

## Laying off antibiotics

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**Vaccine therapy has emerged as a promising alternative to antibiotics for the treatment and prevention of UTIs**



Urinary tract infections (UTIs) affect men and women of varied ages but they occur more in women than men because of the female anatomy. In fact, a few studies have pointed out that the incidence of UTIs in adult males aged under 50 years is low, with adult women being 30 times more likely than men to develop a UTI.

UTIs can occur in the urethra (urethritis), bladder (cystitis), or kidneys (pyelonephritis) and are one of the world's most common infectious diseases, affecting 150 million people each year, with significant morbidity and high medical costs.

With clinical symptoms of UTIs ranging from uncomplicated to complicated, these infections are among the most common bacterial infections worldwide, occurring in both community and healthcare settings. Gram-negative bacteria, specifically Enterobacteriaceae, are common causes of both community-acquired and hospital-acquired UTIs which require antibiotics-based treatment, for a shorter or longer term.

As a result, over the years, UTIs have become responsible for a large number of antibiotic prescriptions, which are known to be a major cause of the spread of antimicrobial resistance. Therefore, finding new drugs to combat antimicrobial resistance and expanding the field of research to find new treatment options have become top priorities.

According to recent data, elders have an increased risk of contracting uncomplicated urinary infections that are resistant to multiple antibiotics. Thus, the use of empirical antibiotics should be limited to cases where symptoms are unbearable or a more serious infection is feared.

Since overuse of antibiotics is a major factor in the development of multidrug resistance (MDR) bacteria and about 25 per cent of all antibiotic prescriptions are for UTIs, researchers recommend that antibiotic administration should be used once all non-antibiotic treatment options have been exhausted.

The most recommended non-antibiotic prevention and treatment options for recurrent UTIs include cranberries, intravaginal probiotics, D-mannose, oestrogen-releasing vaginal ring in postmenopausal women, and immunostimulants, to name a few.

Vaccine therapy has also emerged as a promising alternative to antibiotics for the treatment and prevention of UTIs. A sublingual vaccine consisting of inactivated whole bacteria has been shown to be effective in reducing UTI recurrences months after starting treatment with the vaccine. Although the exact protective mechanism by which this vaccine reduces UTI

recurrences is still not entirely clear, several authors suggest that the reduction in UTI recurrences is due to an enhancement of local innate immune mechanisms.

Further, recent studies have shown the potential of bacteriophage therapy for the treatment of UTIs caused by MDR bacteria, such as *E. coli* and *K. pneumoniae*. Again, the preliminary data obtained from this therapy are very promising, but there is still much preclinical and clinical work to be done before bacteriophages can be an alternative to antibiotics in the future.

On the other hand, a decision tool has been developed for health professionals, by a team of international scientists, that has proved capable of halving the use of antibiotics against UTIs while maintaining patient safety.

Additionally, Chinese herbal medicine is also used to treat UTI as a non-antibiotic method. This also opens broader avenues for the Indian ayurvedic system of medicine which offers numerous herbal components that can be introduced as one of the main strategies of antibiotic alternatives for treating UTIs in India and globally.

Moreover, the field of nanotechnology has great promise for the treatment of MDR infections as well as other diseases. There are several reports from all around the world that demonstrate its use to treat different conditions, including UTIs.

Thus, by reducing the large amount of antibiotics that are presently used for the treatment and management of UTIs, recurrent UTIs, and complicated UTIs, and replacing them with non-antibiotic methods, the growing problem of antibiotic resistance can be brought down to a large extent. But of course, thorough clinical validation of the alternative methods needs equal attention.

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