

Urinary Tract Infection

The urinary tract consists of the kidneys, ureters (tubes that carry urine to the bladder for storage), the urinary bladder, and the urethra that conducts urine outside the body. A urinary tract infection could involve any of these areas though most commonly when we speak of a urinary tract infection, or UTI, we mean "bladder infection." Because bladder infections are localized to the bladder, there are rarely signs of infection in other body systems: no fever, no appetite loss, and no change in the blood tests. If the infection ascends all the way to the kidneys, then we do tend to find other signs and other lab work changes. While a kidney infection is technically also a urinary tract infection, we usually use the term pyelonephritis to describe a kidney infection (see the section on "Not So Simple Infections" below).

It is also important to note that the term UTI is frequently erroneously used to refer to [feline idiopathic cystitis](#), which is a common inflammatory condition of the feline bladder affecting young adult cats. It is not a bladder infection.

Bladder Infection

The kidneys make urine every moment of the day. The urine is moved down the ureters and into the bladder. The urinary bladder is a muscular little bag that stores the urine until we are ready to get rid of it. The bladder must be able to expand for filling, contract down for emptying, and respond to voluntary control.

The bladder is a sterile area of the body, which means that bacteria do not normally reside there. When bacteria (or any other organisms for that matter) gain entry and establish growth in the bladder, infection has occurred and symptoms can result. People with bladder infections typically report a burning sensation during urination. With pets we see some of the following signs:

- Excessive water consumption.
- Urinating only small amounts at a time.
- Urinating frequently and in multiple spots.
- Inability to hold urine the normal amount of time/apparent incontinence.
- Bloody urine (though an infection must either involve a special organism, a bladder stone, a bladder tumor, or be particularly severe to make urine red to the naked eye).
- Sometimes there are no symptoms at all so it is important to periodically screen patients at risk (such as elderly patients and patients that use cortisone-type medications long term).

The external genital area where urine is expelled is teeming with bacteria. Bladder infection results when bacteria from the lower tract climb into the bladder, defeating the natural defense mechanisms of the system (forward urine flow, the bladder lining, inhospitable urine chemicals etc.). A bladder infection is not contagious.

- *Bladder infection is somewhat unusual in cats under age 10 years.*
- *Bladder infection is somewhat unusual in neutered male dogs.*

Testing for Bladder Infections

There are many tests that can be performed on a urine sample and people can get confused about what information different tests provide.

Urine Culture (and Sensitivity)

This is the only test that can confirm a urinary tract infection. In this test, the urine is spun rapidly in a centrifuge to separate out the solids from the liquid. The solid part, called the sediment, is transferred to a specialized container and incubated for bacterial growth.

If bacteria grow, then infection is confirmed; further, a positive culture done by a reference laboratory is usually followed by additional important information: an estimate of the concentration of bacteria, the identification of the bacteria, and the antibiotic sensitivity profile. Knowing the concentration of bacteria in the sample helps determine if the bacteria cultured might represent contaminants from the lower urinary tract or bacteria that are transient and not truly colonizing the bladder. Similarly, knowing the species of bacteria also helps determine if the bacteria grown are known to cause disease or likely to be innocent bystanders. The antibiotic profile tells us what antibiotics will work against the infection. There is, after all, no point in prescribing the wrong antibiotic. Clearly, the culture is a valuable test when infection is suspected.

Urine culture results require at least a couple of days as bacteria require this long to grow.

Urinalysis

The urinalysis is an important part of any database of laboratory tests. It is an important screening tool whether or not an infection is suspected. The urinalysis examines chemical properties of the urine sample such as the pH, specific gravity (a measure of concentration), and amount of protein or other biochemicals. It also includes a visual inspection of the urine sediment to look for crystals, cells, or

bacteria. This test often precedes the culture or lets the doctor know that a culture is in order.

Indications that a culture of a urine sample should be done based on urinalysis findings include:

- Excessive white blood cells (white blood cells fight infection and should not be in a normal urine sample except as an occasional finding).
- Bacteria seen when the sediment is checked under the microscope.
- Excessive protein in the urine (protein is generally conserved by the urinary tract. Urine protein indicates either inflammation in the bladder or protein-wasting by the kidneys. Infection must be ruled out before pursuing renal protein loss.)
- Dilute urine. When the patient drinks water excessively, urine becomes dilute and it becomes impossible to detect bacteria or white blood cells so a culture must be performed to determine if there are any organisms. Further, excessive water consumption is a common symptom of bladder infection and should be pursued.
- If the patient has symptoms suggestive of an infection, a urinalysis need not precede the culture; both tests can be started at the same time.

Sample Collection

There are four ways to collect a urine sample: table top, free catch, catheter, and cystocentesis. A table top sample is collected from the exam table or other surface where the patient has deposited urine. This sample is likely contaminated with bacteria from the environment and/or bacteria from the lower urinary tract. This is the least desirable urine collection method but sometimes it's the only option. If bacteria are grown, their numbers and species provide a strong clue as to whether or not they represent infection or contamination.

A free catch sample is obtained by catching urine mid-air as it is passed. The sample may be contaminated by the bacteria of the lower urinary tract but will not be contaminated by the floor or other environmental surface.

With the catheter method a small tube is passed into the bladder and the sample is withdrawn. This is not the most comfortable method for the patient though the procedure is fairly quick. Potentially, bacteria can be introduced into the bladder accidentally with the catheter so this represents a drawback though fortunately, this is a rare occurrence (assuming the catheter is only for urine sample collection and not placed for longer term urine collection). The sample obtained is unlikely to be contaminated and should represent urine as it exists in the bladder.

The ideal collection method is cystocentesis: a needle tap directly into the bladder. In this way, an uncontaminated sample is collected directly from the bladder. Sometimes a little blood enters the sample during the needle stick but for culture purposes, the sample can be considered pristine.

Treatment for Simple Infection

A simple bladder infection is usually easily treated with 10 to 14 days of antibiotics. The patient's symptoms usually resolve quickly, within the first 2 days of treatment, though the entire course of treatment should be given. Inadequate treatment leads to infection recurrence and possibly future bacterial resistance.

Ideally, approximately 5 days after the last antibiotic dose, a new sample is cultured to be sure the infection is gone. If the infection has not cleared or if a new infection has developed, there is usually a reason why.

Not so Simple Infections

There are several situations concerning urinary tract infections.

Kidney Infection (Pyelonephritis)

If the patient's immune system is not ideal, the infection in the bladder may ascend into the kidneys where it can cause kidney failure and a more serious infection. There is currently no good test to determine whether or not a kidney is infected though there might be hints on the lab work (urinary tract infection in combination with fever, elevated white blood cell count, pain in the area of the kidneys). Ultrasound can help and there are specific radiographic studies that can help as well. If infection in the kidney is suspected, the length of the antibiotic course increases to 4 to 6 weeks.

Bladder Stones

Stones in the bladder can cause infection and infection can cause stones. We have an area on [bladder stones](#) for more information.

Urachal Diverticulum

In embryonic life, urine is removed from the body via the umbilical cord. A structure called the urachus exits the top of the bladder and enters the umbilical cord so that urine can be dumped into the mother's bloodstream for removal by her kidneys. After birth, the urachus degenerates but sometimes a small nipple-like protrusion exists on the top of the bladder. This section can protect a

bladder infection in which case recheck cultures will reveal the same organism over and over until the urachal diverticulum is surgically removed.

Bladder Tumors

Bladder tumors, with or without infection, often create symptoms similar to those of a severe bladder infection. The tip off to look for a tumor is that infection and/or symptoms do not clear up with an appropriate antibiotic course, urine is bloody, and there are no bladder stones on radiographs. The most common bladder tumor is the [transitional cell carcinoma](#). (Our article on this topic includes more information on how to detect this tumor; often ultrasound is needed to image the inside of the urinary bladder.)

Prostatitis

An unneutered male dog has a special risk: prostate infection. The prostate gland is located at the neck of the bladder and, due to its glandular nature, infection in the bladder readily spreads to the prostate where the crypts and crannies are particularly protective to the infection. It is nearly impossible to clear the prostate of the infection without neutering.

Vaginal Stricture

Sometimes when an infection simply cannot seem to be cleared up, the reason is a vaginal stricture. A vaginal stricture is a small narrowing in the vagina that creates a ledge for bacteria to colonize. If a female dog's UTI seems stubborn against antibiotics that the culture indicates should be effective, a vaginal exam may be warranted. A stricture can generally be broken down by the veterinarian's finger though some dogs find this painful and sedation may be needed.

Most urinary tract infections are straightforward and require only a relatively short antibiotic course for clearance. If you have additional questions, do not hesitate to use the Ask A Vet feature on the home page of Veterinary Partner.