

# Asymptomatic Bacteriuria in Older Adults

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*The prevalence of asymptomatic bacteriuria increases with advancing age in community populations, and approaches 50% in the functionally impaired, institutionalized elderly. Asymptomatic bacteriuria is usually associated with pyuria, but has not been shown to contribute to any short- or long-term negative clinical outcomes in the older population. Treatment of asymptomatic bacteriuria is not recommended. Clinical trials evaluating antimicrobial therapy have found no improved outcomes, and therapy is usually followed by recurrence of bacteriuria. Antimicrobial treatment also is associated with increasing antimicrobial resistance and adverse drug effects. Due to the high prevalence of positive urine cultures, bacteriuria is not a useful diagnostic test for symptomatic urinary tract infection. However, a negative urine culture may exclude the urinary tract as a potential source of infection.*

**Key words:** urinary tract infection, bacteriuria, older adults, long-term care.

## Introduction

Urinary tract infection is the most frequent infection that occurs in older populations, and most urinary infection is asymptomatic. The terms asymptomatic bacteriuria and asymptomatic urinary tract infection are generally used interchangeably, both defined as a urine specimen that meets microbiologic criteria for urinary tract infection in an individual with no symptoms or signs attributable to infection. Growth of  $\geq 10^8$  cfu/L ( $\geq 10^5$  cfu/mL) of the same organism(s) on two consecutive urine specimens identifies asymptomatic bacteriuria.<sup>1</sup>

In community-living women, the prevalence of asymptomatic bacteriuria increases with age, approaching 10–20% among women older than 80 years (Table 1).<sup>2</sup> For men, asymptomatic bacteriuria is uncommon prior to 60 years of age, while about 5% of men older than 70 years have a positive urine culture. Thus, in the community one in every five to 10 older women and one in every 10 to 20 older men have bacteriuria. The prevalence of asymptomatic bacteriuria in residents of long-term care facilities is extremely high (Table 1).<sup>2</sup> Among institutionalized women and men, 25–50% and 15–40%, respectively, have a positive urine culture at any time. For the individual nursing home resident, increased functional impairment as evidenced by inconti-

nence of urine or bowel and dementia is strongly associated with the presence of bacteriuria.<sup>2</sup>

Those residents of long-term care facilities with voiding managed with indwelling catheters (5–10%) comprise a unique group.<sup>3</sup> A chronic indwelling catheter (i.e., one in place for 30 days or longer) is uniformly associated with persistent polymicrobial bacteriuria.<sup>4</sup> Thus, residents with chronic indwelling catheters should be considered bacteriuric at all times.

## Causes of Asymptomatic Bacteriuria

The reasons for the high prevalence of asymptomatic bacteriuria in older populations are multifactorial, with different variables of relative importance in different individuals. For postmenopausal women resident in the community, asymptomatic bacteriuria is associated with the same patient variables that have been associated with an increased frequency of symptomatic urinary infection.<sup>5</sup> These include a history of urinary infection in the premenopausal period, being a nonsecretor of the blood group substances (i.e., a genetic predisposition) and a history of genitourinary surgery. The presence of cystoceles or increased residual volume also are associated with an increased frequency of bacteriuria

among these women. A decreased estrogen effect on the genitourinary mucosa contributes to some of these changes and itself may promote bacteriuria, but specific mechanisms for such an effect are still to be determined. Women with diabetes have an increased prevalence of bacteriuria for all age groups.<sup>6</sup> For ambulatory older men, the primary factor promoting bacteriuria is prostatic hypertrophy, resulting in obstructed voiding and turbulent flow of urine in the urethra. Many older men also have prostate calculi which serve as a nidus for recurrent bacteriuria within the urinary tract.

These patient variables also are likely to contribute to bacteriuria in the institutionalized elderly, but their role is generally overwhelmed by the impact of chronic comorbid diseases. For both men and women, the chronic neurologic diseases that lead to institutionalization, such as cerebrovascular disease, Parkinson's disease or Alzheimer disease, are usually accompanied by neurologic involvement of the bladder. This results in impaired voiding, increased residual volume and retention, all of which promote bacteriuria.

A chronic indwelling catheter also facilitates entry of bacteria into the bladder and promotes persistence of bacteriuria once present. When an indwelling catheter is present the bladder does not completely empty; a pool of urine persists around the bulb and bacteria continue to multiply in this retained urine. In addition, a chronic indwelling catheter and any foreign material in the urinary tract, including catheters and stents, provide a surface for bacterial biofilm development.<sup>7</sup> Biofilm is composed of bacteria and extracellular bacterial substances with urinary components, including Tamm-Horsfall protein and minerals such as magnesium and calcium. Bacteria growing within the biofilm live in an environment relatively protected from antimicrobials or host defenses. This leads to the persistent, polymicrobial bac-

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teriuria characteristic of residents with chronic indwelling catheters.<sup>4</sup>

Bacterial species isolated from asymptomatic infection in older populations are similar to those isolated from any population with complicated urinary infection.<sup>8</sup> *Escherichia coli* remains the single most common species, but other enterobacteriaceae, *Pseudomonas aeruginosa* and gram-positive organisms such as enterococcus, coagulase negative staphylococci and group B streptococci, are frequent. Urease-producing organisms, including *Proteus mirabilis* and *Morganella morganii* are common, and may be isolated more frequently in men than in women. For the institutionalized population, transmission of organisms among patients may result in a high prevalence of a single species in bacteriuric residents on a unit. *Providencia stuartii*, another urease-producing organism, appears to have a particular predilection for transmission in the institutional environment.<sup>9</sup> Organisms isolated from bacteriuria in institutionalized residents also tend to be of increased resistance. This is a result of repeated courses of antimicrobials given to individual patients, as well as the pressure for intense antimicrobial use for all infections in the long-term care environment.

Table 1

### Estimates of Prevalence of Asymptomatic Bacteriuria in Various Older Populations<sup>2</sup>

	Prevalence
<b>Community-dwelling Residents</b>	
Women 60–70 years	5–10%
Women > 70 years	15–20%
Men > 65 years	5–10%
<b>Long-term Care Facility Residents</b>	
Women	25–50%
Men	15–40%
With chronic indwelling catheter	100%

## Impact of Asymptomatic Bacteriuria

The short-term adverse outcomes that have been considered potentially attributable to asymptomatic bacteriuria include acute symptomatic episodes, such as pyelonephritis and bacteremia. Mid-term outcomes possibly due to asymptomatic bacteriuria include urolithiasis and increased chronic genitourinary symptoms such as incontinence, while long-term outcomes include renal failure, hypertension and mortality. Current evidence does not support a role for asymptomatic bacteriuria as a contributor to any of these potential adverse outcomes in residents without indwelling catheters.<sup>2</sup> Older subjects with asymptomatic bacteriuria are likely to have an increased frequency of symptomatic urinary infection, but this is not attributable to asymptomatic bacteriuria. These individuals are simply at increased risk of all urinary infection, both symptomatic and asymptomatic. Urease-producing organisms are commonly isolated from older long-term care facility residents with asymptomatic bacteriuria, but excess urinary stone disease in this population has not been described.<sup>10,11</sup> On the other hand, subjects with chronic indwelling catheters infected with these organisms have a higher frequency of catheter blocking, which is also caused by biofilm.<sup>12</sup>

While early studies from Europe reported an increased mortality in older ambulatory subjects with asymptomatic bacteriuria, subsequent studies in both institutionalized<sup>13,14</sup> and noninstitutionalized populations<sup>15</sup> have not confirmed this association. The initial reports were likely subject to residual confounding in patient characteristics. Any group of older subjects with asymptomatic bacteriuria will differ from those without bacteriuria in variables such as functional status and comorbid illness, which are themselves independent predictors for mortality.

While bacteriuria has not been shown to be associated with negative clinical outcomes, asymptomatic bacteriuria is a frequent reason for prescribing

antimicrobial therapy for residents of long-term care facilities.<sup>16</sup> This antimicrobial use contributes to the emergence and persistence of resistant organisms in these environments, as well as the increase of adverse antimicrobial effects in residents and in the cost of care.

## Optimal Management

Asymptomatic bacteriuria in institutionalized older residents should not be treated with antimicrobials. This recommendation follows consistent observations of no benefit with treatment in prospective, randomized, comparative trials of therapy versus no therapy in these populations (Table 2).<sup>10,14,17,18</sup> Treatment of asymptomatic bacteriuria does not decrease the frequency of symptomatic episodes of urinary infection, does not improve chronic genitourinary symptoms and does not enhance survival. With treatment of bacteriuria, however, residents experience increased rates of re-infection with resistant organisms, increased adverse effects attributable to antimicrobial therapy and increased costs of care. As there is no indication for treatment of asymptomatic bacteriuria, it follows that screening for asymptomatic bacteriuria in this population is not appropriate.

At least 90% of older bacteriuric individuals have pyuria.<sup>2</sup> The presence or absence of pyuria on urinalysis is not specific for bacteriuria, and does not differentiate symptomatic and asymptomatic infection, nor is it an indication for antimicrobial therapy. In addition, the degree of pyuria does not correlate with mortality in up to five years follow-up.<sup>19</sup>

There are few studies describing management in ambulatory populations. No significant difference in frequency of symptomatic episodes was found with treatment of asymptomatic bacteriuria in ambulatory women in six months follow-up.<sup>20</sup> Pending further studies relevant to older community populations, observations from the institutionalized population should be considered applicable. For patients with chronic indwelling catheters, treatment of asymptomatic bacteriuria does not pre-

Table 2

### Prospective, Randomized Trials of Asymptomatic Bacteriuria Treatment in Older, Institutionalized Populations

Trial	Population	Outcomes
Nicolle, <i>et al.</i> , 1983 <sup>10</sup>	Men	No therapy vs. therapy, followed for 24 months: – symptomatic episodes, 10% vs. 13% – mortality, 31% vs. 25%
Nicolle, Mayhew and Bryan, 1987 <sup>18</sup>	Women	No therapy vs. therapy, followed for 12 months: – symptomatic episodes, 0.05 vs. 0.14 – mortality, 18% vs. 39% (p=0.11) – resistant reinfection, 6.7% vs. 20% (p=0.05) – adverse antibiotic reactions, 4% vs. 36% (p=0.03)
Abrutyn, <i>et al.</i> , 1994 <sup>14</sup>	Women	Over nine years follow-up: – with treatment, relative risk of mortality 0.92 (95% confidence interval 0.50–1.97)
Ouslander, <i>et al.</i> , 1995 <sup>17</sup>	Incontinent women with treatment of bacteriuria	No decrease in frequency or volume of incontinence
Warren, <i>et al.</i> , 1982 <sup>21</sup>	Chronic indwelling catheter	Episodes of fever similar in treated or not treated, with mean follow-up of 29.2 weeks: – resistant isolates in reinfection: 64% treated vs. 25% not treated

vent symptomatic urinary infection, but rather leads to infection with bacteria of increasing resistance.<sup>21</sup>

### Diagnosis of Symptomatic Infection

The high prevalence of asymptomatic bacteriuria in older populations, particularly among the institutionalized elderly, limits the utility of the urine culture as a diagnostic test for symptomatic urinary infection. When the prevalence of asymptomatic bacteriuria is 50%, a urine culture is positive for at least 50% of individuals for any clinical presentation, regardless of whether it is related to urinary infection. Given the inherent diagnostic imprecision in the management of confused older people with chronic symptoms, as well as this high frequency of asymptomatic bacteriuria, symptomatic urinary infection in this population is overdiagnosed and overtreated. In a prospective study of residents of long-term care facilities, a presentation of fever and a positive urine culture without localizing

genitourinary findings had serologic evidence supporting a urinary source in only 10% of episodes.<sup>22</sup> About 90% of patients would be misdiagnosed if fever and a positive urinary culture were considered sufficient diagnostic criteria for urinary infection. This potential misdiagnosis is of concern because management of alternate diagnoses may be delayed, and because treatment of urinary infection contributes to the intensive use of antimicrobial agents in long-term care facilities.

The appropriate management of the older, noncommunicative resident with a positive urine culture and acute clinical deterioration, however, remains an important problem in the long-term care facility.<sup>23</sup> Symptomatic urinary infection is likely if there are acute, localizing, genitourinary symptoms, fever with a chronic indwelling catheter, or bacteremia. Clinical deterioration in the absence of specific genitourinary findings is unlikely to be due to urinary infection. Similarly, foul-smelling or cloudy urine and

chronic genitourinary symptoms are not sufficient to diagnose symptomatic urinary infection or to initiate antimicrobial therapy.<sup>17,24</sup> When the diagnosis is uncertain, observation and repeated reassessment is likely the appropriate approach. Current access to physician or nurse practitioner evaluation in long-term care facilities, however, may not be adequate to support an approach of repeated reassessment. In addition, for residents who are significantly ill with high fevers and hemodynamic instability, presumptive treatment will still be necessary. Further evaluation of approaches to management of this clinical problem in the institutionalized population are necessary.

### Conclusions

Asymptomatic bacteriuria is very common in older populations. It is important that clinicians who care for these patients understand the characteristics and management of this problem. Screening urine cultures are not indicated for ambulatory

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ry or institutionalized older subjects, and treatment of asymptomatic bacteriuria, with or without pyuria, is not appropriate. Managing the aging individual with clinical deterioration, no localizing findings and a positive urine culture remains problematic. Careful and repeated clinical assessment and limitation of antimicrobial use is the preferred approach, but may not always be feasible. ◆

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