

Bacteria in Urine

Urine in the healthy bladder is normally free of bacteria. However, bacteria from the rectal area may enter the urinary tract through the urethra and travel the short distance to the bladder. While normally the bladder cleanses itself of bacteria, if for some reason it cannot, the bacteria may cause an infection. About 80 percent to 90 percent of urinary tract infections are caused by *Escherichia coli* (*E. coli*) bacteria, which are normally present in the rectum. A urinary tract infection can be a variety of conditions, including cystitis (infection of the bladder) and urethritis (infection of the urethra). Other conditions such as vaginitis and irritable bladder (similar to irritable bowel disorder) may produce similar symptoms.

Symptoms

An infection of the urinary tract commonly has the following symptoms:

- Frequent and urgent need to urinate
- Painful urination
- Cloudy urine
- Lower back or abdominal pain
- Blood in the urine

If you have these symptoms for more than 24 hours, you should see your doctor. Fever, chills, nausea and vomiting, and pain in the mid-back may indicate a kidney infection. If you have these symptoms, you should seek immediate medical treatment.

Causes

Women are eight times more likely to get a UTI than men. Part of the problem may be that bacteria have a much shorter distance to travel in women. The female urethra, leading from the outside of the body to the bladder, is roughly one and a half inches long. In

contrast, the male urethra is roughly eight inches in length. Another contributing factor is the female urethra's location. As it is so close to the vagina and the anus, it is much easier for bacteria to enter the urethra and work its way up into the bladder.

While children may get UTIs, most sufferers are adult women. Approximately 25 percent of women are estimated to have had at least one urinary tract infection in their lifetime. Many will have several. Infections are frequently related to sexual activity. They also may occur during pregnancy because of hormone fluctuations and increased pressure on the bladder. If left untreated, the infection can harm the fetus. The occurrence of UTIs also can increase after menopause when breakdown in vaginal tissues begins to occur due to a decrease in estrogen levels.

Some factors that may contribute to urinary tract infections are:

- Sexual activity: Sexual intercourse may facilitate the transfer of bacteria from the anal-vaginal area to the urethra and thus to the bladder. It may also irritate tissues, making them more susceptible to infection.
- Birth control methods: If your diaphragm is not fitted properly, it may place pressure on the bladder and thus increase your chances of infection. The chemicals in spermicides may irritate vaginal tissues and make them more susceptible to infection.
- Low water intake: If your water intake is low, you will urinate less frequently. Bacteria that enter the bladder have more time to multiply and to take hold, causing an infection.
- Anatomical problem: A small percentage of women may have some kind of anatomical problem that would predispose them to UTIs. Your doctor will be able to determine from your medical history, a physical exam, and simple tests whether this is the cause of your infections.

Preventing UTIs

There is no proven way to prevent UTIs, but you may find some of the following suggestions helpful:

- Drink plenty of liquids to flush bacteria out of your system.
- Wipe from the vagina to the anus after urinating to avoid spreading bacteria.
- Schedule frequent bathroom breaks.
- Drink water before and after sex so that you will urinate a good volume with a steady stream afterward. This will help eliminate any bacteria that may have entered.
- Consider checking the fit of your diaphragm or using another method of birth control. If you continue to use a diaphragm, leave it in no longer than necessary for contraception.
- Avoid tight clothing and pantyhose. They may irritate tissues, trap heat and promote bacterial growth.
- Wear cotton underwear. Cotton is less irritating and provides more ventilation than nylon.

Treatment

The first step is to confirm a bacterial infection by reviewing your symptoms and testing your urine. It is important to have the infection diagnosed by a urine culture, as several other conditions, such as a vaginal infection, gonorrhea, chlamydia, irritable bladder, and bladder cancer, have similar symptoms. When pain is the predominant symptom, your doctor may consider a diagnosis of interstitial cystitis.

If a culture shows that there are bacteria in your urine, your doctor will prescribe a course of antibiotics that should take care of the problem.

Several different antibiotics are used to treat uncomplicated infections. You may be given a regimen of one to three days if this is your first infection. Taking antibiotics for seven to 10 days also is customary for recurrent infections. It is important to continue taking

the medication until it is finished, even though your symptoms may be gone after a few days. Your doctor also may prescribe a urinary analgesic, such as phenazopyridine, for the pain.

There are several other steps you can take to make yourself more comfortable:

- Drink large amounts of water. It will help flush the bacteria out of your system (about 8 ounces an hour).
- Put one teaspoon of baking soda in one-half cup of water once or twice a day.
- Avoid caffeine, acid foods, spices, citrus fruits, tomatoes, alcohol, and chocolate. You may find these things increase your discomfort.
- Drink cranberry juice cocktail. A study conducted on older women published in the Journal of the American Medical Association suggests that drinking cranberry juice cocktail may reduce the amount of bacteria in your urine.

Try hot water bottles or heating pads. They may ease your cramps and soothe the pain.

What is asymptomatic bacteriuria?

Asymptomatic bacteriuria is a condition in which bacteria are in your urine, but you have no symptoms of infection.

How does it occur?

Urine is normally sterile, which means that it contains no bacteria. A small number of bacteria may be found in the urine of many healthy people. This is usually considered to be harmless. However, a certain level of bacteria can mean that the bladder, urethra, or kidneys are infected.

Anything that blocks the flow of urine or prevents the bladder from emptying completely can cause bacteria to grow in the urine. For

example, a stone or tumor might block the flow of urine. Prostate enlargement in men might also cause such a block.

This problem occurs more often in women than men because a woman's urethra is shorter. (The urethra is the tube that empties the bladder.) The short urethra makes it easier for bacteria from the anus or genital area to reach the bladder. This can happen during such activities as wiping or sexual intercourse. Most infections of the urinary tract are caused this way. Bacteria can also enter the urine through the bloodstream, but this is rare.

If you are healthy, asymptomatic bacteriuria is usually not a problem and usually does not require treatment. However, in some cases it is more likely to lead to a kidney infection; for example, if you are pregnant or have diabetes.

What are the symptoms?

Asymptomatic bacteriuria has no obvious symptoms.

How is it diagnosed?

Urine samples will be tested for bacteria. You may also have some blood tests.

If you have bacteria in your urine you may have:

- more blood tests
- a special x-ray of the kidneys called an intravenous pyelogram (IVP)
- an ultrasound scan.

The IVP and ultrasound scan can show problems in the urinary tract.

How is it treated?

Your health care provider may or may not prescribe an antibiotic. If you are healthy and do not have any underlying problems, you will

probably not be prescribed an antibiotic. If, however, you have a medical condition that puts you at a higher risk of developing a kidney infection from asymptomatic bacteriuria, you will be prescribed an antibiotic. These high-risk conditions are:

- pregnancy (asymptomatic bacteriuria may also cause you to go into labor too early)
- diabetes
- kidney stones
- kidney transplant
- advanced age.

You may need to return to your provider's office after you have taken all of the antibiotic to have your urine tested again. Your provider may recommend testing your urine regularly to see if the problem happens again.

In some cases, regular urine testing rather than antibiotic treatment may be the best course. Your provider will determine what treatment is best for you.

How long will the effects last?

Asymptomatic bacteriuria usually clears up after treatment with antibiotics. However, it can come back.

If this problem is not treated, it could become a full-blown urinary tract infection. If the infection is not then treated with antibiotics, the kidneys could be damaged.

How can I take care of myself?

- If you were prescribed an antibiotic, take all of it as prescribed, even if you have no symptoms. Do not take medicine left over from previous infections.
- Drink plenty of water each day to cleanse the bladder and urinary tract.

- Follow your health care provider's recommendation for follow-up urine testing to check for recurrence.

What can be done to help prevent asymptomatic bacteriuria?

Women can take the following steps to help prevent a bladder infection from recurring:

- Drink plenty of fluids.
- Urinate regularly during the day. Empty your bladder completely each time.
- Keep the vaginal area clean. Wipe from front to back after a bowel movement.
- Urinate before and after intercourse.
- Wear cotton underwear, which allows better air circulation than nylon. Wear pantyhose that have a cotton crotch.
- Avoid tight clothes in the genital area, such as control-top pantyhose and tight jeans. Do not wear a wet bathing suit for long periods of time.

About 15 to 25 percent of women with diabetes mellitus have bacteria in their urine without having symptoms of a urinary tract infection as frequency or dysuria (asymptomatic bacteriuria). It is known that women who have asymptomatic bacteriuria (ASB) do not necessarily have an increased risk for a faster decline in renal function.

It was reported that women with diabetes type 1 (diabetes of the “youth”) and ASB showed a tendency to a faster decline in renal function than women without ASB after 18 months, but this difference was small and not statistically significant. What are the long-term consequences of ASB on renal function in diabetic women? Chronic kidney disease is an increasing public health problem. Diabetes is one of the main causes of kidney disease and end-stage renal failure, in the United States it is the primary diagnosis in 44% of the cases. Vascular complications are the most common

cause of diabetic nephropathy, but it is possible that urinary tract infections also contribute to renal insufficiency in diabetic patients. Bacteria, especially *Escherichia coli*, can damage renal cells. Since women with diabetes mellitus are more susceptible for both urinary tract infections and for renal insufficiency, it was important to know whether diabetic women who have bacteria in their bladder have an increased risk for a faster decline in renal function than women with sterile urine, especially because most women have no symptoms of this infection and do not visit a doctor for it. 17% of women who had bacteria in their urine do not have symptoms of a urinary tract infection. In the multivariate analysis, in which other variables were included that can influence the presence of bacteria in urine, namely age, length of follow-up, duration of diabetes, and microalbuminuria (low concentration of protein in urine), no association was found between ASB and the relative or the absolute decrease in renal function. It was concluded that women with diabetes (type 1 or type 2) with bacteria in their urine do not have a higher risk on renal function deterioration. This has clinical significant implications. Before the results of this study were demonstrated, it was not known whether these bacteria could harm the patient, and could lead to damage of the kidneys. The problem is that renal function decline can develop while the patient is not aware of it. It is only when the patient has end-stage renal failure (when it is already too late to prevent it), will he/she visit a doctor.

Urine breeds bacteria

Yeast infections are caused by the *Candida* species of fungi. Some members of this species are normally found among the native bacterial colonies in the mouth, gastrointestinal tract, and vagina. The native bacteria and immune system prevent overgrowth of these bacteria. However, *Candida* may grow excessively in individuals whose immune systems are compromised, such as AIDS or diabetes patients. Some conditions that result from *Candida* overgrowth are thrush, a mouth infection; esophagitis, spreading of mouth fungus to

the esophagus; skin infections; vaginal yeast infections, or deep candidiasis, where fungi contaminate the bloodstream.

Over a lifetime, 75 percent of women are likely to have had at least one vaginal *Candida* infection. Pregnancy or diabetes may put a woman at higher risk of a vaginal yeast infection. Normally, a short treatment with antifungal medication can eliminate the yeast infection in cases where the infection has not spread to the bloodstream or the individual's immune system is strong.

The low presence of niacin, a water-soluble vitamin that is part of the vitamin B complex, helps yeast stick to the urinary tract. Niacin, also known as nicotinic acid, is normally found in low levels in urine. Yeast in the *Candida glabrata* family, which cause blood and mucosal tissue infection, produce a family of proteins known as sirtuins in the presence of niacin. *C.glabrata* cannot make niacin, so it has be imported from the environment. Sirtuin blocks the expression of adhesion proteins, which are translated from EPA genes. The sirtuin family proteins attach near the tips of chromosomes, obstructing nearby genes. EPA genes are found near the ends of chromosomes, so sirtuin expression blocks the production of adhesion proteins. Yeast without sirtuin genes exhibited higher levels of adhesion to mucosal tissue.

The present study shows that normally silenced EPA genes are expressed in cases of murine urinary tract infection. Yeast in the urinary tract have a limited amount of NAD⁺, which is derived from nicotinic acid. Low levels of NAD⁺ prevent the activation of mechanisms that turn on sirtuin expression. Low sirtuin levels allow EPA genes for adhesion molecules to be expressed.

According to Dr. Cormack, "this particular yeast has in some sense committed to living with the human host and so it takes advantage of us to provide certain key nutrients."

These *C.glabrata* become drug resistant when EPA genes are turned on, so drug resistance would indicate the expression of EPA genes.

In the study, drug resistance did not develop in blood; this indicates that low niacin in the urine, compared to high niacin in the blood, creates a more favorable environment for yeast to expression adhesion proteins.

C.glabrata is the common culprit in cases of infection in patients with urinary catheters. Dr. Cormack warns, "It is not know whether niacin supplements might help prevent these catheter infections, or whether the plastic could be treated somehow to reduce the organism's ability to bind to it. But there can be significant liver toxicity associated with niacin supplements, so the question would have to be studied very carefully."

Tests are used to diagnose a urinary tract infection (UTI).

A urine culture may be ordered when symptoms indicate the possibility of a urinary tract infection, such as pain and burning when urinating and frequent urge to urinate. Antibiotic therapy may be prescribed without requiring a urine culture for symptomatic young women, who have an uncomplicated lower urinary tract infection. If there is suspicion of a complicated infection, or symptoms do not respond to initial therapy, then a culture of the urine is recommended. Pregnant women without any symptoms may be screened for bacteria in their urine, which could affect the health and development of the fetus.

If the skin and genital area were not cleaned well prior to collecting the sample, the urine culture may grow three or more different types of bacteria and is assumed to be contaminated. The culture will be discarded because it cannot be determined if the bacteria originated inside or outside the urinary tract. A contaminated specimen can be avoided by following the directions to carefully clean yourself and by collecting a mid-stream clean catch urine sample.

The reason is because bacteria known as *Eschericia coli* (E. coli) cause the majority of lower urinary tract infections. This organism is usually

susceptible to a variety of antibiotics, such as trimethoprim-sulfamethoxazole, ciprofloxacin, and nitrofurantoin. In most patients with uncomplicated disease, the UTI will be resolved after empiric therapy with one of these antibiotics.

If your infection is not treated, it can move from the lower urinary tract to the upper urinary tract and infect the kidney itself, and possibly, enter the bloodstream, causing septicemia. Symptoms of septicemia include fever, chills, elevated white blood cell count, and fatigue. Your doctor will often use blood cultures to determine if you have septicemia and will prescribe antibiotics accordingly.

There are a wide variety of factors that predispose a person to acquire a UTI. After the neonatal period, the incidence in females is higher than in males due to the anatomical differences in the female genitourinary tract. In infants and young children, congenital abnormalities are associated with UTI. In adults, sexual intercourse, diaphragm use, diabetes, pregnancy, reflux, neurologic dysfunction, renal stones, and tumors all predispose to UTI. In a hospital, nursing home, or home care setting, indwelling catheters and instrumentation of the urinary tract are major contributing factors to acquiring a UTI

What does the test result mean?

The presence of a single type of bacteria growing at high colony counts (greater than 10,000 colony forming units (CFU)/ml) is considered a positive urine culture. A culture that is reported as no growth in 24 or 48 hours or less than 10,000 CFU/ml usually indicates that there is no infection. If the symptoms persist, however, the culture may be repeated to look for the presence of bacteria at lower colony counts (less than 10,000 CFU/ml) or other microorganisms that may cause these symptoms. The presence of white blood cells and low numbers of microorganisms in a symptomatic patient is a condition known as acute urethral syndrome.

If a culture shows growth of several different types of bacteria, then it is likely that the growth is due to contamination. This is especially true if the organisms present include *Lactobacillus* and common nonpathogenic vaginal bacteria in women. If the symptoms persist, the doctor may request a repeat culture on a sample that is more carefully collected.

The presence of a significant amount of a single type of bacteria usually indicates an infection. Susceptibility testing is performed to guide antimicrobial treatment. Any bacterial infection may be serious and can spread to other areas of the body if not treated. Since pain is often the first indicator of an infection, prompt treatment, usually with antibiotics, will help to alleviate the pain.

Females get UTIs more often than males. Even school-age females may have frequent UTIs. For males with a culture-proven UTI, the doctor may order further tests to rule out the presence of a kidney stone or structural abnormality that could cause the infection.

If there is recurrent urinary tract infections, culture and susceptibility testing may be performed with each episode. For patients who have frequent UTIs, their bacteria may become resistant to antibiotics over time, making careful selection of antibiotic (and the full course of treatment) essential. Those with kidney disease and/or with diseases that affect the kidneys, such as diabetes and those with compromised immune systems may be more prone to recurring UTIs.