

## Will Probiotics Be a Game Changer in the Treatment of Recurrent UTI? – a Short Review

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### Abstract

The most frequent condition primary care doctors address is recurrent urinary tract infections (RUTI) in both men and women. RUTI is defined as occurring at least three times in the past year or twice in the past six months. This is a serious health hazard for women. Even though there is a wide range of antibiotics available for the treatment of bacterial urinary tract infections (UTIs), due to the development of antibiotic resistance, chronic UTIs are now the subject of debate. This review focuses on the connection between probiotic use and the management of recurrent UTIs and offers recommendations for using probiotics as a substitute to lessen the likelihood of adverse medication reactions. After reviewing a number of studies, it was determined that probiotics might be a better choice than antibiotics given their advantages over disadvantages.

**Keywords:** Recurrent urinary tract infection, Probiotics, Lactobacillus, Drug Resistance, microbiota, Antibiotic Prophylaxis

### Introduction

One of the most frequent conditions primary care doctors address is recurrent urinary tract infections (RUTI) in both men and women. An estimated 10.5 million office visits (representing 0.9% of all ambulatory visits) and 2-3 million visits to emergency departments were made in 2007 due to UTI symptoms [1-4]. For men and women of all ages, RUTIs are a major cause of morbidity. A few examples of significant effects include frequent relapses, pyelonephritis with sepsis, renal damage, and problems brought on by repeated antibiotic use, such as high levels of antibiotic resistance [5-10]. Probiotics are proposed as supportive treatments for chronic UTIs in men and women. This review focuses on the relationship between the use of probiotics in the treatment of recurrent UTIs and provides suggestions regarding the use of probiotics as an alternative to prevent drug-related side effects.

*Urinary Tract Infection:* UTIs are known as bacterial colonisation-related infections of the kidneys, ureters, urethra, or bladder. One of the most prevalent bacterial

infections, UTI can cause serious complications like strictures, abscess development, fistulas, bacteraemia, sepsis, pyelonephritis, and kidney failure. UTIs are brought on by both gram-negative and gram-positive bacteria, as well as a few fungi. Both mild and complex UTIs are most frequently caused by uropathogenic *Escherichia coli* [11]. UTIs can be classified as simple or complicated clinically. People who are generally healthy and have no structural or neurological abnormalities of the urinary tract are most commonly affected by uncomplicated UTIs. These infections are distinguished as higher UTIs (pyelonephritis) and lower UTIs (cystitis).

Female gender, past UTI, sexual activity, vaginal infection, diabetes, obesity, and genetic predisposition are some of the risk factors linked to cystitis.<sup>3,7</sup> Urinary obstruction, urinary retention brought on by neurological conditions, immunosuppression, renal failure, renal transplantation, pregnancy, and the presence of foreign bodies like calculi, indwelling catheters, or other drainage devices are all examples of complications that can affect the urinary tract or the host's defence [12]. The pathogenesis of UTI is depicted in Figure 1.

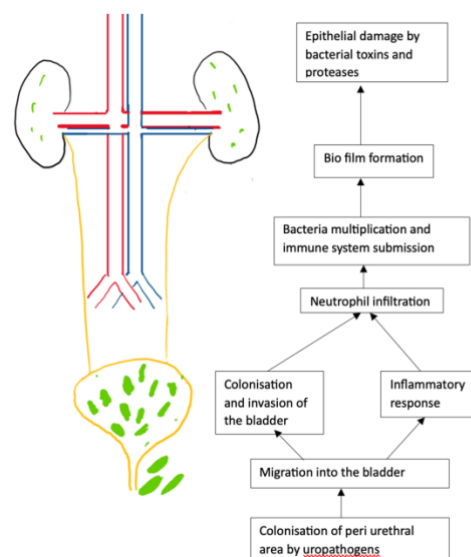


Figure 1: The pathogenesis of UTI

Figure Credit: Corresponding author of this article Dr. Zareen Zohara

RUTI is defined as occurring at least three times in the past year or twice in the past six months. This is a serious health hazard for women [13]. The Gupta et al. study reported that nearly one-half of the women who had uncomplicated UTI developed recurrent UTI in one year. Loading the body with antibiotics can disrupt the natural flora and make it more susceptible to severe infections [14].

Antibiotics are frequently administered to people who have UTI symptoms; however, it has been discovered that these medications also promote the growth of multidrug-resistant microorganisms and long-term alterations in the natural microbiota of the gastrointestinal and urinary tracts. The likelihood of being colonised by multidrug-resistant bacteria may rise as a result of the gaps that the changed bacteria are no longer able to fill [15]. Antibiotics' "golden age" is coming to an end, necessitating the development of stronger substitute medications. Even though there is a wide range of antibiotics available for the treatment of bacterial UTIs, due to the development of antibiotic resistance, chronic UTIs are now the subject of debate due to their financial repercussions, which include effects on mental health, quality of life, medical costs, and lost workdays, among other things.

### Probiotics

Over the past 20 years, probiotic bacteria have drawn increasing amounts of interest as a result of the expanding body of scientific evidence demonstrating their beneficial impacts on human health. As a result of the food industry's vigorous investigation and promotion of them, they are now used in a variety of goods. The majority of the goods in this industry that are fermented dairy products have probiotics added to them.

An essential infection defence is the bacterial flora that lives on the skin and mucosal surfaces. A balance between non-pathogenic commensals and pathogenic bacteria within the natural bacterial flora ensures the host's defence. It is generally known that the immune-compromised host's natural protective biofilm of bacteria and surface cells is disrupted, as is the case with antibiotic treatment [16]. The use of probiotics is one method for re-establishing a bacterial flora that supports the host. Live microorganisms that, when given in sufficient quantities, boost the host's health are known as probiotics [17]. There are various mechanisms that insist on the positive role of probiotic administration in the treatment of Giardia intestinalis, acute diarrhoea, and their bactericidal or bacteriostatic action on pathogenic flora in the same host [18–21].

### Urinary microbiota

In recent years, there has been a lot of interest in the structure of the human microbiome. Studies on the potential functions of complex microbial structures in a

wide range of disorders have been conducted. Urinary microbiota (UM) has not been thoroughly studied, despite the fact that there are many studies in the literature on the microbiota of the skin, mouth, vagina, and intestines. This happened because, until recently, it was believed that in healthy people, urine was sterile. Advanced quantitative urine culture (EQUC) techniques and 16S rRNA sequencing have made it possible to identify aerobic and anaerobic bacteria that are part of the normal flora in the urinary system [22,23]. According to sex, the method of collecting urine, and the method used to research UM, the degree of concentration of bacteria habituating in urinary systems may differ in studies on urinary microbiomes. The most frequently found species, and the subjects of several investigations, are Streptococcus and Lactobacillus [24].

### Discussion

#### Role of probiotics in recurrent UTI:

Studies have proven that there is a clear relationship between the flora present in the urogenital system and its effective role in the prevention of genitourinary symptoms. Probiotics regulate the damaged flora, unlike antibiotics. Probiotics prevent the action of bacteria by inhibiting adhesion, acidifying the mucosal surface, and blocking various other steps of bacterial pathogenesis [25]. Various studies have been analysed to find the use of probiotics in recurrent UTIs and the findings were postulated below.

Author	Reference number	Study	Conclusion
Reid G et al	[17]	Clinical trial	There is an improvement in the urogenital infection within one week
Abdad et al	[26]	Systematic review	The two most often seen species are Lactobacillus and Streptococcus, and numerous investigations have been done on them. It is encouraging that several lactobacillus strains, including L. rhamnosus GR-1 and L. reuteri, can be used to prevent and cure recurrent urogenital infections
Beerepoot MAJ et al	[27]	Randomised clinical trial	When compared to trimethoprim-sulfamethoxazole, lactobacillus do not meet the noninferiority requirements for the prevention of UTIs in postmenopausal women with recurrent UTIs. However,

			lactobacilli do not lead to an increase in antibiotic resistance, unlike trimethoprim-sulfamethoxazole.
Falagas et al	[28]	Clinical trial	This study demonstrates that probiotics may help prevent women from getting recurrent UTIs, and they also have a solid safety profile.
Zuccotti GV, et al	[29]	Review	This study concludes that probiotics could be a good alternative to antibiotics
Meena, J et al	[30]	A systematic review and meta-analysis of randomized controlled trials	When compared to placebo, probiotic medication was more effective at reducing UTI recurrence (RR: 0.52; 95% CI: 0.29-0.94). Probiotic therapy has a reduced risk of antibiotic resistance than antibiotic prophylaxis (RR: 0.38; 95% CI: 0.21-0.69), despite the fact that it was not more effective in preventing UTIs (RR: 0.82; 95% CI: 0.56-1.21).
Sadeghi-bojd S et al	[31]	A randomized double-blind trial	244 children with a single, uncomplicated febrile UTI were randomised to receive either a combination of various Lactobacillus species (including <i>L. acidophilus</i> and <i>Lactobacillus rhamnosus</i> , strains not specified) and <i>Bifidobacterium</i> species (including <i>Bifidobacterium bifidum</i> and <i>B. lactis</i> , strains not specified) or placebo after treatment for the acute UTI (181 children (181 completed the trial)). After 18 months, children in the probiotic group experienced a significantly reduced rate of UTI recurrence than children in the placebo group.
Reid G et al	[32]	Randomized, placebo-	The research in this field showed

		controlled trial	that oral administration of <i>L. reuteri</i> (formerly fermentum) RC-14 and <i>L. rhamnosus</i> GR-1 can colonise the vagina and reduce the prevalence of coliform bacteria.
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## Conclusion

On account of the increasing prevalence of RUTIs and the depletion of sensitive antibiotics, there is a growing urge among the population to find an alternative source for treatment. From the studies analysed, it is suggestive that probiotics, though not a standardised treatment for UTI, can be used as an alternative to reduce the side effects of using antibiotics. Due to the high demand for finding alternatives, various research studies have to be done on the use of probiotics to find out the efficacy of the drug, particularly in clinical trials. With satisfying results, probiotics can be used as a monotherapy or as a combination therapy for not only the treatment but also the prevention of RUTIs. It is also recommended to do explorative research on this field so as to use probiotics as a standard regime for the treatment of RUTI. Antibiotic use should be controlled, and prescriptions should only be written when absolutely necessary. Frequent use of antibiotics may transform uncomplicated UTI by making it multi-drug resistant.

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