Urinary Tract Infections due to Mycoplasma canis in Dogs.

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Urine samples were obtained from 100 dogs with symptoms of lower urinary tract disease by cystocentesis and were examined for mycoplasmas. Urinalysis, haematological and biochemical analyses were also performed. Bacteria were isolated from urine in 41 of 100 dogs; Mycoplasma canis was isolated from four of 100 (4%) urine samples and three were pure culture. Selective mycoplasma media were used for isolation. In growth inhibition test, propagation of the four M. canis isolates was inhibited by their specific hyperimmune sera and there was no cross reactivity between isolates and hyperimmune sera of other mycoplasmas. Dogs in which M. canis was isolated were azotemic. All dogs were treated with enrofloxacin, furosemide, and supportive therapy (fluid therapy, ascorbic acid). In all animals, clinical improvements were observed after treatment.

Frequency and risk factors for urinary tract infection in cats with diabetes mellitus.


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BACKGROUND: Identification and control of infections are important in the management of diabetic cats. Urinary tract infections have not been well characterized in diabetic cats. This retrospective study was performed to review and characterize urinary tract infections in diabetic cats. HYPOTHESIS: Urinary tract infections are common in diabetic cats. ANIMALS: A review was made of the medical records of 141 diabetic cats that had had urine obtained for culture by antepubic cystocentesis and that had not been treated with antibiotics, undergone urinary tract catheterization or urinary tract surgery within 2 weeks of urine collection or had urethral obstruction at the time of urine collection. METHODS: A review of medical records. RESULTS: Urinary tract infection was identified in 18 of 141 diabetic cats. Escherichia coli was the most common isolate (67%). Female cats were at increased risk (prevalence odds ratios [POR], 3.7; 95% confidence interval [CI], 1.3 to 10.2; P = .013). Clinical signs of lower urinary tract disease and findings on urine sediment
examination were good predictors of positive urine cultures. CONCLUSIONS
AND CLINICAL IMPORTANCE: Urinary tract infections are common in diabetic
cats regardless of status of diabetic control, suggesting routine monitoring with
urine sediment exams or urine culture is warranted.

Prevalence and characterization of urinary tract infections in dogs with
surgically treated type 1 thoracolumbar intervertebral disc extrusion.

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OBJECTIVE: To determine the prevalence of urinary tract infections (UTI),
factors that correlate positively with UTI, and whether identified UTI are most
likely community- or hospital acquired in dogs with surgically treated type 1
thoracolumbar intervertebral disc (IVD) extradutions. STUDY DESIGN:
Prospective cross-sectional clinical study. SAMPLE POPULATION: Dogs (n=92)
that were surgically treated for a thoracolumbar extradural compressive spinal
cord lesion that was consistent with type 1 IVD extrusion. METHODS: Dogs
were evaluated for bacterial lower UTI when possible by cystocentesis and
urine culture before surgery, and 48-72, 96-120 hours, and 7 days after
surgery while hospitalized. Paraparesis, confirmation of thoracolumbar
extruded nucleus pulposus, and informed owner consent were required for
study inclusion. Urine specimens (n=297) were cultured and both objective
and subjective clinical data were obtained. RESULTS: Prevalence of UTI in dogs
with surgically treated type 1 thoracolumbar IVD extrusion was 27% (25
dogs). Temporal prevalence of UTI was 15% (13/89) before surgery, 12%
(11/91) at 2-3 days, 16% (12/76) at 4-5 days, and 20% (8/41) at 7 days after
surgery. Statistically significant factors affecting UTI prevalence included
neurologic and urinary status, sex, administration of perioperative antibiotics,
and amount of time body temperature was <35 degrees C during anesthesia.
CONCLUSION: UTI are common in dogs with surgically treated type 1
thoracolumbar IVD extrusion. Females, dogs that cannot ambulate or
voluntarily urinate, dogs not administered perioperative cefazolin, and dogs
whose body temperature falls <35 degrees C during anesthesia have a higher
incidence of UTI. CLINICAL RELEVANCE: All dogs with surgically treated type 1
thoracolumbar IVD extrusion should be monitored for the presence of UTI;
however, close attention should be paid to females and dogs that cannot
ambulate or voluntarily urinate.
Antibiotic sensitivity profiles do not reliably distinguish relapsing or persisting infections from reinfections in cats with chronic renal failure and multiple diagnoses of Escherichia coli urinary tract infection.

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Older cats with chronic renal failure (CRF) commonly develop urinary tract infections (UTI). Uropathogenic Escherichia coli (UPEC) is identified as the causal agent of UTI in most affected cats. Infections are often complicated, and UPEC infections may persist or recur in these cats. Antibiotic sensitivity profiles have been used to distinguish relapsing or persisting UTI from reinfection by different clones of the same species. However, the accuracy with which antibiograms discriminate different urinary E coli clones in cats is uncertain. We studied 17 cystocentesis-derived UPEC isolates collected from 5 cats with stable CRF and multiple diagnoses of UTI. UTIs were classified as relapses versus persistent infections or reinfections using antibiograms determined by Kirby-Bauer discs and Etests. Subsequently, clonality of UPEC isolates was determined by pulsed-field gel electrophoresis (PFGE). A comparison of PFGE results with antibiograms indicated that antibiotic resistance patterns varied considerably within several individual E coli clones. Both antibiotic susceptibility tests differentiated between relapsing or persistent infections and reinfections with only 58% overall efficiency. Thus, antibiotic sensitivity profiles cannot be relied upon to distinguish between persisting or relapsing infections as compared to reinfections in cats with CRF and multiple diagnoses of E coli UTI.

Susceptibility of bacteria from feline and canine urinary tract infections to doxycycline and tetracycline concentrations attained in urine four hours after oral dosage.

Wilson BJ, Norris JM, Malik R, Martin PA, Wigney DI, Baral RM, Govendir M.

Faculty of Veterinary Science, The University of Sydney, New South Wales, 2006.

OBJECTIVES: To measure urinary concentrations of doxycycline in cats and dogs and tetracycline in dogs 4 h after conventional oral dosing and determine whether these antibiotics were present in sufficient concentrations to be effective against common feline and canine urinary tract pathogens as
assessed in vitro by Epsilometer and disc diffusion antimicrobial susceptibility methods. DESIGN: A prospective study involving oral administration to clinically normal cats and dogs of doxycycline or tetracycline (dogs only) and culture of bacteria from dogs and cats with urinary tract infections to determine their susceptibility to both doxycycline and tetracycline in vitro. PROCEDURE: In the first study, nine cats and eight dogs were administered doxycycline monohydrate (5 mg/kg every 12 h) and a further eight dogs were administered tetracycline hydrochloride (20 mg/kg every 8 h) for 72 h. Blood was collected at 2 and 4 h, and urine at 4 h, after the last dose. The concentration of each agent in serum and urine was determined by modified agar diffusion. In the second study, 45 urine samples from cats and dogs with urinary tract infections were cultured. Every bacterial isolate was tested in vitro using both Epsilometer (doxycycline and tetracycline) and disc diffusion (doxycycline, tetracycline or amoxycillin-clavulanate) tests. RESULTS: Serum doxycycline concentrations in sera of cats and dogs at 2 h were 4.2 +/- 1.0 mg/mL and 3.4 +/- 1.1 mg/mL, respectively. The corresponding concentrations at 4 h were 3.5 +/- 0.7 mg/mL and 2.8 +/- 0.6 mg/mL. Urinary doxycycline concentrations at 4 h (53.8 +/- 24.4 mg/mL for cats and 52.4 +/- 24.1 mg/mL for dogs) were substantially higher than corresponding serum values. Serum tetracycline concentrations in dogs at 2 and 4 h, and in urine at 4 h, were 6.8 +/- 2.8, 5.4 +/- 0.8, 144.8 +/- 39.4 mg/mL, respectively. Most of the urinary tract pathogens (35/45) were susceptible to urinary concentrations of doxycycline and 38/45 were susceptible to tetracycline. In contrast 41/45 of all isolates were susceptible to amoxycillin-clavulanate. CONCLUSION: This is the first report of urinary concentrations of doxycycline after conventional oral administration. Concentrations attained in the urine of normal cats and dogs were sufficient to inhibit the growth of a significant number of urinary tract pathogens and thus doxycycline may be a useful antimicrobial agent for some urinary tract infections.


Evaluation of clinical signs and causes of lower urinary tract disease in European cats.


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OBJECTIVES: To investigate the clinical signs and causes of lower urinary tract disease (LUTD) in 77 cats. METHODS: Cats diagnosed with LUTD over a two-year period were included in the study. RESULTS: The study population comprised 67 male and 10 female cats. Uroliths occurred in 17 of the 77 cats (22 per cent), urethral plugs in eight cats (10 per cent) and urinary tract
infection in six cats (8 per cent). In 44 cats (57 per cent), no specific cause for the disease was found and they were classified as having idiopathic LUTD. In two of the 77 cats (3 per cent) no definitive diagnosis was established. Pain was less common in cats with uroliths and haematuria was more often seen in cats with urinary tract infection. At presentation, urethral obstruction was diagnosed in 45 of the 77 cats (58 per cent). CLINICAL SIGNIFICANCE: The causes of LUTD found in cats in this study are similar to those that have been previously documented, and idiopathic LUTD is the most frequent diagnosis. However, the rate of urethral obstruction, particularly in cats with idiopathic LUTD, was higher than in other reports. The cause of this difference is unknown.


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Thirty-five animals (23 dogs, 12 cats) with fungal urinary tract infections (UTIs) were retrospectively studied. Dysuria, hematuria, increased frequency of micturition, anorexia, depression, and pyrexia were the most common clinical signs noted. Seven species of fungi were identified in the affected animals. Candida albicans was the most common isolate. Most animals diagnosed with fungal UTI also had other concurrent urinary tract or medical problems. Lower urinary tract diseases, diabetes mellitus, neoplasia, and renal failure were the most common concurrent or preceding diseases identified. Resolution of fungal UTI occurred in 12 animals that received specific antifungal treatment.


Antimicrobial resistance in Escherichia coli isolated from bitches with pyometra and from urine samples from other dogs.

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To assess whether the rates of antimicrobial susceptibility in bacteria isolated from the urine of dogs with urinary tract infections are similar to those of
bacteria isolated from bitches with pyometra, the antimicrobial resistance of Escherichia coli isolated from the two groups were determined and compared. The samples were collected in Sweden between April 2002 and March 2003, and potential changes over time were assessed by comparing the results with corresponding data from 1991 to 1993. Among 80 isolates of E. coli from cases of pyometra, the proportions that were resistant to the antimicrobials used in canine practice were generally low (ampicillin 10 per cent, enrofloxacin 4 per cent, gentamicin 0 per cent, streptomycin 5 per cent, sulfamethoxazole 8 per cent, tetracycline 4 per cent and trimethoprim 2 per cent) and similar to the proportions reported previously. Significantly lower proportions of resistance were recorded among the pyometra isolates than among 92 isolates from urine samples submitted by animal hospitals to ampicillin (P=0.04), streptomycin (P=0.002) and tetracycline (P=0.03), but there were no differences between the pyometra isolates and 113 isolates from urine samples submitted by animal clinics.


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OBJECTIVE: To determine frequency of urinary tract infection (UTI) among dogs with pruritic disorders that were or were not receiving long-term glucocorticoid treatment. DESIGN: Observational study. ANIMALS: 127 dogs receiving glucocorticoids for > 6 months and 94 dogs not receiving glucocorticoids. PROCEDURE: Bacterial culture of urine samples was performed in dogs receiving long-term glucocorticoid treatment, and information was collected on drug administered, dosage, frequency of administration, duration of glucocorticoid treatment, and clinical signs of UTI. For dogs not receiving glucocorticoids, a single urine sample was submitted for bacterial culture. RESULTS: Multiple (2 to 6) urine samples were submitted for 70 of the 127 (55%) dogs receiving glucocorticoids; thus, 240 urine samples were analyzed. For 23 of the 127 (18.1%) dogs, results of bacterial culture were positive at least once, but none of the dogs had clinical signs of UTI. Pyuria and bacteriuria (present vs absent) were found to correctly predict results of bacterial culture for 89.9% and 95.8% of the samples, respectively. Type of glucocorticoid, dosage, frequency of administration, and duration of treatment were not associated with frequency of UTI. None of the urine samples from dogs not receiving glucocorticoids yielded bacterial growth. The frequency of UTI was significantly higher for dogs treated with glucocorticoids than for dogs that had not received glucocorticoids. CONCLUSIONS AND CLINICAL
RELEVANCE: Results suggest that dogs receiving long-term glucocorticoid treatment have an increased risk of developing a UTI. On this basis, we recommend that urine samples be submitted for bacterial culture at least yearly for such dogs.


Retrospective study of indications for and outcome of perineal urethrostomy in cats.

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OBJECTIVES: To evaluate indications for and outcome of perineal urethrostomy in cats. METHODS: The medical records of 59 cats that had undergone perineal urethrostomy were evaluated. Short-term follow up information (for a period of four weeks following surgery) was available for all of the cats. Long-term follow up information (for a period of at least four months) was available for 39 cats. RESULTS: Early complications occurred in 25.4 per cent of cats and late complications were observed in 28.2 per cent of cats. The most frequent late complication was recurring bacterial urinary tract infection. CLINICAL SIGNIFICANCE: Despite frequent complications and recurring signs of lower urinary tract disease, 32.2 per cent of the cats had a disease-free long-term outcome (mean four years, median 3.9 years), and 88.6 per cent of clients interviewed thought that their cats had a good quality of life after surgery.


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OBJECTIVE: To identify clinical features of Corynebacterium urealyticum urinary tract infection in dogs and cats and antimicrobial susceptibility patterns of C urealyticum isolates. DESIGN: Retrospective study. ANIMALS: 5 dogs and 2 cats. PROCEDURE: Medical records of dogs and cats for which C urealyticum was isolated from urine samples were reviewed. Isolates from clinical cases, along with previously lyophilized unsubtyped isolates of Corynebacterium spp collected between 1977 and 1995, were examined and, if subtyped as C
urealyticum, tested for antimicrobial susceptibility. RESULTS: Signalment of infected animals was variable. Prior micturition disorders were common, and all animals had signs of lower urinary tract disease at the time C urealyticum infection was diagnosed. Median urine pH was 8.0; WBCs and bacteria were variably seen in urine sediment. In vitro antimicrobial susceptibility testing of 14 C urealyticum isolates revealed that all were susceptible or had intermediate susceptibility to chloramphenicol, tetracycline, and vancomycin and most were susceptible to enrofloxacin. Thickening of the bladder wall and accumulation of sediment were common ultrasonographic findings. Contrast radiography or cystoscopy revealed findings consistent with encrusting cystitis in 3 dogs. Infection resolved in 2 dogs following surgical debridement of bladder plaques and antimicrobial administration. In 2 other dogs and 1 cat treated with antimicrobials, infection with C urealyticum resolved, but urinary tract infection with a different bacterial species developed. CONCLUSIONS AND CLINICAL RELEVANCE: Results suggest that preexisting urinary tract disorders are common in dogs and cats with C urealyticum infection. Treatment with appropriate antimicrobials in combination with surgical debridement might eliminate C urealyticum infection.


Incidence of catheter-associated urinary tract infection among dogs in a small animal intensive care unit.

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OBJECTIVE: To determine incidence of and possible risk factors for catheter-associated urinary tract infection (UTI) among dogs hospitalized in an intensive care unit and compare results of bacterial culture of urine samples with results of bacterial culture of catheter tips. DESIGN: Prospective study. ANIMALS: 39 dogs. PROCEDURE: A standard protocol for aseptic catheter placement and maintenance was used. Urine samples were obtained daily and submitted for bacterial culture. When possible, the urinary catheter tip was collected aseptically at the time of catheter removal and submitted for bacterial culture. Bacteria that were obtained were identified and tested for antimicrobial susceptibility. RESULTS: 4 of the 39 (10.3%) dogs developed a UTI. The probability of remaining free from UTI after 1 day in the intensive care unit was 94.9%, and the probability of remaining free from UTI after 4 days was 63.3%. Bacteria isolates were generally common urinary tract pathogens and were susceptible to most antimicrobials. Specific risk factors for catheter-associated UTI, beyond a lack of antimicrobial administration, were not identified. Positive predictive value of bacterial culture of urinary catheter tips
was only 25%. CONCLUSIONS AND CLINICAL RELEVANCE: Results suggest that placement of an indwelling urinary catheter in dogs is associated with a low risk of catheter-associated UTI during the first 3 days after catheter placement, provided that adequate precautions are taken for aseptic catheter placement and maintenance. Results of bacterial culture of urinary catheter tips should not be used to predict whether dogs developed catheter-associated UTI.


Cystocentesis is essential for reliable diagnosis of urinary tract infections in cats.

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Urine samples were taken from 79 cats with clinical signs of acute feline lower urinary tract disease (FLUTD) by means of cystocentesis, catheterization, or at voiding and were cultured. No bacteria were cultured from 79% of the samples taken by cystocentesis, 55% of the samples obtained by catheterization, and 17% of the samples obtained at voiding. Samples obtained by cystocentesis most often yielded pure cultures, whereas the voided samples were often contaminated, yielding mixed cultures. Therefore, it is difficult to interpret culture results for voided or catheterized urine samples, which may lead to overdiagnosis of urinary tract infections. E. coli was the most prevalent bacterial species. Numbers of bacteria were low (10^2 to 10^3/ml) in three out of eight culture-positive samples taken by cystocentesis, indicating that the number of bacteria present in the bladder of cats with urinary tract infections may be low. This may lead to underdiagnosis of urinary tract infections when interpreting culture results for voided and catheterized samples, because bacterial counts lower than 10^3 colony-forming units/ml of urine are generally considered not clinically relevant. In conclusion, cystocentesis is the preferred method of sampling for the evaluation of cats with suspected urinary tract infection.


Urine culture as a test for cure: why, when, and how?

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Quantitative urine culture before initiation of antimicrobial therapy is considered to be the gold standard for diagnosis of bacterial urinary tract infections (UTIs). In addition to facilitating differentiation of harmless bacterial contaminants from bacterial pathogens, accurate identification of specific bacterial species aids in selection of antimicrobial drugs. It also facilitates differentiation of recurrent UTIs caused by relapses from recurrent UTIs caused by reinfections. Failure to perform bacterial urine cultures or failure to interpret results of urine cultures correctly may lead not only to diagnostic errors but to therapeutic failures as well.

Diagnosis of urinary tract infections.

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Urinary tract infections (UTIs) are a common cause of urinary tract disease and may be associated with systemic disease. Diagnosis cannot be made on urinalysis and other findings alone. A urine culture is the "gold standard" for diagnosis of UTI. Antimicrobial susceptibility testing performed as part of a urine culture aids in selection of appropriate treatment for patients with confirmed bacterial UTI.

Evaluation of modified Wright-staining of urine sediment as a method for accurate detection of bacteriuria in dogs.

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OBJECTIVE: To compare the findings of light microscopic evaluation of routine unstained wet-mounted preparations and air-dried, modified Wright-stained preparations of urine sediment with results of quantitative aerobic bacteriologic culture of urine. DESIGN: Masked prospective study. SAMPLE POPULATION: 459 urine samples collected by cystocentesis from 441 dogs. PROCEDURE:
Urinalyses and quantitative bacteriologic cultures of urine were performed. Unstained wet-mounted preparations and air-dried, modified Wright-stained urine sediment preparations were examined by light microscopy for the presence of bacteria. RESULTS: Compared with results of quantitative bacteriologic culture, routine unstained preparations and modified Wright-stained preparations had sensitivities of 82.4% and 93.2%, specificities of 76.4% and 99.0%, positive predictive values of 40.1% and 94.5%, negative predictive values of 95.8% and 98.7%, and test efficiencies of 77.3% and 98.0%, respectively. Compared with 74 samples that yielded growth on bacteriologic culture, the routine unstained method had concordance and misclassification rates of 39.2% and 60.8%, respectively, whereas the Wright-stained method had concordance and misclassification rates of 78.4% and 21.6%, respectively. Significant associations between each of occult blood in urine, pyuria, female sex, and lower urine specific gravity with bacteriuria detected by Wright-stained sediment examination and quantitative bacteriologic culture of urine were identified. CONCLUSIONS AND CLINICAL RELEVANCE: Examination of modified Wright-stained preparations of urine sediment appeared to be a rapid, cost effective method that significantly improved the sensitivity, specificity, positive predictive value, and test efficiency of light microscopic detection of bacteriuria, compared with that of the routine unstained method.


**Effects of urinary tract inflammation and sample blood contamination on urine albumin and total protein concentrations in canine urine samples.**

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BACKGROUND: Urinary tract inflammation and hemorrhage are believed to be common causes of proteinuria in dogs based on results of studies that measured total urine protein concentration. A method to quantify urine albumin (UAlb) concentration in dogs recently has become available; however, the effect of inflammation on albuminuria is unknown. OBJECTIVES: The goals of this study were to determine the effects of urinary tract inflammation, as indicated by pyuria and sample blood contamination, on UAlb concentration and on urine protein:creatinine (UPC) ratio in dogs. METHODS: Urine samples were obtained from dogs with pyuria that were presented to a veterinary teaching hospital or were part of a laboratory colony. To mimic the effects of hematuria, canine whole blood was added to a microscopically normal canine urine sample that had baseline albumin and total protein concentrations below the limits of detection. UAlb concentration was measured using a canine albumin-specific competitive ELISA. UPC ratio was determined using routine
methods. RESULTS: Of 70 samples with pyuria, 67% had negligible UAlb concentrations and 81% had normal UPC ratios. UAlb concentration but not UPC ratio was significantly higher (P < 0.05) in samples with concurrent hematuria or bacteriuria. When whole blood was added to normal urine, UAlb concentration did not exceed 1 mg/dL until the sample became visibly pink; the UPC did not exceed 0.4 at any dilution. CONCLUSIONS: Many dogs with pyuria do not have albuminuria or proteinuria; however, albuminuria may be more likely in dogs with pyuria and concurrent hematuria or bacteriuria. Hematuria may not cause an increase in UAlb concentration until it becomes macroscopic and even then may not increase the UPC ratio.


Emphysematous cystitis due to Escherichia coli associated with prolonged chemotherapy in a non-diabetic dog.

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An 11-year-old male Labrador retriever dog with chronic recurrent complicated urinary tract infection due to Escherichia coli and a history of prolonged multi-drug chemotherapeutic protocol due to lymphoma was diagnosed with emphysematous cystitis. Diagnosis was based on ultrasonographic and radiographic findings. The immunosuppressive effects of the long glucocorticoid treatment were probably the main underlying mechanism involved in the pathogenesis, however, chemotherapy and/or the presence of lymphoma might have also been involved.


Evaluation of the role of lower urinary tract disease in cats with urine-marking behavior.

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OBJECTIVE: To determine whether findings of urinalyses could be used to reliably distinguish gonadectomized cats with urine-marking behavior from those with no problem urination. DESIGN: Case control study. ANIMALS: 58 gonadectomized cats (47 males and 11 females) with urine-marking behavior (ie, marking of vertical surfaces) and 39 (26 males and 13 females) without
problem urination or urinary tract-associated conditions. PROCEDURE: Urine was collected by cystocentesis from all cats. Findings of urinalyses of cats with urine-marking behavior were analyzed statistically for sex-related differences and differences between cats that marked vertical surfaces only and those that marked both vertical and horizontal surfaces; findings of urinalyses of control cats were compared between sexes. Subsequently, results of urinalyses of cats with urine-marking behavior were compared with those of control cats. RESULTS: With regard to variables measured via urinalysis, there were no differences between male and female cats within either group. Among cats with urine-marking behavior, there were no differences between those that only marked vertically and those that marked vertically and horizontally. Analyses of data from all cats with urine-marking behavior and control cats revealed no differences that could be associated with urine marking. CONCLUSIONS AND CLINICAL RELEVANCE: These data suggest that urine-marking behavior by gonadectomized cats is an aspect of normal behavior. Clinicians are advised to focus on behavioral history of house-soiling cats to differentiate between urine-marking behavior and inappropriate urination; for the latter, urinalysis is appropriate to rule out lower urinary tract disorders.


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A retrospective study was performed of 100 dogs with persistent urinary tract infections (UTIs) or reinfections presenting to the North Carolina State University (Raleigh, NC) Veterinary Teaching Hospital between 1989 and 1999. Criteria for selection included > or = 2 positive urine cultures within a 6-month period. Signalment, presence of predisposing disorders, urinalysis and urine culture results, and treatment strategies were extracted from the medical records. Dogs were a median age of 7 years when the UTI was 1st diagnosed. Dogs younger than 3 and older than 10 years were at increased and decreased risks, respectively, for reinfections or persistent UTIs. Spayed females were more common in the UTI population. More than half of the dogs were asymptomatic for a UTI at 1st presentation. Urine sediment examinations identified hematuria, pyuria, and bacteriuria in 47, 72, and 85% of the samples, respectively. The most commonly isolated organisms were Escherichia coli and Streptococcus/Enterococcus spp.; multiple isolates also were common. Of the isolates, 29.5% were resistant to achievable serum concentrations of all antibiotics commonly prescribed for PO administration. Dogs with abnormal micturition were more likely to have infections by organisms resistant to commonly prescribed antibiotics. Potentially predisposing disorders were identified in 71 dogs. A correction of these
disorders was accomplished in 35% of these 71 dogs. Dogs given standard antibiotic therapy without addressing predisposing disorders experienced poor control of their UTIs; 74.5% of these dogs had an apparent disease-free interval (ADFI) of < 8 weeks. By comparison, dogs in which predisposing disorders were corrected or those that were treated with low-dose, long-term antibiotic regimens subjectively had better control.


Trends in fluoroquinolone resistance of bacteria isolated from canine urinary tracts.

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Fluoroquinolone (FQ) antimicrobial agents are used extensively in human and veterinary medicine. Widespread use of any antimicrobial agent can apply selective pressure on populations of bacteria, which may result in an increase in the prevalence of antimicrobial-resistant isolates. Antimicrobial-susceptibility data on bacteria isolated from the canine urinary tract by the University of Missouri-Columbia Veterinary Medical Diagnostic Laboratory, Columbia, MO, were used to determine whether there has been an increase in the prevalence of FQ-resistant bacteria over time. Between January 1992 and December 2001, minimum inhibitory concentrations of either ciprofloxacin (1992-1998) or enrofloxacin (1998-2001) were determined for 1,478 bacterial isolates from the canine urinary tract. The predominant bacterial species isolated were Escherichia coli (547 isolates), Proteus mirabilis (156), and Staphylococcus intermedius (147). In all, there were 13 bacterial species with more than 25 isolates each. A significant increase in the overall proportion of resistant bacterial isolates was documented from 1992 to 2001 (Cochran-Armitage test for trend, P < 0.0001). The same increase in resistant isolates was documented when either ciprofloxacin or enrofloxacin was analyzed separately (P < 0.0001 and P < 0.0002, respectively). No difference was detected in rates of bacterial FQ resistance with regard to the sex of the dog from which the bacteria were isolated. The frequency with which some bacterial species were isolated differed with the sex of the infected dog. Proteus mirabilis was found more often in females (P < 0.0001), whereas beta hemolytic Streptococcus spp., were found more often in males (P = 0.0003). Although the overall efficacy of FQ antimicrobials remained high with greater than 80% of isolates being susceptible, the data demonstrated an increase in the proportion of resistant bacteria isolated from the urinary tract of the dog.
Candida spp. urinary tract infections in 13 dogs and seven cats: predisposing factors, treatment, and outcome.

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Records from 20 animals (13 dogs, seven cats) with Candida spp. urinary tract infections were reviewed. Six Candida spp. were isolated; Candida albicans was the most common isolate. Concurrent diseases or nonantifungal drugs administered within 1 month of isolation included antibiotics (n=16), corticosteroids (n=6), diabetes mellitus (n=4), nonurogenital neoplasia (n=3), and noncandidal urogenital disease (n=14). All animals had sources of local or systemic immune compromise that likely predisposed to infection. Of five animals with resolution of infection, three did not receive specific antifungal treatment. The authors conclude that correction of predisposing conditions is likely critical for management of Candida spp. urinary tract infection.

Detection of occult urinary tract infections in dogs with diabetes mellitus.

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Dogs with diabetes mellitus may develop occult urinary tract infections. In this study, diabetic dogs with negative and positive bacterial urine cultures were compared. Records from 51 dogs with diabetes mellitus were reviewed at the University of Illinois. No difference was identified between the groups in urine specific gravity, pH, glucose, ketones, protein, red blood cells, white blood cells, or epithelial cells. Dogs with occult urinary tract infection did have an increased incidence of bacteriuria, but this was not a consistent finding. Therefore, the urine on all diabetic dogs should be cultured to accurately identify the presence or absence of bacterial urinary tract infections.

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OBJECTIVE: To determine influence of vestibulovaginal stenosis, pelvic bladder, and recessed vulva on response to treatment for clinical signs of lower urinary tract disease in dogs. DESIGN: Retrospective study. ANIMALS: 38 spayed female dogs. PROCEDURE: Medical records and client follow-up were reviewed for dogs evaluated via excretory urography because of clinical signs of lower urinary tract disease. Clinical signs, results of radiography, and response to surgical or medical treatment were analyzed. RESULTS: Clinical signs included urinary tract infection (n = 24), urinary incontinence (20), vaginitis (11), pollakiuria or stranguria (10), and perivulvar dermatitis (4). Vaginocystourethrogramic findings included vestibulovaginal stenosis (n = 28), pelvic bladder (17), and ureteritis or pyelonephritis (4). Ten dogs had a vestibulovaginal ratio of < 0.20 (severe stenosis), 9 dogs had a ratio of 0.20 to 0.25 (moderate stenosis), 9 dogs had a ratio of 0.26 to 0.35 (mild stenosis), and 10 dogs had a ratio of > 0.35 (anatomically normal). Lower urinary tract infection, incontinence, and pelvic bladder were not associated with response to treatment for recessed vulva. Vestibulovaginal stenosis with a ratio < 0.20 was significantly associated negatively with response to treatment. Dogs without severe vestibulovaginal stenosis that received vulvoplasty for a recessed vulva responded well to treatment. CONCLUSIONS AND CLINICAL RELEVANCE: Vestibulovaginal stenosis is likely an important factor in dogs with vestibulovaginal ratio < 0.20. Vaginectomy or resection and anastomosis should be considered in dogs with severe vestibulovaginal stenosis and signs of lower urinary tract disease.


Urinary tract infection caused by Corynebacterium urealyticum in a dog.

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Urinary tract infection (UTI) caused by Corynebacterium urealyticum is a rarely recognised condition in veterinary medicine. This report describes a case in a 13-month-old dog which presented with a history of dysuria and haematuria. C
urealyticum was identified as the cause of UTI. The clinical, radiological and ultrasonographic features and the results of urinalysis and urine bacteriological culture are described, as are the therapeutic challenges presented by this particular infection.


**Epidemiologic study of risk factors for lower urinary tract diseases in cats.**

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OBJECTIVE: To determine proportional morbidity rates (PMR) and risk factors for lower urinary tract diseases (LUTD) in cats. DESIGN: Case-control study. SAMPLE POPULATION: Records of 22,908 cats with LUTD and 263,168 cats without LUTD. PROCEDURE: Data were retrieved from the Purdue Veterinary Medical Data Base. Descriptive statistics and univariate logistic regression analyses were performed to assess whether breed, age, sex, and neutering status were associated with different causes of LUTD. RESULTS: Mean PMR for LUTD irrespective of cause was 8/100 cats (range, 2 to 13/100 cats). Increased risk for urocystolithiasis (Russian Blue, Himalayan, and Persian cats), bacterial urinary tract infections (UTI; Abyssinian cats), congenital urinary tract defects (Manx and Persian cats), and urinary incontinence (Manx cats) was detected. Cats between 2 and < 7 years of age had increased risk for urethral plugs, neurogenic disorders, congenital defects, and iatrogenic injuries. Cats between 4 and < 10 years of age had increased risk for urocystolithiasis, urethral obstructions, and idiopathic LUTD. Cats > or = 10 years of age had increased risk for UTI and neoplasia. Castrated males had increased risk for each cause of LUTD except UTI and incontinence. Spayed females had increased risk for urocystolithiasis, UTI, and neoplasia. Sexually intact females had decreased risk for each cause of LUTD except neurogenic disorders and iatrogenic injuries. CONCLUSION AND CLINICAL RELEVANCE: Specific breed, age, sex, and neutering status may be associated with specific types of feline LUTD. Knowledge of patient risk factors for LUTD may facilitate development of surveillance strategies that enhance earlier detection.


**Interrelations of organism prevalence, specimen collection method, and host age, sex, and breed among 8,354 canine urinary tract infections (1969-1995).**
Ling GV, Norris CR, Franti CE, Eisele PH, Johnson DL, Ruby AL, Jang SS.

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Selected information was compiled from canine urinalyses and urine cultures conducted between January 1969 and December 1995. Eight thousand three hundred fifty-four microbial isolates (bacteria and fungi) included 4,873 isolates from females and 3,481 from males. Ten bacterial genera accounted for 96.3% of the urinary isolates, including Escherichia coli (44.1%), Staphylococcus spp. (11.6%), Proteus spp. (9.3%), Klebsiella spp. (9.1%), Enterococcus spp. (8.0%), and Streptococcus spp. (5.4%) as the 6 most common isolates in both genders of dogs. Among these 6 genera, female dogs were generally predisposed over males, although males had more urinary tract infections (UTIs) caused by Klebsiella spp. Distributions of ages at UTI diagnosis tended to be similar between genders. Infection with a single microbial species was responsible for >72% of UTIs in both genders. Among females, 40 breeds and a mixed-breed group represented 90.2% of all positive urine cultures, 88.4% of the individual dogs with UTIs, and 88.2% of the microbial isolations. Among males, these same 41 breed groups represented 87.9% of all positive urine cultures, 87.6% of the individual dogs, and 88.2% of the microbial isolations.


Norris CR, Williams BJ, Ling GV, Franti CE, Johnson, Ruby AL.

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Laboratory records of bacterial urine cultures from 383 dogs with recurrent or persistent urinary tract infections (UTI) diagnosed at the University of California Veterinary Medical Teaching Hospital (VMTH) between 1969 and 1995 were reviewed retrospectively to characterize the bacteria involved and their association with age, gender, and breed of dogs affected. Sixty-eight breeds and a mixed-breed group were represented. Escherichia coli was the most common isolate, although mixed-bacterial infections were seen in 58% of the female and 55% of the male dogs. Recurrent and persistent UTI were most prevalent in middle-aged to older German shepherd dogs, miniature/toy poodles, and Labrador retrievers, with no apparent sex predilection. Criteria fitting recurrent and persistent UTI were present in 0.3% of all dogs seen at the VMTH during this 26-year period.
Retrospective evaluation of urinary tract infection in 42 dogs with hyperadrenocorticism or diabetes mellitus or both.

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A retrospective study was performed to determine the proportion of dogs with hyperadrenocorticism or diabetes mellitus or both that had urinary tract infection (UTI) and to describe clinical and laboratory findings. Dogs with these endocrine disorders were included if results of quantitative urine culture were available and dogs were not receiving antimicrobials. Dogs with positive urine cultures were considered to have UTI and dogs with negative urine cultures were used as controls. Information including history, clinical signs, physical examination findings, and results of laboratory tests and urine culture was extracted from all records. Findings in dogs with UTI were compared with control dogs. There were 101 dogs with hyperadrenocorticism or diabetes mellitus or both that met inclusion criteria; 42 (41.6%) had UTI and 59 (58.4%) did not. UTI was present in 46% of dogs with hyperadrenocorticism, 37% of dogs with diabetes mellitus, and 50% of dogs with both endocrine disorders. There was no association between endocrine group and occurrence of UTI. Escherichia coli was the most common bacteria isolated, and cultures from 29 dogs (69%) showed growth of this organism. Of dogs with UTI, <5% had stranguria, pollakiuria, or discolored urine, whereas 60% had pyuria and 69% had bacteriuria. We conclude that UTIs are common in dogs with hyperadrenocorticism, diabetes mellitus, or both diseases. Clinical signs of UTI, however, are uncommon and results of urinalysis may be normal. Therefore, it is appropriate to recommend urine culture as part of the evaluation of dogs with these endocrine disorders.

Urinary tract infection as nidus for systemic spread and septic arthritis.

Morrow M.

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A 12-year-old bearded collie was diagnosed with septic arthritis. The same beta-hemolytic streptococcus was cultured from the joint, blood, and urine. With arthritis, it is important to search for an inciting cause (this case, urinary tract infection) and to differentiate infectious from immune-mediated disorders, as treatment may be very different.


Use and misuse of indwelling urethral catheters.

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Because indwelling urethral catheterization is potentially detrimental, especially when it leads to urinary tract infection, indwelling urinary catheters must not be used indiscriminately. Appropriate use of indwelling catheters in recently obstructed cats is accomplished by identifying which cats are likely to experience repeated obstruction if such catheterization is not performed. When indwelling catheters are used, precautions must be taken to minimize the occurrence and severity of catheter-associated complications. Following catheter removal, which should be done as soon as possible, urine culture results should be used to verify absence of infection or to guide treatment when infection is detected.


Viral infections of the feline urinary tract.

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The exact cause of hematuria, dysuria, and urethral obstruction remains unknown in a large percentage of naturally occurring cases of feline lower urinary tract disease (FLUTD). One attractive hypothesis implicates viruses as the cause of some idiopathic forms of FLUTD; supporting this hypothesis is the fact that a gamma herpesvirus, a calicivirus, and a retrovirus have been isolated from urine and tissues obtained from cats with this type of disease. Although the clinical course and laboratory findings of cats with idiopathic FLUTD are suggestive of an infectious cause, the question of whether viruses have a pathologic role in some forms of naturally acquired FLUTDs has not
been completely answered.

Comparative study of marbofloxacin and amoxicillin-clavulanic acid in the treatment of urinary tract infections in dogs.


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One hundred and four dogs with clinical signs of urinary tract infection were selected by 15 practitioners in a multicentric, controlled and randomised study. The clinical diagnosis was confirmed by urinalysis and imaging. Each dog received either marbofloxacin (2 mg/kg orally once daily or 4 mg/kg by subcutaneous injection every four days) or amoxicillin-clavulanic acid tablets (12.5 mg/kg twice daily) for 10 or 28 days, depending on the clinical diagnosis. Rectal temperature, general condition, appetite, urinary signs, defecation disorders and pain on abdominal palpation were monitored at each visit, the timetable depending on diagnosis: three urinalyses and at least three examinations per case were performed. Side effects were also thoroughly sought at each examination. Marbofloxacin and amoxicillin-clavulanic acid both yielded good bacteriological cure rates (96.2 per cent versus 85.0 per cent, respectively) and clinical cure rates (83.3 per cent versus 69.7 per cent). Fewer relapses were observed in those dogs that received marbofloxacin. Few mild side effects were recorded with both products.

The role of uropathogens in feline lower urinary tract disease. Clinical implications.

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Bacterial, fungal, and parasitic uropathogens have small but significant roles as causative agents in naturally occurring feline lower urinary tract disease. However, the exact cause of hematuria, dysuria, and/or urethral obstruction remains unknown in a large percentage of cats. Feline calicivirus, feline syncytia-forming virus, bovine herpesvirus-4, mycoplasmas, and ureaplasmas
are potential uropathogens whose etiopathogenic roles in idiopathic feline lower urinary tract disease remain, as of yet, unresolved.


Prevalence of bacterial urinary tract infection after perineal urethrostomy in cats.

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It has been reported that the prevalence of bacterial urinary tract infection (UTI) increases after perineal urethrostomy in male cats. Perineal urethrostomy, using a surgical technique preserving striated urethral sphincter function, was performed on 2 groups of cats. The first group consisted of healthy castrated cats. The second group of cats had recurrent or persistent urethral obstruction. All cats had normal urethral sphincter function after surgery, as measured by urethral pressure profilometry and electromyography. Long-term periodic urinalysis and bacterial culturing of urine was performed on all cats. Twenty-two percent of the previously obstructed cats had recurrent bacterial UTI, compared with none of the healthy cats. On the basis of these findings, we suggest that perineal urethrostomy per se does not predispose cats to bacterial UTI, but surgical alteration of the urethral meatus combined with an underlying uropathy may increase the prevalence of ascending bacterial UTI after surgery.


Rational approaches to the treatment of first time, relapsing, and recurrent urinary tract infections.

Aucoin DP.

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Urinary tract infections (UTIs) in the dog are common clinical problems that often respond to a variety of therapeutic regimes. There are, however, many cases of non-responding or recurring infections that require a more systematic approach to therapy. This involves a simple process defining duration, clinical severity, and location, as well as clear identification of the UTI as relapsing or recurrent. Based on these factors, therapeutic approaches and clinical expectations can be developed, improving the chances of resolution in these
often frustrating cases.

The role of viruses in feline lower urinary tract disease.

Kruger JM, Osborne CA.

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Viruses have been implicated as causative agents in the etiopathogenesis of some forms of feline lower urinary tract disease (LUTD). This hypothesis was supported by isolation of feline calicivirus, bovine herpesvirus 4 (strain FeCAHV), and feline syncytia-forming virus from cats with naturally occurring LUTD, and by experimental studies of induced viral urinary tract infection. Results of early clinical studies yielded contradictory results concerning the role of viruses in feline LUTD. However, recent detection of bovine herpesvirus 4 antibodies in feline serum samples and discovery of calicivirus-like particles in crystalline/matrix urethral plugs obtained from cats with naturally occurring LUTD, suggests the need to reexamine the etiopathologic role of viruses using contemporary methods of virus identification and localization.

Canine and feline urinalysis: value of macroscopic and microscopic examinations.

Barlough JE, Osborne CA, Stevens JB.

A retrospective survey of complete urinalyses performed on dogs and cats hospitalized at the University of Minnesota Veterinary Teaching Hospital was performed to determine the frequency of abnormal findings in urine sediment, compared with normal and abnormal macroscopic findings. One thousand consecutive urine samples collected from dogs and 1,000 consecutive urine samples collected from cats were studied. Results indicated that failure to examine urine sediment of macroscopically normal samples would have yielded false-negative results in 16.5% of the canine patients and 5.7% of the feline patients. Microscopic findings in macroscopically normal canine samples consisted primarily of pyuria and bacteriuria, whereas in cats they consisted of hematuria and bacteriuria. Microscopic abnormalities were detected in almost 50% of the canine and feline samples with macroscopic abnormalities. The results of this evaluation confirm the value of routine microscopic examination of urine sediment as a component of complete urinalysis.
Laboratory findings in urinary tract infections.

Barsanti JA, Finco DR.

Urinary tract infection should be considered in a differential diagnosis on the basis of history, physical examination, and urinalysis. To definitively diagnose urinary tract infection, significant bacteriuria must be found by quantitative bacterial culture. The absolute definition of significant numbers of bacteria varies with the method of collection because of the possibility of contamination with the normal bacterial flora of the lower genitourinary tract. Numbers of bacteria are also influenced by the manner in which urine samples are handled, by urine concentration, and by frequency of voiding. Quantitative and qualitative urine cultures should also be used to monitor the efficacy of treatment in chronic and recurrent infections. Cultures should be repeated three to five days after the termination of antimicrobial therapy to ensure elimination of infection. If feasible, cultures should also be repeated two to three days after beginning therapy to ensure the antimicrobial agent selected is effective. Remission of clinical signs should not be used to judge efficacy of treatment, especially in chronic or recurrent infections, since infections can persist without causing clinical signs, particularly if bacterial numbers are temporarily reduced. Determination of the minimum inhibitory concentration of an antibiotic for a particular bacteria is preferable to Kirby-Bauer antibiotic sensitivity testing in urinary tract infection because of the difference in serum and urine concentrations of most antibiotics. Bacteria are not sensitive or resistant to an antibiotic but rather to a concentration of that antibiotic. If Kirby-Bauer sensitivity testing is used for urinary tract infection, results must be interpreted carefully since drugs reported as ineffective may be effective in vivo.

Gentamicin for treatment of resistant urinary tract infections in dogs.

Ling GV, Ruby AL.

Gentamicin was administered parenterally for 6 days to 43 dogs with urinary tract infections. The daily dosage of 6.6 mg/kg (3 mg/lb) was divided into equal parts and given IM or SC at 8-hour intervals. Dogs selected for treatment with gentamicin had urinary infections that had not responded to treatment with other antimicrobial agents or had bacterial isolates from urine that were resistant to several antimicrobial agents on in vitro susceptibility
tests. Response to treatment, defined as negative urine culture on the last day of therapy or 4 to 14 days after completion of the therapeutic course, included 20 of 22 (91%) infections caused by Escherichia coli, 8 of 9 (89%) infections caused by Klebsiella pneumoniae, 6 of 7 (86%) infections caused by Proteus spp, and 6 of 7 infections caused by Pseudomonas spp. These four species comprised 84% of the bacteria isolated from the dogs in this study.


Finco DR, Shotts EB Jr, Crowell WA.

Urinary tract infection (UTI) was induced in the left kidney of seven female dogs and in the urinary bladder of eight female dogs. Several methods advocated for localization of UTI in other species were tested in the infected dogs. Although fever, renal pain, and leukocytosis were detected in some dogs with renal infection, findings were transient. Radiographic changes in the kidneys and ureters were detected in some dogs with renal infection, but were absent in others. Bladder washout studies were not reliable for differentiating renal infection from bladder infection. Antibody coating studies were positive in dogs with bladder infection and in dogs with renal infection. The positive results from dogs with bladder infection may have been because of nonspecific binding of immunoglobulins to Staphylococcus aureus after leakage of serum immunoglobulins into urine. Studies of six dogs of both sexes with naturally occurring UTI indicated that their serum contained antibody against common urinary pathogens and that this antibody gained access to the urine in some dogs. It was concluded that the antibody coating test was unreliable for localization of UTI in the dog.