

AHCA/NCAL Infection Preventionist Hot Topic Brief

Examining the Use of Nitrite Results in Guiding Antibiotic Treatment for UTIs

Focal Problem or Issue:

The value of using urine nitrite testing to indicate the presence of bacteria has come under growing scrutiny. The nitrite dipstick test is a common part of the urinalysis (UA) testing process, which is quick and noninvasive, but its diagnostic interpretation and accuracy are influenced by several variables. These variables can result in both false positives and false negatives. The results can contribute to diagnostic errors and antimicrobial overuse. As evidence grows, clinicians question the value of continuing to rely on nitrite results in guiding diagnosis and antibiotic treatment decisions.¹

Background and Scope:

Nitrite testing has been around for over a century, and it is a standard component of the dipstick portion of the urinalysis. Understanding the meaning of nitrates and nitrites in urine is important when determining the significance of the nitrite test results. Normally, healthy urine has nitrates present, which are nitrogen chemicals that are created as part of the production of waste by-products of dietary protein.

Bacteria that cause urinary tract infections fall into two groups regarding nitrates. Either those that produce an enzyme (i.e. nitrate reductase) that changes the normally found nitrates in the urine to nitrites or those that do not produce the enzyme necessary to change nitrates into nitrites. If urine contains bacteria that produce an enzyme that converts nitrates to nitrites, the urinalysis test results will be positive for nitrites. If instead, the urine contains bacteria that do not have the enzyme to change nitrate into nitrite, the results will indicate negative for nitrites even though there are bacteria present. The test will also indicate negative for nitrites when there are no bacteria present. It is for this reason that the nitrite test results can be unreliable in accurately identifying uropathogens present in the urine. The specificity of the nitrite test hinges on the presence of bacteria capable of reducing urinary nitrates to nitrites.

Additional Influencing Factors for Nitrite Testing Results Issue:

A key consideration is the duration for which urine is retained in the bladder prior to collection. For nitrites to be produced, urine typically needs to stay in the bladder for at least four hours, allowing bacterial enzymes enough time to convert nitrates into nitrites. Therefore, collecting the first voided urine specimen in the morning is recommended.

Sample processing techniques also play a crucial role. Results may be less reliable if the specimen or dipstick is not handled according to the manufacturer's directions. For instance, if the dipstick is exposed to air for too long, it may cause a false positive result.

These findings and others cast doubt on whether the presence of bacteriuria as indicated by a positive nitrite test should guide clinicians in starting empirical antibiotics.

Bacteria that have the specific enzyme to change nitrates to nitrites include: *Escherichia coli*, *Klebsiella*, *Proteus*, and *Serratia*

Bacteria that do not have the specific enzyme to change nitrated to nitrites include: *Acinetobacter* and *Enterococcus*

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Criteria for diagnosis of UTI includes the presence of compatible signs and symptoms, urinalysis and culture results.

Classic symptoms of uncomplicated urinary tract infection (UTI) include focal genitourinary symptoms such as:

- Urinary frequency
- Urgency
- Dysuria
- Suprapubic discomfort

Individuals **without** focal genitourinary symptoms are generally considered **asymptomatic bacteriuria (ASB)** and does not constitute treatment **except** in the following exceptions:

- Pregnant women
- Patients about to undergo specific urologic procedures
- Those with a kidney transplant or other high-risk conditions where it has been shown to prevent complications. 2

Current Guideline Recommendations:

Although there are no current guidelines containing recommendations on the use of urinary nitrite test results for diagnosing UTIs, there are specific recommendations from the Infectious Diseases Society of America (IDSA) related to the management of asymptomatic bacteriuria in the current Clinical Practice Guideline for Management of Asymptomatic Bacteriuria: Update 2019 IDSA". Since the initial publication of the guideline in 2005, which focuses on recognizing the distinction between asymptomatic urinary tract infection (ASB) and symptomatic urinary tract infection, the recommendations have become integral to the assessment of antibiotic therapy appropriateness

Distinguishing between asymptomatic and symptomatic UTIs by utilizing evidence-based recommendations is an important part of the clinical assessment for UTI treatment. The following are several recommendations taken from the IDSA guideline for specific situations common to older adults, including those residing in long-term care settings.

The following are recommendations for older adults regarding screening for or treating ASB.2

1. In older, community-dwelling people who are functionally impaired, we recommend against screening for or treating ASB (strong recommendation, low-quality evidence).
2. In older persons resident in long-term care facilities, we recommend against screening for or treating ASB (strong recommendation, moderate-quality evidence).

There are so many different causes for behavior change in older adults with or without dementia, and the prevalence of ASB is so common, using behavior change to trigger urine testing or as part of the criteria to diagnosis a UTI will lead to both over diagnosis and inappropriate antibiotic prescribing but also to not evaluating and treating the actual cause of the behavior change.

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Summary:

- **Relying on dipstick results for nitrites alone has been shown to be inadequate for detecting urinary tract infections (UTIs), especially in the elderly population.**

This has been primarily due to the poor specificity of the test for uropathogenic bacteria. A positive dipstick test needs to be correlated with clinical signs and symptoms of a UTI and should ideally be confirmed by a urine culture before initiating treatment.

Elderly residents and patients are often overdiagnosed with UTIs and unnecessarily treated with antibiotics, largely due to high rates of asymptomatic bacteriuria and a tendency toward overtreatment in this population.

- **Antimicrobial stewardship programs have identified non-treatment of asymptomatic bacteriuria as a significant opportunity to reduce inappropriate antimicrobial use.**

As efforts to improve antimicrobial stewardship and reduce unnecessary antibiotic prescriptions increase, the specific limitations of nitrite testing are becoming more relevant. As a result, there is a growing shift toward more comprehensive clinical assessments and careful interpretation of laboratory findings when making treatment decisions.

References:

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