensive patients.

Vet Clin North Am Small Anim Pract. 2011 Jan;41(1):91-113.

Peritoneal dialysis in veterinary medicine.

Cooper RL, Labato MA.

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

Vet Clin North Am Small Anim Pract. 2011 Jan;41(1):115-33.

Intermittent hemodialysis for small animals.

Bloom CA, Labato MA.

Hemodialysis is a life-saving medical modality that cleanses the blood using an artificial kidney, called a dialyzer. Hemodialysis uses contact between the patient's blood and the semipermeable membrane of the extracorporeal dialyzer to remove compounds such as blood urea nitrogen, creatinine, electrolytes, minerals, anions, cations, certain drugs and toxins, and excess fluid from the bloodstream. The extracorporeal dialyzer distinguishes hemodialysis from peritoneal dialysis, which uses a patient's peritoneum as the dialysis membrane. There are 2 main types of hemodialysis: intermittent hemodialysis and continuous renal replacement therapy. This article focuses on intermittent hemodialysis for acute and chronic kidney injury.

Vet Clin North Am Small Anim Pract. 2011 Jan;41(1):135-46.

Continuous renal replacement therapy in dogs and cats.

Acierno MJ.

Continuous renal replacement therapy (CRRT) is a relatively new extracorporeal blood purification modality that is rapidly gaining acceptance for the treatment of acute kidney injury in cats and dogs. The author has used CRRT for the treatment of leptospirosis, tumor lysis syndrome, heatstroke, pre- and postsurgical support of ureteral obstructions, as well as aminoglycoside and melamine toxicities. As the name implies, CRRT is a slow gradual process, and once treatment begins, patients continue therapy until their renal function returns, they are transitioned to intermittent hemodialysis (IHD), or they are euthanized. Unlike IHD, which is a primarily diffusive therapy, CRRT uses diffusion as well as convection. Because of its efficient use of fluids, CRRT units use prepackaged fluids, eliminating the need for costly water purification systems that are needed for IHD.

Vet Clin North Am Small Anim Pract. 2011 Jan;41(1):147-61. Epub 2010 Dec 15.

Vascular access for extracorporeal renal replacement therapy in veterinary patients.

Chalhoub S, Langston CE, Poepfel K.

Vascular access is the first and most basic requirement for successful extracorporeal renal replacement therapy (ERRT). Dual-lumen catheters are the most commonly used method of vascular access for ERRT in veterinary patients. An adequately functioning dialysis catheter allows for smooth and efficient patient management, whereas a poorly functioning catheter frustrates the technician, doctor, and patient. These catheters are fairly quick to place but require meticulous care for optimal function. The most common complications are thrombosis and infection. Monitoring catheter performance should be a routine part of dialysis patient care.

Vet Clin North Am Small Anim Pract. 2011 Jan;41(1):163-75.

Anticoagulation in intermittent hemodialysis: pathways, protocols, and pitfalls.

Ross S.

Several methods to prevent extracorporeal circuit clotting during hemodialysis have been used in human medicine. Unfractionated (UF) heparin remains the mainstay of anticoagulant therapy in both human and veterinary intermittent hemodialysis. Different UF heparin regimes may be used depending on the bleeding risk of the patient. In patients with active bleeding or with a recent history of surgery or hemorrhagic episodes, hemodialysis may be performed without any anticoagulation or with regional anticoagulation.

Vet Clin North Am Small Anim Pract. 2011 Jan;41(1):177-91. Epub 2010 Dec 4.

Equipment commonly used in veterinary renal replacement therapy.

Poepfel K, Langston CE, Chalhoub S.

Hemodialysis is a highly technical procedure that requires specialized equipment that is not used in other areas of veterinary medicine. Certain hemodialysis-specific monitoring equipment is also employed.

Vet Clin North Am Small Anim Pract. 2011 Jan;41(1):193-225.

Urea kinetics and intermittent dialysis prescription in small animals.

Cowgill LD.

Hemodialysis improves survival for animals with acute kidney injury beyond what would be expected with conventional management of the same animals. Clinical evidence and experience in human patients suggest a role for earlier intervention with renal replacement to avoid the morbidity of uremia and to promote better metabolic stability and recovery. For a large population of animal patients, it is the advanced standard for the management of acute and chronic uremia, life-threatening poisoning, and fluid overload for which there is no alternative therapy.

Vet Clin North Am Small Anim Pract. 2011 Jan;41(1):239-50. Epub 2010 Dec 3.

Nutritional considerations for the dialytic patient.

Elliott DA.

Nutritional therapy has a key role in the conservative management of renal disease. This role is even more vital with the advent of advanced renal replacement therapies to support patients with life threatening severe oliguric or anuric acute uremia or the International Renal Interest Society stage IV chronic kidney disease. Nutritional assessment and institution of nutritional support is crucial because dialysis only partially alleviates uremic anorexia. Dialytic patients have a higher risk of protein calorie, iron, zinc, vitamin B6, vitamin C, folic acid, 1,25-dihydroxycholecalciferol, and carnitine malnutrititions.

Vet Clin North Am Small Anim Pract. 2011 Jul;41(4):727-44. Epub 2011 May 23.

The kidney in critically ill small animals.

Lunn KF.

Critically ill animals may have preexisting renal disease or develop acute kidney injury as a consequence of their presenting complaint. Age, concurrent medical therapy, electrolyte and fluid imbalances, and exposure to potential nephrotoxics are factors that predispose to acute kidney injury. Many risk factors are correctable or manageable, and these should be addressed whenever possible. Measurement of serum creatinine is insensitive for the detection of acute kidney injury, and clinicians should consider assessment of other parameters such as urine output, urinalysis, and urine chemistry results. A stepwise approach for management of acute kidney injury in small animal patients is outlined.

Vet Clin North Am Small Anim Pract. 2011 Sep;41(5):869-88, v.

Complications of upper urinary tract surgery in companion animals.

Adin CA, Scansen BA.

Due to the negative effects of urine on wound healing, the high rate of complications associated with surgical incisions in the ureter and a desire to avoid large open approaches to the abdomen, there is a strong trend in human medicine toward the use of endoscopic methods in the treatment of upper urinary tract disease. However, the small size of urogenital structures in companion animals has prevented the widespread application of endoscopy of the upper urinary tract and surgery continues to be the mainstay of treatment. Through careful decision making, veterinary surgeons now use microsurgical technique and interventional radiology to provide a high success rate. The current review will discuss complications pertaining to surgery of the kidney and ureter in companion animals, using experimental and clinical data to guide the detection and avoidance of these complications.

Vet Clin North Am Small Anim Pract. 2011 Sep;41(5):889-913, v.

Complications of lower urinary tract surgery in small animals.

McLoughlin MA.

Surgical procedures of the lower urinary tract are commonly performed in small animal practice. Cystotomy for removal of uroliths and urethrostomy diverting urine outflow due to urethral obstruction are the most commonly performed surgical procedures of the bladder and urethra respectively. Surgical procedures of the lower urinary tract are typically associated with few complications, including leakage of urine, loss of luminal diameter (stricture or stenosis), urine outflow obstruction, tissue devitalization, denervation, urinary incontinence, urinary tract infection, and death. Complications can result from inappropriate or inadequate diagnosis, localization, and surgical planning; failure to respect regional anatomy, and other causes.

Veterinary Pathology

Vet Pathol. 2011 Mar;48(2):408-19. Epub 2010 Jul 23.

Renal membrane transport of glutathione in toxicology and disease.

Lash LH.

Membrane transport processes, at both the plasma membranes and intracellular membranes, play critical roles in renal function and are a determining factor in the susceptibility of renal epithelial cells to blood-borne drugs and toxic chemicals. Proximal tubular epithelial cells possess a large array of transport proteins for organic anions, organic cations, and peptides on both basolateral and brush-border plasma membranes. Although these transporters function in excretion of waste products and reabsorption of nutrients, they also play a role in the susceptibility of the kidneys to drugs and other toxicants in the blood. The proximal tubules are typically the primary target cells because they are the first epithelial cell population exposed to such chemicals in either the renal plasma or glomerular filtrate and because of their large array of membrane transporters. Besides transport across the basolateral and brush-border plasma membranes, transport across intracellular membranes such as the mitochondrial inner membrane is a critical determinant of metabolite distribution. To illustrate the function of these transporters, carrier-mediated processes for transport of the tripeptide and antioxidant glutathione across the basolateral, brush-border, and mitochondrial inner membranes of the renal proximal tubule are reviewed. Studies are summarized that have identified the involvement of specific carrier proteins and characterized the role of these transporters in glutathione metabolism and turnover, susceptibility of the proximal tubules to oxidative and other stresses, and modulation in disease and other pathological processes.

Vet Pathol. 2011 Mar;48(2):427-32. Epub 2010 Sep 22.

Immunohistochemical characterization of 13 canine renal cell carcinomas.

Gil da Costa RM, Oliveira JP, Saraiva AL, Seixas F, Faria F, Gärtner F, Pires MA, Lopes C.

Canine renal cell carcinomas (RCCs) are uncommon aggressive tumors that occur mainly in middle-aged male dogs. Their histologic classification bears no relationship with prognosis, and little information is available concerning their immunohistochemical properties. In this retrospective study, formalin-fixed, paraffin-embedded tissues from 13 canine RCCs were retrieved from the archives, classified histologically, and evaluated immunohistochemically. The dogs were 7 males and 6 females (1 spayed) of 10 different breeds, averaging 8 years in age. The tumors were classified as papillary, tubulopapillary, papillary-cystic, solid, or sarcomatoid. All 13 tumors were immunohistochemically positive for uromodulin, 12 for c-KIT, 11 for vimentin, 9 for wide-spectrum-screening cytokeratins, 7 for cytokeratins AE1/AE3 and carcinoembryonic antigen, 4 for cytokeratins CAM 5.2, and 3 for CD10. All 3 solid RCCs expressed vimentin, c-KIT, and carcinoembryonic antigen and were negative for cytokeratins. All 7 papillary and tubulopapillary tumors expressed vimentin; 6 (86%), cytokeratins; and 6 (86%), c-KIT. Both papillary-cystic RCCs were positive for cytokeratins and c-KIT and negative for vimentin. These results indicate that the different histologic types of RCC have characteristic immunohistochemical profiles and that c-KIT may be involved in the pathogenesis of canine RCC.

Vet Pathol. 2011 May;48(3):698-705. Epub 2010 Sep 28.

Renal lesions of nondomestic felids.

Newkirk KM, Newman SJ, White LA, Rohrbach BW, Ramsay EC.

To comprehensively evaluate the occurrence of renal lesions in a variety of nondomestic felids, necropsy cases from 1978 to 2008 were reviewed from a municipal zoo and a large cat sanctuary for those in which the kidneys were examined histologically. Seventy exotic felids were identified (25

tigers, 18 lions, 6 cougars, 5 leopards, 3 snow leopards, 3 clouded leopards, 3 Canadian lynx, 2 ocelots, 2 bobcats, 2 cheetahs, 1 jaguar), and their histologic renal lesions were evaluated and compared. The most common lesion was tubulointerstitial nephritis (TIN); 36 of 70 (51%) cats were affected to some degree. Lymphocytic interstitial nephritis was the most common lesion in the tigers (9 of 25, 36%) and was rarely seen in other species. Although the renal pelvis was not available for all cats, 28 of 47 (60%) had some degree of lymphocytic pyelitis. There was no significant association between the presence of pyelitis and that of TIN. Only 1 cat had pyelonephritis. Renal papillary necrosis was present in 13 of 70 (19%) cats and was significantly associated with historical nonsteroidal anti-inflammatory drug treatment (odds ratio, 7.1; 95% confidence interval, 1.9 to 26.8). Only 1 cat (lion) had amyloid accumulation, and it was restricted to the corticomedullary junction. Primary glomerular lesions were absent in all cats. Intraepithelial pigment was identified in many of the cats but was not correlated with severity of TIN. Despite several previous reports describing primary glomerular disease or renal amyloidosis in exotic felids, these lesions were rare to absent in this population.

Vet Pathol. 2011 May;48(3):754-7. Epub 2010 Jun 23.

Cerebral and renal phaeohyphomycosis in a dog infected with *Bipolaris* species.

Giri DK, Sims WP, Sura R, Cooper JJ, Gavrilov BK, Mansell J.

Mycotic meningoencephalitis in dogs may manifest as a primary disease of the central nervous system or as a part of disseminated infection. Fungi belonging to the genus *Bipolaris* are saprophytic plant pathogens and can cause disease in humans. The authors report a case of *Bipolaris* infection in a dog with granulomatous meningoencephalitis, nephritis, and vasculitis. The clinical and histological features resembled those of the more common aspergillosis, thus warranting confirmation by molecular methods. Polymerase chain reaction and sequence analysis identified *Bipolaris* from the brain lesion, indicating its involvement in the disease. To the authors' knowledge, this is the first reported case of meningoencephalitis caused by this fungus in a domestic animal.

Veterinary Radiology and Ultrasound

Vet Radiol Ultrasound. 2011 Jan-Feb;52(1):88-94.

Clinical significance of renal pelvic dilatation on ultrasound in dogs and cats.

D'Anjou MA, Bédard A, Dunn ME.

Renal pelvic dilatation is often recognized sonographically in dogs and cats, but ranges of measurements expected with different urologic conditions remain unknown. Ultrasound images of 81 dogs and 66 cats with renal pelvic dilatation were reviewed, and six groups were formed based on medical records: (I) clinically normal renal function, and (II) clinically normal renal function with diuresis; (III) pyelonephritis; (IV) noninfectious renal insufficiency; (V) outflow obstruction; (VI) miscellaneous nonobstructive anomalies. Medians for maximal pelvic width (range) for group I was 2.0 mm (1.0-3.8) in 11 dogs, and 1.6 mm (0.8-3.2) in 10 cats; for group II, 2.5 mm (1.3-3.6) in 15 dogs, and 2.3mm (1.1-3.4) in 16 cats; for group III, 3.6 mm (1.9-12.0) in nine dogs, and 4.0 mm (1.7-12.4) in seven cats; for group IV, 3.1 mm (0.5-10.8) in 33 dogs, and 2.8 mm (1.2-7.3) in 13 cats; for group V, 15.1mm (5.1-76.2) in six dogs, and 6.8mm (1.2-39.1) in 17 cats; and for group VI, 3.8mm (1.2-7.6) in seven dogs, and 3.0 mm (1.3-7.5) in three cats. Pelvic width in group I was lower than in groups III-V (P = 0.0001), but did not significantly differ from group II. Pelvic width > or =13 mm always indicated obstruction. While the proportion of bilateral pelvic dilatation was not different among groups, the difference in pelvic width (maximal-minimal) was greater in group V vs. groups I, II, and IV (P = 0.0009). These results confirm that renal pelvic dilatation can be detected sonographically in dogs and cats with clinically normal renal function, and that it increases with renal insufficiency, pyelonephritis, or outflow obstruction. Nevertheless, renal pelvic width varies substantially within groups and should be interpreted with caution.

Vet Radiol Ultrasound. 2011 May-Jun;52(3):270-2. doi: 10.1111/j.1740-8261.2010.01772.x.

Radiographic characterization of the os penis in the cat.

Piola V, Posch B, Aghte P, Caine A, Herrtage ME.

The os penis in the cat has not been described radiographically, as compared with the dog. However, a small linear bony radiopacity is sometimes detected in the perineal area of male cats. We hypothesized that the feline os penis might be visible on survey radiographs of the pelvis, and we aimed to investigate the frequency of its visualization using analog and computed radiography (CR) system. One hundred radiographs of the pelvis of 99 male cats were reviewed retrospectively (50 were obtained with a CR system and 50 with an analog system). Age, breed, neutering status, and reason for presentation were recorded, as well as the visualization of the os penis. An os penis was detected in 19/50 (38%) cats with CR and in eight of 50 (16%) cats with analog radiography; this difference was statistically significant. With CR, the median age of cats with a visible os penis was significantly higher than in cats where the os penis was not seen. In one cat with a visible os penis examined with CR and analog radiography, the os penis was only visible on CR images. The penile tissues were examined histopathologically in one cat and well-differentiated bone was found but there were no pathologic findings detected in surrounding tissues. Thus, the os penis can be detected on radiographs of cats and this should not be mistaken for a pathologic finding such as urolithiasis or dystrophic mineralization.

Vet Radiol Ultrasound. 2011 Jul-Aug;52(4):448-50. doi: 10.1111/j.1740-8261.2011.01807.x.

Imaging diagnosis-bilateral orthotopic ureterocele in a dog.

Secrest S, Britt L, Cook C.

A 5-year-old neutered male Akita had a 5-month history of hematuria. Bilateral orthotopic ureterocele were diagnosed using a combination of sonography, computed tomography (CT), and radiography. With CT excretory urography, the ureterocele appeared as two intraluminal cystic structures in the vesicoureteral region of the urinary bladder, which directly communicated with dilated ureters. Unlike the other imaging modalities CT excretory urography provided a definitive diagnosis by confirming the communication between the hydroureters and the cystic dilations in the caudodorsal aspect of the urinary bladder.

Vet Radiol Ultrasound. 2011 Nov-Dec;52(6):640-7.

Contrast harmonic ultrasound appearance of consecutive percutaneous renal biopsies in dogs.

Haers H, Smets P, Pey P, Piron K, Daminet S, Saunders JH.

Ultrasound-guided percutaneous renal biopsy may be associated with complications, especially when using larger needles. Contrast harmonic ultrasound increases blood pool echo intensity, enhancing parenchymal lesions. Therefore, contrast harmonic ultrasound is a potential alternative screening method for postbiopsy renal lesions. Renal biopsies were performed using 14 G needles in 11 healthy Beagles, at three occasions: 0 ("Baseline Biopsy"; BB), 4 ("Biopsy 2"; B2), and 6 months ("Biopsy 3"; B3). Ultrasound and contrast harmonic ultrasound of biopsied kidneys were performed approximately 30 min after biopsy (week 0) at BB and B2, and repeated once every week (weeks 1-3) until normal appearance. At B3, only contrast harmonic ultrasound was performed, both immediately and 30-min postbiopsy. Contrast harmonic ultrasound images were reviewed using subjective and semiquantitative methods to describe lesions including number, shape, size, sharpness, echogenicity, and evolution. More renal lesions were detected with contrast harmonic ultrasound (22/22) compared with conventional ultrasound (14/22). The majority appeared at week 0 as hypoechoic tract(s) (27/33), the other (6/33) as ill-defined areas or area/tract combination, all having variable size, shape, and echogenicity. Seven tracts had a small subcapsular hematoma. In most kidneys, similar or gradual decrease of size and sharpness, and increased echogenicity was

observed until normal appearance occurred at week 1 (1/22), week 2 (18/22), or week 3 (22/22). Two Beagles developed complications. At B3, immediately postbiopsy, tracts were hyperechoic in 9/11 kidneys, becoming hypoechoic again 30 min later. Contrast harmonic ultrasound is a valuable method to evaluate postbiopsy renal lesions in dogs.

The Veterinary Record

Vet Rec. 2011 Mar 12;168(10):264. Epub 2011 Feb 28.

Prognosis of acute kidney injury in dogs using RIFLE (Risk, Injury, Failure, Loss and End-stage renal failure)-like criteria.

Lee YJ, Chang CC, Chan JP, Hsu WL, Lin KW, Wong ML.

A retrospective case-series study evaluated the prognosis of 853 dogs with acute kidney injury (AKI) based on the RIFLE (Risk, Injury, Failure, Loss and End-stage renal failure) criteria, derived from human medicine. The 30-day mortality of dogs with AKI in each class was found to be 23.8 per cent (40 of 168) dogs for Risk, 41.0 per cent (107 of 261) dogs for Injury and 78.5 per cent (333 of 424) dogs for Failure. Using the dogs in the Risk class as the reference, the mortality of dogs in either the Injury or Failure class was significantly higher than that of dogs in the Risk class ($P < 0.05$). The longest median survival time was observed in the Risk class (nine days) and the shortest median survival time was observed in the Failure class (three days). Using a multiple logistic regression model, a new score that simultaneously considered RIFLE class, diarrhoea status and serum phosphorus level was calculated to predict prognosis. Evaluation using the area under the receiver-operating characteristic curve (AUROC) indicated that the new scoring method (AUROC 0.80) was a better prognostic indicator than using RIFLE criteria alone (AUROC 0.73).

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Renal calculi in wild Eurasian otters (*Lutra lutra*) in England.

Simpson VR, Tomlinson AJ, Molenaar FM, Lawson B, Rogers KD.

Macroscopic renal calculi were seen in 50 of 492 (10.2 per cent) wild Eurasian otters found dead in England from 1988 to 2007. Forty-eight adults and two subadults were affected. Calculi were present in 15.7 per cent (31 of 197) of adult males and 12.7 per cent (17 of 134) of adult females. There was an increase in prevalence in the study population over time; no calculi were found in 73 otters examined between 1988 and 1996, but in most subsequent years they were observed with increased frequency. Calculi occurred in both kidneys but were more common in the right kidney. They varied greatly in shape and size; larger calculi were mostly seen in the calyces while the smallest ones were commonly found in the renal medulla. Calculi from 45 cases were examined by x-ray diffraction analysis; in 43 (96 per cent), they were composed solely of ammonium acid urate. Affected otters had heavier adrenal glands relative to their body size than unaffected otters ($P < 0.001$). There was no significant association between body condition index and the presence of calculi ($P > 0.05$). Many otters had fresh bite wounds consistent with intraspecific aggression. The proportion bitten increased over time and this coincided with the increased prevalence of renal calculi.

Vet Rec. 2011 Aug 20;169(8):209. Epub 2011 Jul 8.

Xanthine urolithiasis in a Cavalier King Charles spaniel.

Gow AG, Fairbanks LD, Simpson JW, Jacinto AM, Ridyard AE.

Vet Rec. 2011 Dec 17;169(25):657. Epub 2011 Oct 2.

Penile amputation and scrotal urethrostomy in 18 dogs.

Burrow RD, Gregory SP, Giejda AA, White RN.

The objective of this study was to report the signalment, indications for surgery, postoperative complications and outcome in dogs undergoing penile amputation and scrotal urethrostomy. Medical records of three surgical referral facilities were reviewed for dogs undergoing penile amputation and scrotal urethrostomy between January 2003 and July 2010. Data collected included signalment, presenting signs, indication for penile amputation, surgical technique, postoperative complications and long-term outcome. Eighteen dogs were included in the study. Indications for surgery were treatment of neoplasia (n=6), external or unknown penile trauma (n=4), penile trauma or necrosis associated with urethral obstruction with calculi (n=3), priapism (n=4) and balanoposthitis (n=1). All dogs suffered mild postoperative haemorrhage (posturination and/or spontaneous) from the urethrostomy stoma for up to 21 days (mean 5.5 days). Four dogs had minor complications recorded at suture removal (minor dehiscence (n=1), mild bruising and swelling around the urethrostomy site and mild haemorrhage at suture removal (n=2), and granulation at the edge of stoma (n=1)). One dog had a major complication (wound dehiscence and subsequent stricture of the stoma). Long-term outcome was excellent in all dogs with non-neoplastic disease. Local tumour recurrence and/or metastatic disease occurred within five to 12 months of surgery in two dogs undergoing penile amputation for the treatment of neoplasia. Both dogs were euthanased.

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Postoperative mortality in cats after ureterolithotomy.

Roberts SF, Aronson LR, Brown DC.

OBJECTIVE: To identify preoperative risk factors associated with mortality before discharge in cats having a single or multiple ureterotomy procedures to treat a ureteral obstruction.

STUDY DESIGN: Case series.

ANIMALS: Cats (n=47).

METHODS: Data were obtained from the medical records (2002-2009) of cats that had undergone ureterolithotomy procedures. Multiple preoperative factors were evaluated for association of survival to discharge.

RESULT: Survival to discharge after ureterolithotomy was 79% (37/47). Over 79% of cats were azotemic before surgery and 94% had chronic kidney disease changes at the time of ultrasonographic diagnosis. Six cats required an additional surgical procedure because of complications with ureterolithotomy. Overall prevalence of postoperative uroabdomen was 6% (3/47). On multivariate analysis, there were no preoperative variables significantly associated with survival to discharge.

CONCLUSIONS: Ureterolithotomy in cats was associated with a 21% mortality rate before hospital discharge. No preoperative variables associated with mortality were identified; therefore, further studies are needed to identify more discriminating preoperative characteristics for mortality after ureterolithotomy in this population of cats.