

Urinary Tract Infections in Dogs with Kidney Disease



Dogs suffering from kidney disease often get a urinary tract infection (UTI), but inexperienced vets occasionally wrongly manage this complication – causing more stress on the kidneys, a higher release of toxins into the bloodstream, and an infection that is likely to run unrestrained and out of control.

UTIs are at best uncomfortable for a dog, but they are also occasionally painful, so early detection and treatment are essential. Some dogs show no signs of illness whatsoever because their pain threshold is quite high. Others are likely to appear depressed and lethargic and may also express the wish to urinate far more than normal. Dogs may also want to urinate, but then seem unable to do so. Incontinence (particularly at night) is another common sign. There might also be blood seen in the urine, the urine may have a foul smell, and dogs are likely to constantly and sometimes obsessively lick their genital region.

UTIs are more common in female dogs because they have a shorter urinary tract and their anatomy creates the opportunity for this type of infection. Dennis J. Chew, DVM, DACVIM, states in his (and others) study *'Problem Urinary Tract Infections'* that: *'Female dogs typically have recurrent infections with Staphylococcus, Enterococcus sp., or Pseudomonas. Male dogs with recurrent UTI are more likely to have Klebsiella, Providencia, Salmonella sp., Corynebacterium sp., Acinetobacter sp., and Actinomyces sp. In recurrent infections, 20% of dogs have two bacterial organisms isolated, and 4% have three isolated.'*

Male dogs with a UTI are often assumed to have a prostate infection; therefore, this likelihood needs exploring further. Antibiotics selected for the effective treatment of UTIs in male dogs need to accomplish good prostate penetration (dvm360).

Kidney disease (KD) suppresses the immune system, which means these dogs have a reduced capacity to fight infections entering the body. KD dogs also produce dilute urine and the pH balance sometimes becomes insufficiently acidic, which magnifies the risk of UTIs occurring. Significantly, the compromised kidneys do not effectively filter bodily fluids entering the organ pathways, which mean an infection accumulates and develops unheeded. Diabetes mellitus, hyperthyroidism, Cushing's Syndrome, cancer, prostate disease, stress, incontinence, and bladder stones all increase the risk of UTIs.

Although bacterial infections are the most likely UTI, they are certainly not the only type a KD dog might suffer from. Vets very often wrongly assume a bacterial infection from symptoms alone and begin a generic antibiotic to treat it. This is cutting corners and it's potentially a very big mistake that will adversely affect the recovery rate and ongoing health of a dog with kidney disease. Moreover, those dogs with more than one type of infection happening at the same time may only be given the correct antibacterial treatment for one of the strains and not the other(s).

Bacterial UTI Infections

E. coli, *Staphylococcus*, and *Proteus* spp. (multiple species) are the bacteria that affect the lower urinary tract and bladder of half of all dogs with UTIs seen by vets. These generally originate from an external source when a bacterium enters the urinary tract. It then ascends upwards to the bladder where it multiplies. Left untreated, this can cause extensive inflammation and a severe kidney infection, as it spreads to upper urinary tracts.

Poor hygiene, excessive licking, joint problems (arthritis), dehydration, poor water intake, and pertinent physical characteristics (such as too much hair around the urethral opening) all cultivate UTIs. Another common cause includes dogs denied the opportunity to urinate and who are then forced to hold urine in the bladder for far too long. Sometimes an infection is also caused by bacteria circulating in a dog's bloodstream, which can settle and proliferate somewhere along the urinary tract.

Bacterial Organisms

In addition to the common bacteria mentioned above, there is also a group of organisms that inflict serious damage to a dog's kidneys. The disorder most often described as being seen by vets is Interstitial Nephritis. There are a variety of potential causes, but the one most relevant to UTIs is *Leptospira Interrogans*. These organisms most often enter a dog's body through another dog's contaminated urine. Infection is less often acquired through bite wounds, contaminated stagnant or slow-flowing water, by eating infected food sources, or tainted bedding.

Although there are vaccinations for *Leptospira Interrogans*, they are only effective against a small number of strains. For this reason alone, it is very important vets explore the potential for *Leptospira* infection when suspecting and diagnosing a UTI, otherwise and without starting an effective treatment, further severe damage to an already sick dog is likely to ensue.

Non-Bacterial UTIs

There is also a range of non-bacterial organisms that can cause a UTI. Some dogs will lick at or eat almost anything and this trait occasionally leads directly to an infection beginning. You perhaps have or have had a “soil-eater”. These are dogs that seem constantly tempted to dig at and then chew at the soil in the garden or while out exercising off-lead. Unfortunately, topsoil holds many risks including earthworms contaminated with a particular parasite’s larvae, *Capillaria Plica*, which then commonly cause bladder infections in dogs, but also occasionally infections of the ureters and kidneys.

And earthworms are not the only non-bacterial cause of UTIs. Dogs are naturally inquisitive and relentless scavengers, and this behaviour puts them in constant danger. For example, various fungi can invade a dog’s body. *Cryptococcus neoformans* is one that lives in bird excrement. *Candida* is a yeast infection. *Rhodotorula* is found on fruit, in soil, peanuts, cheese, sausages, and many other products. This particular pathogen seems particularly attracted to plastics and some recent studies have found humans are at increased risk from toothbrushes, shower curtains, and even, when hospitalized, from medical equipment such as infected catheters. *Diocotophyma Renale* is another organism that lives in earthworms, but dogs also become infected by eating contaminated frogs and fish.

The list is endless ... and I am only describing these sources to make the point that avoiding a UTI is almost impossible. Dogs with kidney disease are far more likely to suffer more onerous health complications from them because they have an impaired immune system and are less likely to combat an infection naturally.

Medications Can Promote UTIs

Dogs that are on certain medications are more prone to acquiring a UTI. Perhaps the most obvious of these are corticosteroids (steroids), such as Prednisone, Prednisolone, and Azathioprine, which reduce inflammation and constrain immune system responses. These medications are commonly given to dogs with more severe or chronic allergic reactions and with Addison’s disease and Cushing’s, but the very nature of their effect on the immune system makes them contraindicated for dogs with kidney disease. The same or similar medications are often used when treating immune-mediated haemolytic anaemia, inflammatory bowel disease, and glomerulonephritis.

By limiting the immune system's response, infections have an open-door with no barrier to restrict them. The long-term treatment of another primary or secondary illness using any immunosuppressant medication will only increase the risk of recurrent UTIs in dogs with kidney disease. However, treating certain health problems is sometimes considered a higher and more important priority than running the risk of a dog developing a UTI, and it is for a vet to consider the options and balance the pros and cons in every specific case.

Guard Against a Vet's Standard Protocol for UTIs

Many vets diagnose a UTI from listening to the symptoms an owner describes and by physically examining a dog brought to their surgery. They may also suspect a UTI after seeing the results of a recent blood test where the white cell count (WBC) is abnormally high. Incidentally, WBC counts are sometimes misleading – as they are often affected by fluid therapy (both intravenous and/or subcutaneous), which often cause the WBC to fall within normal limits or into the abnormally low zone, even when there is an infection present. It is dangerous for vets to assume there is no evidence of UTI purely due to a normal WBC level.

A very useful and informative multi-discipline symposium report on the guidelines for treating UTIs by Veterinary Medicine International (Volume 2011, Article ID 263768) states:

'Sediment analysis alone is inadequate for diagnosis of UTIs because of problems regarding the variable quality of interpretation, stain contamination, and false-positive results from bacteriuria in the absence of clinical infection. Hematuria and proteinuria are often present with a UTI, but they are nonspecific and may be caused by noninfectious conditions. The presence of pyuria and bacteriuria does, however, provide supporting evidence of a UTI. Sediment analysis is a useful adjunctive measure to consider in conjunction with clinical signs and culture results ... Complete urinalysis, including urine-specific gravity, urine glucose level determination, and examination of the sediment for crystalluria is considered a minimum database for evaluation of suspected UTI and may be helpful to investigate underlying causes of infection if present.'

Vets often treat the assumed UTI by prescribing a broad-spectrum antibiotic. This approach is likely to work providing the dog is otherwise healthy and the UTI falls within some of the most common bacterial infections. It generally also helps cut costs borne by the owner and purposefully saves some time getting a suspected UTI treated.

Unfortunately, this standard method is not always the best management practice – and it's an approach that may prolong the infection and further harm a dog with kidney disease. Like all medications, the metabolism of antibiotics causes the release of waste by-products. In a healthy dog, these are normally expelled from the body through kidney filtering and urine production, but in dogs with kidney disease,

these by-products slip back into the bloodstream and increase circulating toxins. This is a risk worth taking when properly and effectively treating a UTI, but it becomes an extra and unnecessary health burden when the medication prescribed (i.e. the wrong antibiotic) has no chance of solving the infection.

As stated earlier, dogs with this condition already have an impaired immune system, so their ability to fight any UTI themselves is severely limited. A UTI can quickly run rampant, causing the kidney disease itself to deteriorate and other organs and systems too. If an inappropriate antibiotic is given, it will almost certainly fail to deal with the infection and cause a cascade of further health problems. Assessing the right form of treatment is key to solving the UTI – and that involves specific urine and blood testing (see above and below) **before** prescribing any medication.

Culture and Sensitivity Testing

A Culture and Sensitivity (C&S) urine test helps find the exact type and strain of pathogenic bacteria causing the UTI. Armed with this invaluable information, a vet is then able to choose the most appropriate antibiotic from a list issued in the results, which will treat the infection while minimizing stress on the kidney organs. A C&S test avoids prescribing the wrong broad-spectrum antibiotic and gives the best chance possible for the complete eradication of a UTI by the end of the course.

A C&S urine test is fundamental when a dog with kidney disease has a suspected UTI.

The C&S needs repeating one week after the end of the antibiotic treatment to confirm the UTI has been completely cleared. If traces of the infection persist at the end of the antibiotic course, treatment will need extending. Sometimes the response to treatment is slower in dogs with kidney failure because the standard recommended antibiotic dose often needs reducing to prevent excessive and harmful waste by-product toxins overloading the system. This is also the reason the standard recommended length of treatment should always be extended (usually from 7-14 days to a 21-28 day course as a minimum). The Veterinary Medicine International symposium recommends a minimum of 4 weeks in the case of repeated infections occurring within 6 months – and that the antibiotic chosen is better being different and more rigorous to the earlier course of treatment. Experts suggest an initial treatment course of 4-6 weeks is usually required in the case of upper urinary tract infections.

Diagnosing and Treating Leptospira Interrogans

Testing for Leptospira Interrogans at the same time as undertaking a C&S test is highly recommended because missing this potential cause of a UTI is potentially fatal. Blood testing might show high levels of bilirubin and other pertinent abnormal blood readings, which are early signs of a possible Leptospira infection – but this is

not always the case, so chemical panel testing cannot be used as a diagnostic signal on its own.

The diagnosis of a leptospirosis infection is occasionally complicated and challenging because testing has proved expensive, prolonged, and uncertain until recent times. The Canine *Leptospira* spp. Antibody by ELISA from IDEXX Reference Laboratories provides fast results at a lower cost to help veterinarians in diagnosing this potentially life-threatening infection. Called the SNAP test, results are available instantly, which means the right treatment can also usually begin straight away. Vets that do not have access to rapid SNAP testing are likely to rely on what some consider as superior MAT serological testing, and they may use this approach as a back-up to the SNAP test in any event. Others suggest both MAT and the DNA-PCR test in combination are far more conclusive. These rely on detecting antibodies against *Leptospira* in a dog's blood and the DNA of *Leptospira* in whole blood or urine. Neither is useful when a dog is already on a course of antibiotics, as false-negative results are likely to occur.

Leptospira is known as a zoonotic disease, which means that it can transfer from dogs to people. It is increasing in frequency in companion animals and is becoming more prevalent in the human population, so testing for it and vaccinating against it is a priority.

Is Cranberry Juice an Effective Treatment of UTIs?

It has long been recognized that taking cranberry juice has some minor benefit in helping prevent some UTIs in humans, although its actual effects are sporadic and unpredictable probably due to the variance in supplement quality and potency. It is also relevant to mention that it has no *treatment* value whatsoever – as it cannot treat an existing UTI, but may help prevent one from starting. The Veterinary Medicine International symposium working group concluded that unfortunately there is no evidence that the same effect occurs in dogs, which means cranberry juice probably has no meaningful benefit to dogs with kidney disease and recurrent UTIs.

However, other notable studies contradict this conclusion. Urine collected from female dogs treated for 30 days with cranberry extract showed a 30% decreased adherence of *E. coli* using cell cultures (Smee JVIM 2011). Cranberry juice's ability to prevent or slow-down *E. coli* adhesion to urinary tract tissues was tested using the urine of dogs and proven effective within three hours following treatment, with the peak effect reached by the 7-day stage (Howell JVIM 2010).

There remains some debate about whether cranberry juice has any real significance in helping prevent some forms of bacterial UTIs in dogs. Although even if it does help, it seems very limited in the strains of bacteria it protects against.

Collecting Urine Samples

Many will suggest catching your suspected UTI dog's urine in a suitable container yourself and then taking it to the vet for analysis. While there are obvious advantages to this (cost, time, and convenience among them), it is not always a wise approach. Bear in mind that the point of the test is to look for bacteria in the urine – and there will be a high risk you and/or your dog will have already contaminated the specimen long before it arrives at the vet's office. Furthermore, the urine specimen must be usually tested within 1 to 2 hours of collection (always place in the refrigerator if the vet appointment is not straight away) – so just getting to the vet's office may invalidate the test if timings don't coincide.

With persistent UTI's the better method of collection is by cystocentesis, where the vet inserts a needle directly into the bladder avoiding any likely contamination.

When using the "free catch" or "free-flow" sample collection method yourself, cleanliness handling the container as well as the sterile quality of the container itself is paramount. It is important to collect a mid-flow specimen and the best kind of sample is from a dog's first urination of the day when it's at its most concentrated.

Treatment of UTIs

While C&S and other tests will help decide the best form of treatment for a UTI, there is a reliance on the skill, knowledge, and experience of a good vet to find the best compromise in the case of dogs with kidney disease. Finding the right antibacterial or antibiotic is one thing, but a vet needs to balance the likely damage caused while a particular drug is being metabolized (releasing by-product toxins). The method of clearance of these by-products from the body is another important consideration. Some antibiotics activate and metabolize more through the liver, which can help relieve the otherwise resulting accumulative stress caused to the already compromised kidney organs.

Once there is confirmation of a successfully treated UTI, the recommendation is to have monthly C&S tests for 6 months to make sure complete eradication of the infection. This is particularly important for those dogs with persistent and recurrent UTIs.

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