

Urinary Tract Infection

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According to the *Journal of the American Medical Association (JAMA)*, urinary tract infections (UTIs) account for more than 11 million physician visits annually in the United States (Howell et al. 2002). UTIs may be caused by bacteria, viruses (herpes simplex Type 2), fungi (*Candida*), and a variety of parasites (worms, protozoa). Unfortunately, UTIs have become increasingly resistant to first-line antibiotic therapy. There are two types of UTIs: lower and upper.

Lower UTIs occur in the urethra or bladder and are more common in women than in men (because the female urethra is much shorter and provides less of a barrier to bacterial invasion), with as many as one third of all women experiencing a UTI in their lifetime (Valiquette 2001). Urine that is in the bladder should be sterile. In healthy adults, however, the large bowel is not sterile and bacteria coming from normal intestinal flora can pass into the bladder. When large-bowel bacteria colonize the bladder, the result is cystitis or a bladder infection.

Cystitis or infection of the bladder are common examples of a lower UTI. Although rare in young men, cystitis can occur in men as a result of urethral obstruction from a prior infection of a sexually transmitted disease or from a congenital defect of the urethra requiring surgical correction.

Upper UTIs are infections that involve kidneys (pyelonephritis), ureters (ureteritis), or both. Upper UTIs can occur in both men and women as a complication of a lower UTI. Upper UTIs can also arise without lower urinary tract involvement. The latter may occur in younger women or men as a result of an obstruction somewhere in the urinary tract. Examples are a kidney stone or abdominal tumor which obstructs the ureter. Symptoms of an upper UTI include fever, chills, lower back pain, nausea, and vomiting. The most common organism causing the infection is a bacteria named *Escherichia coli*.

Although men are not generally prone to lower UTIs, they can develop upper UTIs as they become older because they cannot fully empty their bladders as a result of prostatic enlargement. Urine cannot remain sterile when it stays in the bladder for long periods of time. In elderly men, this evolves into full-blown urinary retention, a condition in which a liter or more of urine may have to be drained via a catheter. Urinary retention is potentially very serious and can result in urosepsis, a condition in which overwhelming disseminated infection invades the bloodstream. Urosepsis can be fatal.

One of the more common predisposing factors for UTIs is diabetes mellitus: spillage of glucose into the urine as well as other factors provide a good culture medium for bacteria (Patterson et al. 1997). Other causes include improper bladder emptying from neurological diseases such as paraplegia; valve leakage between the ureter and the bladder; and indwelling urinary catheters that are left unchanged for too long a period of time. The underlying cause of any UTI must be properly diagnosed and promptly treated.

BACTERIAL UTIS AND INTERSTITIAL CYSTITIS

- Bacterial UTIs
- Interstitial Cystitis

Bacterial UTIs

In women of reproductive age, *bacterial* infections are the most common type of infection occurring in the bladder. Often this is the result of a bruised urethra resulting from intercourse, although the exact mechanism is not entirely clear. However, we now know that condoms may be a contributing factor to the high incidence of UTIs in reproductive age groups. In a study in *Epidemiology*, researchers at the University of California-Berkeley conducted a nested case control study among a cohort of 519 women aged 15-29 years and found that male condom use was associated with increased UTI risk, with the largest risk being associated with exclusive condom use and use of Nonoxynol-9-coated condoms (Handley et al. 2002). Symptoms of cystitis include a frequent, urgent desire to urinate, burning pain with urination, and often pain above the pelvic bone and in the lower back. Urine may be cloudy and contain visible blood. What is most significant is that many women have recurrent bouts of cystitis, but no underlying

cause, including sexual intercourse (recurrent cystitis is found in nuns), can be found. The infection is clearly caused by bacteria, but the reason for recurrence remains unclear.

Interstitial Cystitis

As noted earlier, cystitis is caused by an infectious organism. This distinguishes cystitis from another disease called *interstitial cystitis*. Interstitial cystitis is also more common in women than in men. A person who has interstitial cystitis can usually tell you the exact moment the symptoms began. Often interstitial cystitis is characterized by severe suprapubic pain which is relieved by urinating. However, time after time, when patients go to a physician, *bacteria do not grow in a culture of their urine*.

Unfortunately, interstitial cystitis is not widely recognized by many primary care physicians. As a result, the average time until diagnosis is 7 years! The pain associated with interstitial cystitis is said to rival that of cancer. Eventually, the diagnosis is made when a urologist finally decides to perform cystoscopy and look in the bladder. The appearance of the bladder may be totally normal. However, when the urologist attempts to fill the bladder with water, he finds that the bladder capacity is markedly diminished. Additionally, when the water is released, the bladder wall oozes blood in a manner causing a characteristic appearance called glomeration. If a biopsy is taken, mast cells, not normally present in the bladder, are seen. Mast cells are a diagnostic finding.

In a worst-case scenario, the condition progresses with ever-increasing replacement of normal bladder tissue with fibrosis or scar tissue. The bladder capacity lessens. Persons with interstitial cystitis can go few places and cannot maintain employment because they must urinate constantly. They cannot sleep at night because they must continually get up to urinate. Some patients require replacement of the bladder dome with part of their own colon to increase bladder capacity. Other patients require removal of the bladder and creation of a urinary diversion to an exterior bag (urostomy).

Interstitial cystitis has no known cure. Treatment has consisted of bladder installations of DMSO (di-methylsulfoxide) and other agents; hydrostatic dilatation of the bladder under pressure; and use of a drug called Elmiron which is effective in 30% of cases. Changes in diet may also be helpful. Relief of symptoms is variable. Presently, there are some who think there is an agent responsible for interstitial cystitis that has not yet been identified. Research trials, including trials with antibiotics, are presently being conducted.

WHAT CAUSES A UTI?

Escherichia coli (*E. coli*), a bacterium normally found in the digestive tract and present on the skin around the rectal area, is the organism most often responsible for UTIs. Other bacteria can also be involved, but *E. coli* is by far the most prevalent cause of UTIs (over 80%).

Structure of the female anatomy predisposes women to infection because the urethral opening is located very close to the anus, which is a common source of bacteria. Therefore, bacteria can easily migrate across the perineum (the narrow band of flesh between the anus and the vagina) to the urethra. Bacterial invasion can result in *acute cystitis*, the most common type of UTI. A more rare condition is *urethritis*, a condition in which only the urethra is inflamed. When bacteria from the bladder ascend to the kidneys via the ureters, they can cause a more serious infection called *pyelonephritis*. Although men do get UTIs, the structure of their physical anatomy makes infection less likely. The male urethra is much longer, and secretions from the prostate gland provide a better barrier against this type of infection.

URINARY TRACT INFECTION PREVENTION

Because UTIs can be the result of more serious medical conditions, it is important to seek prompt medical advice for proper diagnosis and treatment. Most UTIs are painful and bothersome, but usually they can be successfully treated with antibiotics. A list of the antibiotics that are specific for treating UTIs would be lengthy. Just a few of the commonly used drugs are Bactrim, Ceclor, Cefitin, Cipro, Keflex, Macrochantin, and Septra. All drugs for UTIs require a prescription from a physician. Besides the use of prescription drugs, there are certain steps that persons with chronic UTIs can take to lower the likelihood of recurrence:

- Avoid caffeine, alcohol, and spicy foods that can further irritate the bladder.
- Use several capsules of a probiotic (*Lactobacillus acidophilus*) regularly.
- Drink 8-10 glasses of water or other fluids each day to dilute bacteria in the urine.
- Eat plain yogurt to help control development of a yeast infection after taking antibiotics for a UTI.
- Cleanse well with soap and water before and after sexual activity. Your partner should do the same.
- Take showers instead of baths.
- Wear cotton underwear and loose-fitting clothes.

- For women: if using a diaphragm, clean thoroughly, rinse, and carefully dry the diaphragm after each use. After using the toilet, always wipe from front to back.

ALTERNATIVE TREATMENTS FOR RECURRENT URINARY TRACT INFECTIONS

- Cranberry Juice
- Cranberries Under the Microscope
- Probiotics
- Acupuncture

Cranberry Juice

Cranberry juice can be an effective deterrent to the recurrence of simple UTIs (Schmidt et al. 1988). Cranberry juice has developed into a popular nondrug means to reduce or treat UTIs. Studies document that drinking eight 8-ounce glasses of cranberry juice twice a day (or a total of 16 glasses daily), may eradicate most simple UTIs. As long as cranberry juice consumption is continued the infections are not likely to return. One way that cranberry juice works is to prevent bacteria from adhering to the linings of the urinary tract. Studies suggest that bacterial infections (bacteriuria) and the associated influx of white blood cells into the urine (pyuria) can be reduced by nearly 50% in elderly women who drink 300 mL of cranberry juice cocktail each day (Fleet 1994).

In a study in JAMA, researchers at Rutgers University and the University of Michigan assessed whether the consumption of cranberry juice cocktail prevented adhesion of antibiotic-resistant pathogenic *E. coli* to the uroepithelium in 39 women aged 18-39 years with confirmed UTIs (Howell et al. 2002). According to the researchers, after cranberry juice cocktail consumption, the urine prevented adhesion of 31 (80%) of the 39 isolates and 19 (79%) of the 24 antibiotic-resistant isolates in all bioassays, while preconsumption urine failed to prevent adhesion in any of the samples.

According to the study, the anti-adhesion activity was evident in the urine within 2 hours and persisted for up to 10 hours following ingestion of cranberry juice cocktail. In addition, the extracted cranberry juice pro-anthocyanidins inhibited adhesion of all isolates at concentrations ranging from 6-375 mcg/mL, demonstrating potent *in vitro* anti-adhesion activity against antibiotic-resistant strains. According to the researchers, these data suggest that consumption of cranberry juice cocktail may offer protection against both sensitive and resistant strains of P-fimbriated *E. coli* (the initial step in development of UTIs) and support previous findings which have found cranberry juice to be an effective alternative option in the treatment of UTIs (Howell et al. 2002).

In urostomy patients (surgical diversion of urine away from a diseased or defective bladder and through the skin to the outside of the body), problem urinary wall skin conditions are common and may stem from alkaline urine. Cranberry juice appears to acidify urine and have bacteriostatic properties. Thus, cranberry juice is widely recommended for the reduction of UTIs. A study showed that drinking cranberry juice could help to prevent and improve skin complications for urostomy patients. The study also showed that in patients with severe urinary wall disease, cranberry juice resulted in improvements of skin conditions and a reduction in skin complications (Tsukada et al. 1994).

Most people will find it difficult to drink sixteen 8-ounce glasses of cranberry juice a day. Fortunately, there are dietary supplements that will provide the equivalent of eight to sixteen 8-ounce glasses of cranberry juice in just one capsule. A major advantage of using cranberry juice concentrate supplements is that cranberry juice is high in sugar. If a person were to consume 8-16 glasses of cranberry juice each day, the high fructose intake would induce weight gain and possibly create other serious health problems. (*Refer to the Obesity protocol for information about the dangers of chronic consumption of large amounts of sugars.*)

Cranberries Under the Microscope

In work undertaken separately and in parallel in both the United States and Israel, studies have now established that:

- Adherence of bacteria to the walls of the urinary tract is an important prerequisite for the colonization of *E. coli*. Bacteria adhere to the cells of the urinary tract using hair-like fimbriae (or pili) that protrude from the surfaces of the bacteria. These fimbriae attach to specific monosaccharide or oligosaccharide receptors on urothelial cells. The fimbriae are designated either Type I (mannose sensitive) or Type P (mannose resistant).
- By adhering to urinary tract cells, *E. coli* can withstand normal body-cleaning mechanisms and overcome nutrient deprivation, leading to infection and toxicity.
- The cranberry factor (juice or supplements) contains a potent factor that affects and disables the cell structure of *E. coli*, thus inhibiting the ability of bacteria to adhere to the wall of the urinary tract.
- The cranberry factor is composed of certain condensed tannins (or proanthocyanidins) which collectively prevent *E. coli* from colonizing in the urinary tract.

In 1994, a landmark study demonstrated that regular use of cranberry juice significantly reduced bacterial growth in the urinary tract, as well as the body's response to infection in the form of white blood cells. This study added impetus to the familiar lore about cranberries and their benefits against UTIs (Avorn et al. 1994).

Self-medication with cranberry juice cocktail is often a common approach to dealing with a UTI, and cranberry juice has frequently been recommended by physicians as an adjunct to antibiotic treatments, but this recommendation could certainly be termed old-fashioned.

It is important to remember that cranberry juice cocktail contains only 27% cranberry juice (the remainder is sweetened water). While cranberry juice cocktail may be somewhat effective against UTIs, drinking large amounts of this super-sweetened product has many drawbacks for a health-conscious society: too much sugar and too many calories. Even pure cranberry juice contains high amounts of body-fat-inducing fructose. This is not a preference of most people. For diabetics, using cranberry juice is an impossible recommendation.

An excellent alternative is using a cranberry supplement. These highly concentrated cranberry capsules have shown efficacy in preventing and facilitating treatment in persons with UTIs.

The ultimate way of treating UTIs is to prevent adherence of bacteria to the urinary wall. The development of a low-cost cranberry extract supplement provides an ideal supplement for persons who are at risk for developing a UTI. The recommended dose of this cranberry extract supplement is just one capsule a day.

Probiotics

Probiotics are various strains of "good" bacteria (*Lactobacillus*, *bifidus*, etc.) that naturally inhabit the colon and vagina. Research shows that the presence and dominance of *Lactobacillus* in the gut and vagina are associated with a reduced risk of UTIs and bacterial vaginosis. Apparently a higher level of "friendly" bacteria in the vagina and the intestines inhibits the colonization of unwanted pathogenic bacteria. Additionally, friendly bacteria such as *acidophilus* and *bifidus* aid the immune system, aid digestion, and synthesize vitamins in the intestine.

The significance of the function of friendly bacteria in UTIs has been reported in several studies (Asahara et al. 2001; Reid 2001, 2002; Reid et al. 2001, 2002; Strus et al. 2002). When several different strains of *Lactobacillus* were used orally and introduced vaginally, there was a reduced risk of UTIs and improvement of normal vaginal flora. It is believed that the mechanism of friendly bacteria is similar to that of cranberries in that it involves antiadhesion factors and it also creates by-products that are lethal to pathogens, possibly modulating immune signaling effects. *Lactobacillus* strains taken from normal vaginal flora have been shown to contain antagonistic activity against a variety of bacteria known to cause infections of the urinary tract and vagina. In mouse model studies of UTIs, researchers introduced specific strains of *Lactobacillus* intraurethally and found that *Lactobacillus* worked as an effective treatment and preventive of UTIs (Asahara et al. 2001).

Acupuncture

In a study from Norway, researchers conducted a 6-month clinical trial to evaluate the effect of acupuncture on 67 women with recurrent cystitis. The trial was divided into three groups: the acupuncture group, a sham-acupuncture group, and an untreated control group. In the 6-month trial period, 85% of subjects in the acupuncture group were free of cystitis, compared with 58% in the sham group and 36% in the control group. The results of the study suggest that acupuncture treatment might be a viable alternative in the prevention of chronic cystitis (Aune et al. 1998).

SUMMARY

To Treat Recurrent UTIs:

1. Obtain a thorough evaluation by a nephrologist or urologist.
2. Take 1 Cran-Max (500-mg) cranberry juice concentrate capsule daily.
3. Use 4-6 capsules of a probiotic containing *acidophilus*, taken orally. Use 1-2 capsules, inserted vaginally.
4. Take 1-2 capsules of proanthocyanidins (grape seed extract).
5. Consider taking magnesium (100 mg), or calcium (1000 mg) 3 or 4 times daily.

To Treat Interstitial Cystitis:

1. Obtain a thorough evaluation by a nephrologist or urologist with experience in interstitial cystitis.
2. For pain management, consider using buprinorphine--a 1-5 mg sublingual troche every 6-8 hours. (*See the protocol on Pain for additional information*).

3. Consider using intravenous vitamin C, 50 grams, administered 3 times a week by a knowledgeable physician.
4. Consider using intravenous DMSO.

DMSO should not be used during pregnancy.

For a physician familiar with orthomolecular medicine, contact the American College for Advancement in Medicine: (800)532-3688.

FOR MORE INFORMATION

Contact the Bladder Health Council, 300 West Pratt Street, Suite 401, Baltimore, MD 21201. For more information about interstitial cystitis, contact the Interstitial Cystitis Association of America, P.O. Box 1553, Madison Square Station, New York, NY 10159.

PRODUCT AVAILABILITY

Cran-Max, Life-Flora (Lactobacillus acidophilus and bifidus), calcium, magnesium, and grapeseed extract may be ordered by calling (800) 544-4440 or by ordering online. Buprinorphine is available as a sublingual troche at Medical Center Pharmacy, (800) 723-PILL.

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