

Urinary Tract Infections (UTI) in Dogs and Cats

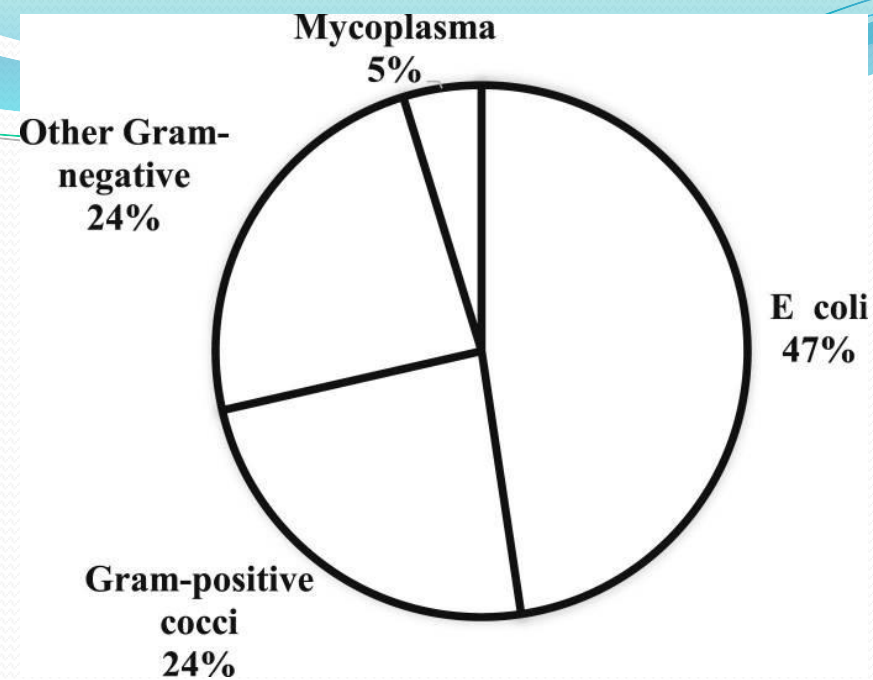
By
Prof. Dr. Wessam MM Saleh

Summary

- Urinary tract infection (UTI) occurs when there is weakness in host defense mechanisms and a virulent microbe adheres, multiplies, and persists in a portion of the urinary tract.
- Most commonly, UTI is caused by bacteria, but fungi and viruses are possible.
- UTI can occur in any part of the urinary tract, the **bladder** and **urethra** are the most common sites of infection.
- This is largely because bacteria tend to enter the urethra and bladder via the opening of the urethra, where contamination from local skin irritation, fecal material, and/or the genitals can occur.
- This is referred to commonly as an "**ascending**" UTI.
- UTIs are common in both dogs and cats, though their causes differ significantly.
- The signs of disease, usually more frequent and painful urination, are similar in both species. Bloody urine may or may not be evident.

Etiology: Bacteria

- Prevalence of common urinary pathogens: 33%–50% *E coli*,
- 25%–33% gram-positive cocci (*Staphylococcus* sp, *Streptococcus* sp, *Enterococcus* sp)
- 25%–33% other gram-negative (*Proteus* sp, *Klebsiella* sp, *Pasteurella* sp, *Pseudomonas* sp, *Corynebacterium* sp),
- less than 5% *Mycoplasma* sp.
- ***Staphylococcus felis*** is the most common Staphylococcal species causing UTI in cats



Etiology: Bacteria/ Conditions

- Lower UTI
- Pyelonephritis
- Prostatitis (acute and chronic): *Brucella canis*/male dogs
- Catheter-associated urinary tract infection

Etiology: Fungal

- **Funguria** may be due to primary infections of the lower UT or secondary to shedding of fungal elements into the urine in animals with systemic infections.
- Primary fungal UTI is most commonly due to ***Candida*** spp, a **commensal inhabitant** of the genital mucosa, upper respiratory tract, and gastrointestinal tract.
- *Candida albicans* is the most commonly identified species, followed by *Candida glabrata* and *Candida tropicalis*;
- Other widespread fungi may cause primary fungal UTI, including *Aspergillus* spp, *Blastomycosis* spp, and *Cryptococcus* spp

Etiology: Viral

Species	Upper Urinary Tract Disease	Lower Urinary Tract Disease
Canine	Canine adenovirus type I	
	Canine herpesvirus	
Feline	Feline coronavirus	Feline calicivirus
	Feline immunodeficiency virus	Bovine herpesvirus-4
	Feline leukemia virus	
	Feline foamy (syncytium-forming) virus	Feline foamy (syncytium-forming) virus

Clinical Signs: Lower UTI

- Lower UTI may be symptomatic or asymptomatic, and clinical signs are **indistinguishable** from other causes of lower urinary tract disease.
- Nonspecific clinical signs of lower urinary tract disease include, but are not limited to,
 - pollakiuria,
 - dysuria,
 - stranguria,
 - hematuria,
 - inappropriate urination

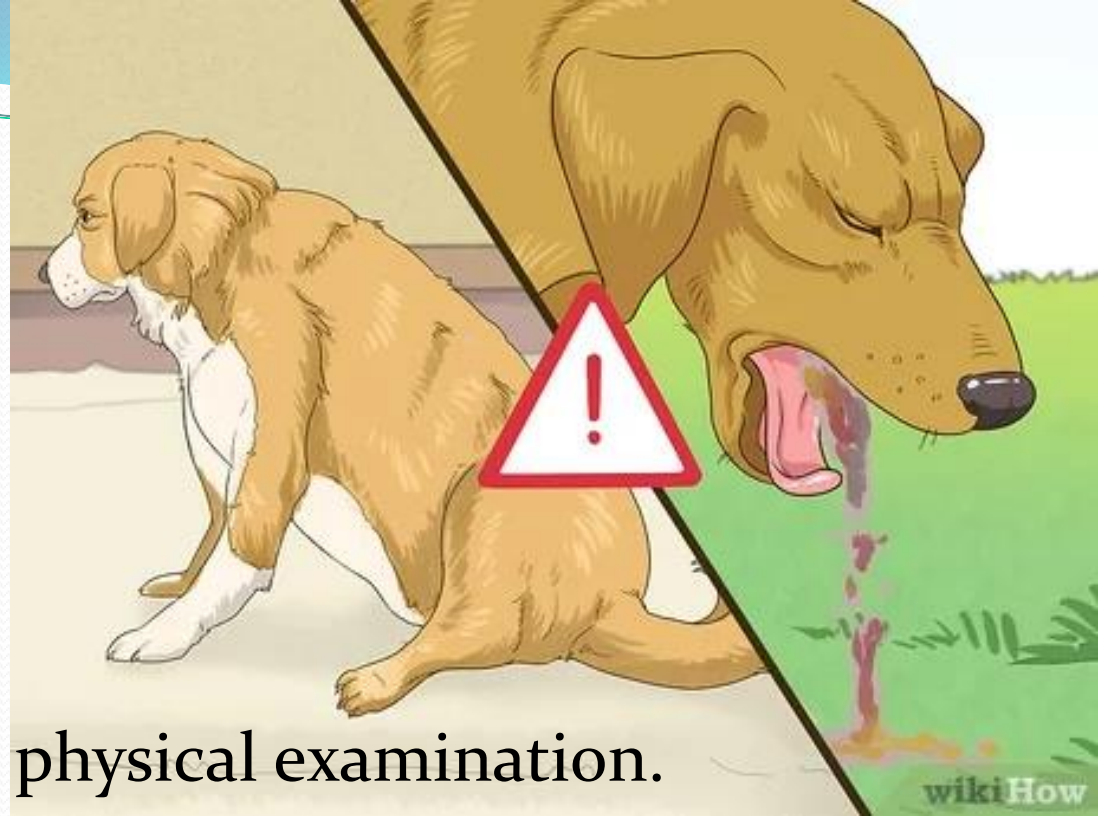
Clinical Signs: Lower UTI/Prostatitis

- Acute prostatitis is usually associated with systemic illness, including **fever, anorexia, vomiting, and lethargy**.
- Dogs also have **caudal abdominal pain, stiff gait, and preputial discharge** and be **unwilling to breed**.
- Chronic prostatitis are usually not systemically ill or febrile.
- Commonly, **recurrent UTI or preputial bloody discharge** is the only clinical sign of chronic prostatitis.
- Other signs include **stiff gait, discomfort with rising, infertility, or orchiepididymitis**, or dogs may be asymptomatic.

Clinical Signs: Upper UTI/Pyelonephritis

- **Acute pyelonephritis** is usually associated with signs of severe systemic illness:
 - uremia, fever, painful kidneys, possible nephromegaly, and/or sepsis
- **Chronic pyelonephritis** usually has a more insidious presentation:
 - slowly progressive **azotemia** that may **not** be associated with ~~uremia~~, **progressive kidney damage**, and ultimately, **renal failure** if untreated.
 - **Bacterial** pyelonephritis may be associated with hematuria only.

Diagnosis



- Complete clinical and physical examination.
- Definitive diagnosis of UTIs are achieved via urinalysis and a "culture and sensitivity," a test that determines the kind of bacteria/fungi growing in the urine as well as the antibiotics it's susceptible to.

Diagnosis

Additional testing is considered very important to determine the cause of the UTI includes:

- Complete blood count
- Serum biochemistry analysis
- Abdominal X-rays
- Abdominal ultrasound
- Cystoscopy
- CT scans
- Testing for immunosuppressive conditions
- Allergy testing (in dogs)
- Thyroid hormone testing (in dogs), Cats: total T₄

Antimicrobial Therapy

Summary of first-line antimicrobial options for urinary tract infections in the dog and cat

Infection	First-Line Drug Options
Uncomplicated UTI	Amoxicillin, trimethoprim-sulfonamide
Complicated	Guided by culture and susceptibility testing, but consider amoxicillin or trimethoprim-sulfonamide initially
Subclinical bacteriuria	Antimicrobial therapy not recommended unless high risk for ascending infection. If so, treat as per complicated UTI
Pyelonephritis	Start with a fluoroquinolone, with reassessment based on culture and susceptibility testing
Prostatitis	Trimethoprim-sulfonamide, enrofloxacin, chloramphenicol

Antimicrobial treatment options for urinary tract infection in dogs and cats I

Drug	Dose	Comments
Amoxicillin	11–15 mg/kg q8h, PO	Good first-line option for UTIs. Ineffective against β -lactamase-producing bacteria.
Amikacin	Dogs: 15–30 mg/kg q24h, IV/IM/SC Cats: 10–14 mg/kg q24h, IV/IM/SC	Not recommended for routine use, useful against multidrug-resistant organisms. Not used in renal insufficiency.
Amoxicillin/clavulanate	12.5–25 mg/kg q8h, PO (dose based on combination of amoxicillin + clavulanate)	Not established whether there is any advantage over amoxicillin alone.
Ampicillin		Not recommended because of poor oral bioavailability. Amoxicillin is preferred.
Cephalexin, Cefadroxil	12–25 mg/kg q12h, PO	Enterococci are resistant. Resistance may be common in <i>Enterobacteriaceae</i> in some regions
Cefovecin	8 mg/kg single SC injection. Can be repeated once after 7–14 d	Should only be used in situations where oral treatment is problematic.
Cefpodoxime proxetil	5 to 10 mg/kg q24h, PO	Enterococci are resistant.
Ceftiofur	2 mg/kg q12–24h, SC	Approved for treatment of UTIs in dogs in some regions. Enterococci are resistant.
Chloramphenicol	Dogs: 40–50 mg/kg q8h, PO Cats: 12.5–20 mg/kg q12h, PO	Reserved for multidrug-resistant infections with few other options. Myelosuppression can occur.
Ciprofloxacin	30 mg/kg q24h, PO	Sometimes used because of lower cost than enrofloxacin.

Antimicrobial treatment options for urinary tract infection in dogs and cats II

Drug	Dose	Comments
Doxycycline	3-5 mg/kg q12h, PO	Highly metabolized and excreted in intestinal tract, so urine levels may be low. Not recommended for routine uses.
Enrofloxacin	Dogs: 10-20 mg/kg q24h, PO Cats: 5 mg/kg q24h, PO	Excreted in urine predominantly in active form. Reserve for documented resistant UTIs but good first-line choice for pyelonephritis (dogs 20 mg/kg PO q24h)
Imipenem-cilastatin	5 mg/kg q6-8h, IV/IM	Reserve for treatment of multidrug-resistant infections, particularly those caused by <i>Enterobacteriaceae</i> or <i>P aeruginosa</i> .
Marbofloxacin	2.7-5.5 mg/kg q24h, PO	Excreted in urine predominantly in active form. Reserve for documented resistant UTIs but good first-line choice for pyelonephritis. Limited efficacy against enterococci.
Meropenem	8.5 mg/kg q12h, SC or q8h, IV	Reserve for treatment of multidrug-resistant infections, particularly those caused by <i>Enterobacteriaceae</i> or <i>P aeruginosa</i> .
Nitrofurantoin	4.4-5 mg/kg q8h, PO	Good second-line option for simple uncomplicated UTI, particularly when multidrug-resistant pathogens are involved.
Orbifloxacin	Tablets: 2.5-7.5 mg/kg q24h, PO; oral suspension: 7.5 mg/kg q24h, PO (cats) or 2.5-7.5 mg/kg q24h, PO (dogs)	Excreted in urine predominantly in active form.
Pradofloxacin	Dogs: 3 mg/kg q24h, PO ^a Cats: 5 mg/kg q24h, PO ^a	May cause bone marrow suppression resulting in severe thrombocytopenia and neutropenia in dogs.
Trimethoprim-sulfadiazine	15 mg/kg q12h, PO Note: dosing is based on total trimethoprim + sulfadiazine concentration	Good first-line option.

Treatment of fungal cystitis

For all cases	Identify and correct underlying predisposing factors	<ul style="list-style-type: none"> • Breaches in local or systemic immunity
If <i>C albicans</i>	Fluconazole 5–10 mg/kg PO q 12h for 4–6 wk	<ul style="list-style-type: none"> • Urine sediment and culture at 2- to 3-wk intervals to confirm resolution • Urine sediment and culture 1 and 2 mo after therapy discontinuation
If non- <i>C albicans</i>	Therapy based on culture and sensitivity	<ul style="list-style-type: none"> • Monitor as above • Consider drug penetration into urine when selecting therapy
If initial treatment fails	Repeat culture and sensitivity	<ul style="list-style-type: none"> • Intravesicular infusion 1% clotrimazole or amphotericin B • IV or SQ amphotericin B • Combination fluconazole at maximum dose plus terbinafine • Benign neglect, regular monitoring for disease progression

Treatment duration and monitoring

Treatment Duration	Monitoring Urine Culture	
Uncomplicated bacterial UTI	7-14 d 3 d?	5-7 d after discontinue antimicrobials
Complicated bacterial UTI	Minimum 3-6 wk	1 wk into therapy Before therapy discontinuation 5-7 d after discontinue antimicrobial 1 mo, 2 mo after treatment
AB (Asymptomatic bacteriuria)	Treatment not recommended unless high risk for ascending or systemic infection	
Fungal UTI	Minimum 6-8 wk	As above for complicated bacterial UTI