

# Collection of urine specimens in general practice: to clean or not to clean?

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**SUMMARY.** *The usefulness of preparatory vulval cleansing before urine specimen collection was evaluated in women aged 16 to 75 years attending a general practice. A total of 316 specimens were examined, 158 from women with symptoms of cystitis and 158 from controls. No significant differences were found in the numbers of contaminated or unreliable results between the specimens collected with and those collected without preparatory cleansing.*

## Introduction

PRIOR to the 1950s urine specimens for culture were often collected from women by catheterization. In 1939 Leishman<sup>1</sup> stated that nine out of 10 specimens obtained from normal women without aseptic precautions grew *Escherichia coli*. Marple<sup>2</sup> suggested that only catheterization specimens should be used for culture in women with symptoms suggestive of urinary tract infection. Beeson<sup>3</sup> argued against this procedure, warning of the risk of introducing infection, but advocated taking 'proper precautions' to provide a clean-voided specimen. This led to women being subjected to various unpleasant and uncomfortable cleansing procedures and collection positions. Stamey and colleagues<sup>4</sup> and Pfau and Sacks<sup>5</sup> have stated that it is rarely possible for a female patient with sterile bladder urine to pass an uncontaminated midstream specimen of urine. Microbiology textbooks outline methods of mid-stream specimen collection from women involving cleansing of the vulva with soap, chlorhexidine or iodine, and emphasize the need to avoid contaminating the specimen with vaginal flora by parting the labia and, in some cases, by plugging the vagina with cottonwool tampons. More recently two papers have challenged the need for these elaborate methods. Immergut and colleagues<sup>6</sup> compared results obtained from specimens voided into non-sterile containers by 95 'unprepped' ambulatory women with specimens obtained by catheter via a sterile cystoscope from the same women. They found a 95% correlation between colony counts from the two specimens. Bray and Corry<sup>7</sup> also compared colony counts in specimens produced by hospital patients with three methods of preparatory cleansing, namely 1:5000 chlorhexidine swabbing, soap and water washing of the genitalia and no preparation. They found no significant difference in the colony counts using these three methods.

The author's practice has been using a simple catch technique to collect urine specimens without obtaining excessive numbers of equivocal or contaminated specimens. The trial was set up to test the validity of this observation.

## Method

The study was carried out in a five-doctor practice with a population of around 11 000. A total of 316 urine specimens were col-

lected from 158 female patients with suspected urinary tract infection and from 158 controls. Two methods of collection described below were examined in each group. The study group comprised any female aged 16–75 years who presented with symptoms of frequency and dysuria, with or without nocturia, suprapubic pain or loin pain. Excluded were pregnant women, those with vaginitis (ascertained by direct questioning) and those with proven urological abnormalities. Those who had taken antibiotics recently were excluded. The exclusion period chosen was one week. Other studies have had exclusion times of three days<sup>8</sup> to two weeks.<sup>9</sup> The control group comprised the next non-pregnant female attending the surgery with no urinary tract symptoms, within the previously detailed constraints. Participants were given information on the purpose of the study and their consent requested. The women were randomly allocated to one of the two methods of urine collection.

## Specimen collection

Each participant was given a printed sheet outlining the details of the method to be used for urine collection. Those using the cleaning method were instructed to wash their hands and then use the three cottonwool swabs provided to cleanse the genital area with soap and water. They were told to part the labia and wipe from front to back three times using a clean swab each time. Keeping the labia parted they passed some urine into the toilet and then caught some urine in a sterile container containing 0.4 g of boric acid as a preservative. Participants not using the cleaning method were instructed simply to pass some urine into the toilet, stop and then catch the next urine in a sterile boric acid container.

Boric acid has been shown to act as a preservative of urine for up to three days at room temperature. As well as maintaining the number of organisms present, the numbers of red blood cells, white blood cells and casts show no appreciable diminution, and the concentrations of protein and glucose are unaffected.<sup>10</sup> Specimens were transported to the laboratory after morning surgery. Those collected in evening surgery were stored overnight in the refrigerator. All specimens were collected at the surgery. None were collected on Friday evenings or Saturday mornings, or on home visits.

## Microbiological assessment

In the laboratory the specimens were examined microscopically for the presence and number of white and red blood cells and the presence of casts. A standard loopful of urine (0.001 ml) was plated onto CLED (cystine lactose electrolyte-deficient) medium and examined after overnight incubation to quantify the organisms present. The criteria used to indicate the presence of infection were the number and culture-purity of the organisms isolated in the presence of significant numbers of white blood cells per litre of urine. A 'definite' infection was classified as one with greater than  $10^8$  organisms per litre of urine in the presence of significant numbers of white cells (greater than  $10^4$  cells per litre) with or without the presence of red blood cells. Results showing the presence of  $3 \times 10^7$  up to  $10^8$  organisms with significant white cells, with or without red cells, were classified as equivocal, as were those showing a mixed growth. The presence of epithelial cells, which come predominantly from the vagina, was taken to indicate contamination of the specimen.

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## Results

A total of 316 specimens were collected over a period of 16 months. There were no significant differences in the marital status or ages of the participants, or in the time of collection of the specimens when comparing the study group with the controls and the cleaning with the non-cleaning technique.

From Table 1 it can be seen that there were no significant differences in the numbers of definite or equivocal infections between the two techniques. The incidences of asymptomatic bacteriuria in the two control groups at 2.4% and 1.4% were lower than the generally accepted figures of 3–7%.<sup>11</sup>

The differences in the numbers of specimens with white cells but no organisms, or organisms but no white cells when comparing the two techniques were not significant (Table 1). In the two study groups a number of specimens showed the presence of epithelial cells but this was not affected by the cleaning technique (Table 1). All but one of these specimens had no other cells or organisms on examination. The control group who did not use cleaning showed a slightly higher number of specimens containing epithelial cells than the control group using cleaning.

**Table 1.** Infections, organisms, inflammation and epithelial cells present in urine samples from 158 women with urinary tract symptoms and 158 controls according to whether vulval cleaning was carried out.

	Number (%) of women			
	Study group		Controls	
	Cleaning (n = 93)	No cleaning (n = 65)	Cleaning (n = 85)	No cleaning (n = 73)
Infections:				
Definite	23 (24.7)	16 (24.6)	2 (2.4)	1 (1.4)
Equivocal	5 (5.4)	5 (7.7) (1 mixed growth)	0 (0.0)	0 (0.0)
Organisms, no inflammation	2 (2.2) (1 mixed growth)	0 (0.0)	0 (0.0) (2 mixed growth)	1 (1.4)
Inflammation, no organisms	26 (28.0)	21 (32.3)	8 (9.4)	12 (16.4)
Epithelial cells	8 (8.6)	6 (9.2)	3 (3.5)	11 (15.0)

n = total number of women.

The organisms grown from the urine specimens are summarized in Table 2. *E. coli* predominated in both study groups regardless of collection technique. A total of 10 specimens in the study groups showed equivocal numbers of *E. coli*.

## Discussion

There have been many publications on the aetiology, epidemiology and treatment of urinary tract infection in women — some from general practice but the majority from hospital inpatient and clinic settings. Few authors have published work regarding the actual method of collection of the urine specimen and this study was designed solely to look at this question in a general practice setting. The early assertions about the inability of women to collect uncontaminated urine specimens seem to have gone largely unchallenged. The results of the present study indicate that the simple technique of urine collection without prior cleansing is as reliable as more fastidious methods. In general practice one has sometimes to be pragmatic

**Table 2.** Organisms grown in urine samples from 158 women with symptoms and from 158 controls, according to cleaning technique.

Infections	Number of organisms			
	Study group		Controls	
	Cleaning	No cleaning	Cleaning	No cleaning
Definite	20 <i>E. Coli</i> 2 proteus  1 klebsiella	11 <i>E. Coli</i> 3 coagulase- negative staphylo- coccus  1 proteus  1 <i>Staphylo- coccus</i> <i>aureus</i>	2 <i>E. Coli</i>	1 entero- coccus
Equivocal	5 <i>E. Coli</i>	5 <i>E. Coli</i>		

about the collection of samples and it is comforting to have reassurance that a quick and simple method of urine collection gives equally reliable results as a more elaborate and possibly distasteful method. As one is reliant on patient cooperation for the production of samples, the easier and more acceptable the method the better.

In this study only a quarter of women presenting with frequency and dysuria had proven infection on microscopy and culture, using the criteria outlined in the method. Five to 8% had what has been termed 'equivocal' infection, that is signs of inflammation in the urine specimen but only  $3 \times 10^7$  up to  $10^8$  organisms per litre, obtained in pure culture. Kass's original criteria specified the count of greater than  $10^8$  organisms per litre as being significant, and this criterion has generally been used by microbiologists and physicians since.<sup>12</sup> However, Kass<sup>13</sup> emphasized that infection could be present in some women with less than  $10^8$  organisms per litre under certain conditions (for example water loading, high pH urine) and Stamm and colleagues<sup>9</sup> reiterate this position for coliform infections, stating that numbers as low as  $10^5$  coliform organisms per litre of urine from a woman with acute dysuria is a sensitive indicator of true coliform infection. The 'equivocal' infections in this series were all of the coliform type and should be classified as definite proven infections. It should be remembered that many women complaining of urinary tract infection symptoms have already increased their fluid intake and some will have used preparations such as potassium citrate mixture which alkalinize the urine.

Of the women presenting with symptoms 26 out of 93 women using cleaning and 21 out of 65 not using cleaning showed signs of urinary tract inflammation in their urine specimen but no organisms that could be cultured. Much smaller numbers (eight out of 85 and 12 out of 73) within the control group also showed this. The question arises whether other organisms which are not routinely looked for in the laboratory may give rise to cystitis. For example *Mycoplasma hominis* and *Ureaplasma urealyticum* have been suggested as possible pathogens<sup>14</sup> though evidence in their favour is rather unconvincing. Although this explanation is possible it is more likely that these specimens represent either naturally resolving infections or should be regarded as contaminated with white blood cells originating from the vagina.

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#### Acknowledgements

This work was funded by a generous grant from the Research Advisory Committee of the North Staffordshire Medical Institute and I am grateful for their support. The help of my partners in carrying out the project was invaluable. Thanks are due to Mr M. Collins, District Statistician.

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If the study involves any intervention or raises issues of confidentiality it is wise to obtain advance approval from an appropriate research ethics committee otherwise a decision to award a grant may be conditional upon such approval.

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