

# What Are the Primary Causes and Potential Complications of Urinary Tract Infections?

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## STORY AT-A-GLANCE

- › About 80% to 90% of the time, UTIs are caused by E. coli bacteria introduced to your urinary tract
- › UTI-causing E. coli may be introduced to your body from the food you eat, namely chicken, as well as pork and beef
- › One study suggested E. coli from food may cause 640,000 UTIs in the U.S. each year, and numbers may be higher in areas near concentrated animal feeding operations (CAFOs)
- › If not effectively treated, UTIs can progress to kidney infections and sepsis; deaths from UTIs increased by 2.4-fold from 1990 to 2019
- › Methylene blue is a highly effective agent against UTIs, as it kills virtually any pathogen in your bladder without disrupting the microbiome the way antibiotics do

Urinary tract infections (UTIs) are one of the most common health conditions globally, with at least half of women affected by one or more UTIs during their lifetime.<sup>1</sup> While UTIs are about 3.6 times more common in women than men, they tend to be more complicated when they occur in men.

Such was the case for U.S. Defense Secretary Lloyd Austin, who was hospitalized for a UTI that developed after he had prostate cancer surgery.<sup>2</sup> While he's expected to make a full recovery, deaths from UTIs increased by 2.4-fold from 1990 to 2019.

Globally, they cause a significant burden to health systems and public health, while reducing quality of life in individuals. In 2019 alone, there were 404.61 million cases of UTI worldwide, along with 236,790 deaths.<sup>3</sup>

## **What Causes Most UTIs?**

About 80% to 90% of the time, UTIs are caused by *E. coli* bacteria,<sup>4</sup> which can be introduced into your urinary tract in a number of ways, such as via your own feces or during sexual intercourse. The urethra, which carries urine out of your body from your bladder, is much shorter in women than in men, which is one reason why women tend to get more UTIs.

“It’s much more difficult for bacteria to work all the way up to the bladder” in men, Marisa Clifton, the director of women’s health for the Brady Urological Institute of the Johns Hopkins University School of Medicine, told *The Washington Post*.<sup>5</sup> But this is just one contributing factor to UTIs.

Risk of UTIs increases with age, particularly after the age of 60.<sup>6</sup> Kidney stones also make UTIs more likely, as does benign prostate enlargement in men, which may cause an inability to completely empty the bladder, increasing infection risk. In women, changes in estrogen levels after menopause may alter bacterial growth, making UTIs more likely.<sup>7</sup>

Another reason why UTIs tend to have such a high recurrence rate in postmenopausal women is because the infection can be caused by several different pathogens. According to research published in the *Journal of Molecular Biology*, data uncovered via urine and bladder biopsies “suggest that diverse bacterial species and the adaptive immune response play important roles” in recurrent UTIs.<sup>8</sup>

In this population, bacteria may form communities deep within the bladder wall, triggering chronic inflammation and making treatment difficult. Exposure to antibiotic-resistant bacteria in hospitals is another driving factor in UTIs. In health care facilities, up to 9.4% of patients may develop healthcare-associated UTIs, which can be deadly.

Among hospitalized patients, UTIs have a mortality rate of 2.3% along with associated annual costs of \$340 million to \$450 million annually in the U.S.<sup>9</sup> While E. coli remains the most common cause of UTIs, including recurrent UTIs, other common UTI pathogens include:<sup>10</sup>

Klebsiella pneumoniae	Staphylococcus spp.
Enterococcus faecalis	Group B Streptococcus
Proteus mirabilis	Pseudomonas aeruginosa

## UTIs May Be a Foodborne Illness Linked to Chicken

E. coli is normally found in the intestinal tract.<sup>11</sup> Problems only arise when these ordinary bacteria are present in high numbers in places where they shouldn't be, like your urinary system. Conventional wisdom has maintained UTIs are primarily caused by a transfer of naturally occurring E. coli via sexual contact with an infected individual and/or the transfer of fecal bacteria from your anus to your urethra by poor personal hygiene.

However, more recent studies have conclusively demonstrated that a majority of UTIs are actually caused by exposure to contaminated chicken.<sup>12</sup> In short, it's likely that UTI-causing E. coli may also be introduced to your body from the food you eat, namely CAFO (concentrated animal feeding operation) chicken, as well as pork and beef.

One study involved 2,460 chicken, pork and turkey samples purchased from large retail stores in Flagstaff, Arizona, nearly 80% of which were found to contain E. coli.<sup>13</sup> The researchers also tested blood and urine samples from people who visited a major medical center in the area, finding E. coli in 72.4% of those diagnosed with a UTI.

In particular, a strain of E. coli known as E. coli ST131 showed up in both the meat samples, particularly poultry, and the human UTI samples. Most of the E. coli in the poultry was a variety known as ST131-H22, which is known to thrive in birds and was also found in the human UTI samples.

“Our results suggest that one ST131 sublineage – ST131-H22 – has become established in poultry populations around the world and that meat may serve as a vehicle for human exposure and infection,” the researchers noted, adding that this E. coli lineage is just one of many that may be transmitted from poultry and other meat sources to people.

A 2020 study also noted that poultry and pork are major reservoirs for so-called extra-intestinal pathogenic E. coli – the strains causing UTIs. To test the theory that eating meat could therefore increase the risk of UTIs, they compared UTI risk in vegetarians to that in meat eaters. Results showed a vegetarian diet was associated with a 16% lower risk of UTI.<sup>14</sup>

A Consumer Reports investigation also revealed fecal contamination (enterococcus and/or nontoxin-producing E. coli) that may cause UTIs in all 458 pounds of ground beef it tested.<sup>15</sup>

## **E. Coli From Food May Cause 640,000 UTIs Annually in the US**

If you eat food contaminated with E. coli, and that E. coli migrates from your gut to your anus to your urethra, a UTI could result.<sup>16</sup> Using comparative genomic analysis, researchers with the University of Minnesota and colleagues found that about 8% of the E. coli infections in their population – most of which were UTIs – were likely due to foodborne zoonotic strains.<sup>17</sup>

Foodborne E. coli strains were associated with asymptomatic bacteria in the urine, UTIs and sepsis, with significant public health effects. The scientists explained:<sup>18</sup>

*“The public health implications of our findings are substantial. Since E. coli causes approximately 6 to 8 million UTIs in the U.S. annually, as many as 480,000 to 640,000 extraintestinal FZEC [foodborne zoonotic E. coli] infections could occur in the U.S. each year.*

*Our findings also implies that, collectively, FZEC strains could cause more UTIs annually than any non-E. coli uropathogenic species (e.g., Klebsiella*

*pneumoniae) or any of the major human-associated extraintestinal pathogenic E. coli lineages, including ST131-H30, ST95, and ST73.”*

UTIs caused by foodborne E. coli may be even more common in areas close to CAFOs as well as in low- and middle-income countries, where water, sanitation and hygiene infrastructure are less developed, the study found.<sup>19</sup>

## **UTI Complications Can Be Deadly**

If E. coli gets into your urinary tract and multiplies, you may experience these common signs of a UTI:

- Burning with urination
- Frequent urges to urinate
- Lower abdominal pain or aching
- Blood in your urine (sometimes, but not always)
- Cloudy or foul-smelling urine

The reason your body cannot simply expel the E. coli through urination is because the bacteria are covered with tiny fingerlike projections called fimbriae, made of an amino acid-sugar complex, a glycoprotein called lectin, which makes them sticky.<sup>20</sup>

This stickiness allows the bacteria to adhere to the inner wall of your bladder and/or work their way upward toward your kidneys, at which point the situation can become quite serious. If the infection spreads to your kidneys, you may experience additional signs of illness, including:<sup>21</sup>

- Fatigue
- Fever, chills or night sweats
- Pain in your side, back or groin
- Mental changes or confusion

- Nausea and vomiting

Sepsis is another potential complication of untreated or unsuccessfully treated UTI, which can happen if the infection is caused by drug-resistant bacteria. Sepsis can be life-threatening.

In older adults, confusion, delirium, dizziness and other behavioral changes may be the only signs of a UTI, which can make diagnosis difficult<sup>22</sup> and delay treatment. If these symptoms occur in an older adult, they should be checked for a UTI. Treatment with methylene blue can be very helpful in these cases, as I discuss below.

## What Helps Reduce the Risk of UTIs?

To maintain a healthy urinary tract and help prevent UTIs from occurring:

Drink plenty of pure, filtered water every day	Urinate when you feel the need; don't resist the urge to go
Wipe from front to back to prevent bacteria from entering your urethra	Take showers instead of baths; avoid hot tubs/Jacuzzis
Cleanse male and female genital areas prior to sexual intercourse	Avoid using feminine hygiene sprays, which may irritate your urethra
Use a bidet	Eat fermented foods such as kefir, sauerkraut and other fermented vegetables, which are great for your overall health, including your urinary system

Cranberries can also be helpful. Research published in the Cochrane Database of Systematic Reviews noted that these tart berries contain proanthocyanidins that help prevent *E. coli* from sticking to the urothelial cells lining the bladder.<sup>23</sup>

The review, which included 50 studies with 8,857 randomized participants, showed cranberry products reduce both the risk of developing UTIs and the risk of symptomatic, culture-verified urinary tract infections in women with recurrent UTIs. The data supported the “use of cranberry products to reduce the risk of symptomatic, culture-verified UTIs in women with recurrent UTIs, in children, and in people susceptible to UTIs following interventions.”

Paying attention to the source of your meat is also important, given its connection to UTI-causing bacteria and antibiotic resistance. While I don't recommend eating chicken due to the high amounts of [linoleic acid](#) it typically contains, if you do eat chicken, choosing organic, pasture-raised options should lower the contamination risk. Ideally, any meat you eat should come from a local farmer using regenerative farming methods the way nature intended.

As for treatment, consider [methylene blue](#), the parent molecule for hydroxychloroquine and chloroquine, off-patent drugs commonly used to treat not only malaria but also COVID-19. Methylene blue is actually the oldest drug in the world. It was founded in 1876 and used as a textile dye for blue jeans, but it has many important medicinal benefits.

It is a highly effective agent against UTIs, as it's excreted by your kidneys into your bladder where it reaches very high concentrations and becomes a potent oxidant stress that kills virtually any pathogen there – without disrupting the microbiome the way antibiotics do. Plus, it has the additional “side effect” of improving brain health and reducing dementia, making it ideal for UTI treatment in older adults.

## Sources and References

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