

## At our Mother's Knee

# Relationship of urinary pH to symptoms of 'cystitis'

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**Summary:** The pH of urine samples from patients suffering symptoms suggesting urinary infection (e.g. dysuria, frequency, urgency) was measured while the patients were symptomatic and again when they had become asymptomatic. There was no correlation between the urine pH and the incidence or number of symptoms. No differences were observed between either the distribution or means of urine pH values in symptomatic and asymptomatic patients. There were also no significant differences in either symptomatology or urine pH between patients with significant bacteriuria and those without significant bacteriuria. These results cast doubt upon the traditional (but unproved) belief that alkalinizing the urine helps to reduce symptoms of dysuria and/or frequency, whether or not associated with urinary infection.

### Introduction

It is widely believed in both medical and lay circles that the symptoms associated with acute urinary infections (frequency, dysuria and urgency) can be alleviated at least temporarily by the use of agents that alkalinize the urine.<sup>1-3</sup> Sodium bicarbonate (readily available in most households), potassium citrate (mist.pot.cit. BNF and Effercitrate) and sodium citrate (Cymalon, Cystemme, Urisal) are examples of compounds used for this purpose. As a literature search for evidence of the efficacy of this treatment yielded only one paper,<sup>4</sup> we felt that it deserved further study. An opportunity to do this, albeit by an indirect means, arose during the analysis of the results of a clinical trial carried out in general practice. The pH was determined of a specimen of urine collected from patients first with symptoms suggesting urinary infections, and again when they returned after their symptoms had disappeared. Correlation between the nature and number of symptoms with the urinary pH was investigated. Results showed that acidity of the urine was not associated with symptoms, which in turn suggests that making the urine alkaline may not be an effective symptomatic treatment for dysuria and frequency.

### Patients and methods

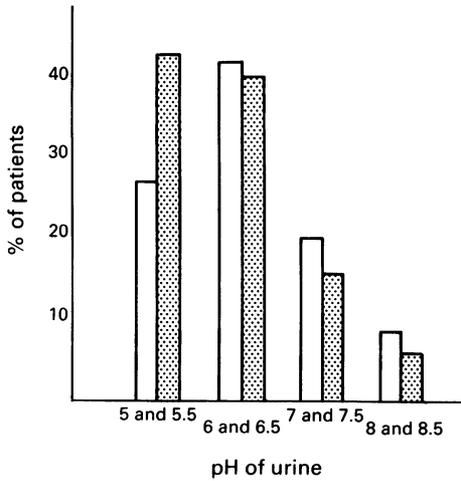
Patients attending their general practitioners' surgery with symptoms suggesting a urinary infec-

tion (usually frequency, dysuria or urgency) were entered randomly into a trial where they were given either single-dose therapy (3 g fosfomycin trometamol) or conventional therapy [amoxycillin and clavulanic acid (Augmentin) 375 mg 8-hourly for 5 days]. These were the only medications taken. A mid-stream urine specimen (MSU) was collected from each patient and divided into three parts. The first was tested with N-Labstix (Ames) in the surgery, and pH recorded; the second portion was used to inoculate a dipslide (Orion) and 20 ml volume of the third was added to 380 mg of boric acid in a Universal container (Sterilin). The dipslide and the borated specimen were posted to the laboratory at the Royal Free Hospital for microbiological investigation. Patients were questioned in detail about their symptoms, both before and 3 to 5 days after the end of the antibiotic treatment.

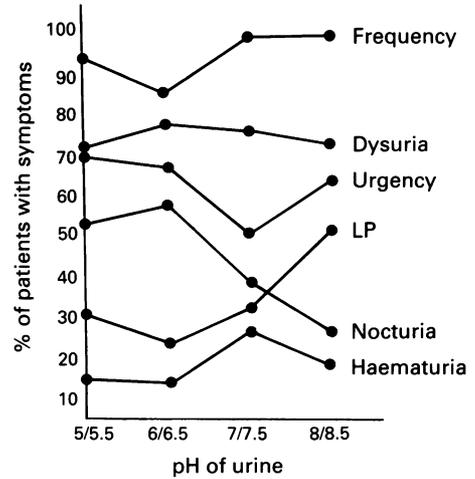
### Results

#### *Urine pH in symptomatic patients*

A preliminary analysis showed that there were no significant differences between symptomatology in patients with and without significant bacteriuria. Data from all the patients were therefore pooled. The distribution of pH in MSUs from 128 female patients complaining of symptoms is shown in Figure 1. The most commonly observed pH (the mode) was 6/6.5. There were no statistically significant relationships between the urinary pH and the incidence of five reported symptoms, namely frequency, dysuria, urgency, nocturia and haematuria



**Figure 1** Distribution of pH in MSUs in symptomatic (□,  $n = 128$ ) and asymptomatic (▨,  $n = 60$ ) patients.



**Figure 2** Relationship between reported symptoms and urinary pH.

(Figure 2). An apparent trend noticed for nocturia (decreasing with a rise in pH) was analysed point by point, but observed differences did not reach the level of statistical significance (chi squared test). Further, there was no correlation between the total number of symptoms reported by patients and the pH of their urine at the time. The mean number of individual symptoms ( $\pm$  s.d.) in each group was as follows: pH 5/5.5:  $3.3 \pm 1.1$ ; pH 6/6.5:  $3.4 \pm 1.1$ ; pH 7/7.5:  $3.2 \pm 1.2$ ; pH 8/8.5:  $3.5 \pm 1.6$ .

#### Urine pH in asymptomatic patients

Sixty patients who attended for follow-up about 1 week after they had finished taking antibiotic were abacteriuric and completely free of symptoms. The distribution of the pH of MSUs collected at the time of the follow-up visit was only slightly different from that seen at the initial visit (at which they had been symptomatic) – Figure 1. A mode pH of 5/5.5 was observed, but there were no significant differences in the incidences of numbers in the various pH groups when the symptomatic and asymptomatic patients were compared. Furthermore, the mean urinary pH of the symptomatic patients ( $6.2 \pm 0.97$ ) was not significantly different from that in asymptomatic patients ( $5.9 \pm 0.93$ ).

#### Discussion

Our finding of similar patterns of symptoms in infected and non-infected patients agrees with the reports of most workers in this field.<sup>5–9</sup> This was not a formal clinical trial of alkalinizing agents.

However, from the data accumulated it is obvious that patients with alkaline urine are just as likely to have symptoms as are those with acid urine. Also, the pH of urine from symptomatic patients is not significantly different from that of asymptomatic patients, either when analysed overall (comparing mean values by the *t* test) or by groups of pH values (by the chi squared test). If alkalinizing the urine reduced symptoms, we would expect fewer symptoms in patients with alkaline urine, and a less acid urine in asymptomatic patients than in patients complaining of symptoms. Thus, our results do not give support to the idea that increasing the pH of the urine in cystitis by the administration of alkalinizing agents will diminish symptoms, either qualitatively or quantitatively.

The evidence we have obtained is of an indirect nature only. However, in view of the unambiguous way in which our data can be interpreted, it appears important as a next step to test directly the hypothesis that alkalinizing the urine alleviates symptoms in cystitis. This can only be done by means of a controlled, randomized trial of an alkalinizing agent against placebo, with appropriate laboratory tests included in the protocol.

The only previous study<sup>4</sup> addressing this subject directly was uncontrolled and reported only improvement of symptoms 3 days after starting treatment with 4 g sodium citrate 3 times a day for 2 days. As symptoms often disappear without treatment<sup>10</sup> or following placebo<sup>11,12</sup> in patients with simple 'cystitis', the absence of comparison with a control group makes the assessment of the efficacy of the treatment difficult. Further, the pH of the urine was not measured, and urinary pH has

been shown to be extremely difficult to alter.<sup>13</sup> Thus, the apparently beneficial results of sodium citrate reported<sup>4</sup> might not have been due to

alkalinization as such, but to other factors like increased fluid intake or a placebo effect.

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