

## The Effectiveness of Grapefruit (*Citrus paradisi*) Seeds in Treating Urinary Tract Infections

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### ABSTRACT

Three middle-aged males and one female were diagnosed as having urinary tract infections (UTIs) between 2001 and 2003 in the Wesley Guild Hospital, Ilesa, a unit of Obafemi Awolowo University Teaching Hospitals Complex, Ile Ife, Osun State, Nigeria. Of the 4 patients, only the female was asymptomatic. The 3 males had *Pseudomonas aeruginosa*, *Klebsiella* species, and *Staphylococcus aureus*, respectively, in their urine samples, while the female had *Escherichia coli*.

All 4 patients were treated with grapefruit seeds (*Citrus paradisi*) orally for 2 weeks and they all responded satisfactorily to the treatment except the man with *P. aeruginosa* isolate. However, the initial profuse growth of *Pseudomonas* isolate in the patient that was resistant to gentamicin, tarivid, and augmentin later subsided to mild growth with reversal of the antibiotic resistance pattern after 2 weeks' treatment with grapefruit seeds.

These preliminary data thus suggest an antibacterial characteristic of dried or fresh grapefruit seeds (*C. paradisi*) when taken at a dosage of 5 to 6 seeds every 8 hours, that is comparable to that of proven antibacterial drugs.

### INTRODUCTION

The three basic forms of urinary tract infections (UTI) are pyelonephritis, cystitis, and asymptomatic bacteriuria. Clinical pyelonephritis is characterized by any or all of the following: abdominal or flank pain, fever, malaise. Cystitis indicates that there is bladder involvement, and the symptoms include dysuria, urgency, frequency, suprapubic pain, incontinence, and malodorous urine. Cystitis may not cause fever and does not result in renal injury, unlike pyelonephritis. Asymptomatic bacteriuria refers usually to children, who have a positive urine culture without any manifestations of infection, and occurs almost exclusively in girls. This condition is benign and does not cause renal injury, except in pregnant women, in whom asymptomatic bacteriuria, if left untreated, can result in symptomatic UTI.

UTIs are one of the causes of preterm delivery. This is because uterine contractions may be induced by cytokines and prostaglandins which are released by microorganisms (Cram et al., 2002; Elder, 2000).

Factors contributing to UTI include urinary obstruction and stasis, renal calculi, vesico-ureteric diversion, presence of foreign bodies, and lowered resistance (Osegbe and Mbonu, 2000). In Enugu, Nigeria, the identified microorganisms in UTI include the following, in order of frequency: *Escherichia coli*, *Staphylococcus aureus*, *Streptococcus*, *Pseudomonas*, *Proteus*, and *Klebsiella* (Osegbe and Mbonu, 2000).

In view of the potential dangers of UTI, there is the need for prompt treatment and in the developing countries, where the cost of antibiotics, especially the newer ones, may not be affordable, there is a need to find cheaper alternatives.

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## CASE REPORTS

### Case 1

A 58-year-old man who had had a transvesical prostatectomy presented 2 weeks later with a 1-week history of painful micturition as well as urinary urgency and frequency, in June 2001. He had been prescribed Cefuroxime (Zinacef) pre- and postoperatively. His physical examination revealed no abnormality and the postoperative, suprapubic scar was not unduly tender.

The initial clinical suspicion of UTI was confirmed from the cloudy urine, which yielded a profuse growth of *Pseudomonas aeruginosa* on culture. The organism was resistant to all antibiotics it was tested against including gentamicin, tarivid, and augmentin. Faced with this challenge, he was advised to chew and swallow fresh grapefruit seeds (*Citrus paradisi*) as often as tolerable for 2 weeks. When the patient re-presented 2 weeks later, the symptoms had lessened in intensity. The repeat urinary culture yielded mild growth of the same organism but was sensitive to gentamicin, tarivid, and carbenicillin. He was successfully managed on a 1-week course of tarivid.

### Case 2

A 50-year-old male security agent presented to one of the authors (OAO) in February 2003 because of urinary symptoms of 2 months' duration. The initial symptom was painful micturition associated with urethral discharge following extramarital sexual exposure. He thought he had contacted gonorrhea and had embarked on self-medication with antibiotics which he bought over the counter and herbal preparations. The discharge subsided after a week but painful micturition, urinary urgency, and frequency persisted, resulting in the informal consultation to one of us because of the fact that he could not afford hospital fees.

His physical examination revealed no abnormality. His urine was cloudy and it yielded a growth of *Klebsiella* species (this could not be typed because of lack of reagents) sensitive to gentamicin, tarivid, and cefotaxime. For reasons of poor finances, he was tried on dry grapefruit seeds which one of the authors was keeping. He chewed 5–6 dry seeds every 8 hours for 2 weeks. After a week, the symptoms subsided completely. The urine was re-examined 2 weeks later and it yielded no growth. Efforts to persuade him to bring his sexual partner for management were unsuccessful.

### Case 3

A 45-year-old male engineer consulted one of the authors (OAO) in April 2003, informally. A month prior to consultation, he had painful urethral discharges after having an extramarital sexual exposure. He had daily cefotaxime injections for one week for presumed gonorrhea. Thereafter, the

urethral discharges subsided but painful micturition, urinary frequency, and urgency persisted. There was no abnormality found on physical examination.

Microbiological examination of his urine revealed *Staphylococcus aureus* sensitive to erythromycin and gentamicin. Because of the initial success with Case 2, this patient was also treated with a 2-week course of dry grapefruit seeds which he chewed and swallowed, 5 to 6 seeds every 8 hours. The urine investigation was repeated three times at two-weekly intervals following the therapy and it revealed no growth. Again, the man did not bring his sexual partner for treatment.

### Case 4

A 20-year-old female university undergraduate consulted one of the authors (OAO) in December, 2003 following the diagnosis of asymptomatic bacteriuria made during a routine medical test. Her turbid urine yielded *Escherichia coli* on culture in the laboratory. The isolated organism was resistant to co-trimoxazole and tetracycline but sensitive to tarivid, amoxicillin, augmentin, and cefotaxime. She also chewed 5 to 6 dry grapefruit seeds 8 hourly for 2 weeks. After completion of the treatment, the microbiological examination of the urine revealed normal findings. She did not report any side effects to chewing the grapefruit seeds.

## DISCUSSION

The clinical symptom or sign of urethral discharge in males is loosely termed "gonorrhea" in most Nigerian communities (Odugbemi, 1982). However, urethral discharge could be symptomatic of clinical conditions other than gonorrhea, just as it could be gonorrhea alone or gonorrhea mixed with any other sexually transmitted disease(s). Cases 2 and 3 thought they had contacted gonorrhea and because of the opprobrium usually associated with the disease, they resorted to self-medication. By the time they were clinically evaluated, it was difficult to establish whether they had gonorrhea in addition to the UTI they were confirmed to have.

Self-medication is very common in Nigeria and most Nigerians tend to have a desire for injections for any illness, regardless of whether those injections are effective or not (Bello, 1986). The use of prophylactic antibiotic therapy in Case 1 was responsible for the emergence of multidrug-resistant *P. aeruginosa*. This finding actually calls into question such practice, which is the norm rather than the exception in surgical practice in developing countries.

The pattern of sensitivity in the cases presented show clearly that UTIs have become expensive diseases to treat in Nigeria (Bello, 1986). The need to use grapefruit seeds was born out of necessity in the first two cases. In the first case, the dilemma posed by the fact that the organism was not sensitive to any available antibiotic prompted the trial

of grapefruit seeds because of anecdotal reports of their efficacy in treating bacterial infections. In addition, one of the authors had tried the use of the seeds in treating infections including pneumonia and gastroenteritis in rabbits, with very good results. The fact that the rabbits showed no adverse reactions emboldened us to use it in human beings. It is conceivable that if dry grapefruit seeds had been used in Case 1, the infection might have completely cleared without resulting to the use of tarivid. The partial success in Case 1 encouraged us to use dry seeds in Case 2; since the patient had no money and he was in distress, we did not feel too ethically challenged in trying the remedy on him.

Recently, it has been confirmed that grapefruit seed extract (GSE) has antimicrobial properties against a wide range of gram-negative and gram-positive organisms at dilutions found to be safe. With the aid of scanning transmission electron microscopy (STEM), the mechanism of GSE's antibacterial activity was revealed (Hegggers et al., 2002). It was evident that GSE disrupts the bacterial membrane and liberates the cytoplasmic contents within 15 minutes after contact even at more dilute concentrations. It has also been found that GSE appeared to have a somewhat greater inhibitory effect on gram-positive organisms than on gram-negative organisms; however, its comparative effectiveness against a wide range of bacterial biotypes is significant (Reagor et al., 2002).

The adequate clinical response of these patients suggests that the 8-hourly dosage of 5 to 6 seeds of grapefruit seeds taken for a 2-week period may have an effect that is comparable to other proven antibacterial drugs. Therefore, more work needs to be done on the effect of this simple seed on various infections, especially in the tropics, where the fruit is readily available and the bulk of the medical problems are mainly those of undernutrition and infections.

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