

Early Diagnosis of Urinary Tract Infections

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Urinary tract infections (UTIs) are challenging, not only because of the large number of infections that occur each year, but also because the diagnosis of UTI is not always straightforward. Physicians must distinguish UTI from other diseases that have a similar clinical presentation, some UTIs are asymptomatic or present with atypical signs and symptoms, so, semiquantitative urine culture is the reference standard for diagnosis of urinary tract infection, yielding a colony count of greater than 10^5 cfu/ml, but it has several practical problems. At least 18 to 24 h are needed for detection of bacterial growth on culture media by standard microbiological techniques and this could cause delay in the treatment. However, clinical importance of early diagnosis and delays with the reference standard, rapid urine tests are used widely. The purpose of rapid bacteriuria screening is twofold:

- (i) to provide accurate information to the physician in a timely manner, which in turn leads to prompt care of the patients.
- (ii) to eliminate negative specimens rapidly.

Rapid bacteriuria screens include a variety of methodologies that use microscopic, enzymatic, filtration, and automated procedures. The tests that have received the most attention are biochemical analyses (enzymatic) of leukocyte esterase and nitrate reductase through a rapid dipstick method. Urine dipsticks are appealing, because they provide rapid results, do not require microscopy, and are eligible for a waiver under the Clinical Laboratory Improvement Amendments.

1- Urine Gram Stain

The Gram stain is one of the most rapid, reliable, and inexpensive methods for estimating bacteriuria at $\geq 10^5$ CFU/ml. Microscopic examinations of fresh, uncentrifuged urine may give useful information, enabling the physician to start treatment while awaiting urine culture results. Finding any bacteria in a Gram-stained urine specimen has been shown to have high sensitivity and specificity for

predicting a positive urine culture. This simple, effective method without the use of a laboratory centrifuge and culture medium makes it an ideal practice in laboratories lacking in resources or facilities to deal with these commonly received specimens.

2- Nitrite Test

The enzyme nitrate reductase catalyzes the removal of oxygen from nitrate, leaving nitrite and water as products. This reaction is the basis for a physiological test used in identifying certain bacteria. This test indicates the presence of urinary nitrite (which is converted from dietary nitrates in the presence of most Gram-negative enteric bacteria in the urine). The conversion of dietary nitrates to nitrites by bacteria requires approximately 4 hours in the bladder. However, not all urinary pathogens reduce nitrate to nitrite. So that, a negative nitrite test does not necessarily mean that the urine is free of all bacteria, particularly if there are clinical symptoms, because some bacteria do not produce nitrite. Optimal results for a urinary nitrite test are obtained by analyzing at an early morning. Bacteria need four to six hours remaining in urine to produce enough amount of nitrite to make the bar sensitive to it and show the change in colour. For this reason the patients who frequently urinate, the bacteria appear in urine without nitrite existence, so the morning urine sample is better than other samples because bacteria took enough time to produce nitrite. The existence of nitrite without the existence of bacteria refers to little number of bacteria and results in disappearance of bacteria in slide. In addition to many factors that perform false positive, such as food that contains nitrite, bad quality of the dipstick and other sources that are related to the increase of bilirubin in urine and nitrite appearance wrongly.

3- Leukocyte Esterase Test

leukocyte esterase (LE), an enzyme produced by polymorphonuclear (PMN) which indicates an active infection. Testing by dipstick has been used for a rapid diagnosis of infection in many body fluids such as urine, pleural fluid, and cerebrospinal fluid. In urine, when this test is positive, it may indicate that there is inflammation in the urinary tract or kidneys. The most common cause for white

blood cells (WBCs) in urine (leukocyturia) is a bacterial urinary tract infection (UTI), such as a bladder or kidney infection.

Leukocyte esterase enzyme is a marker of pyuria from neutrophils found in infected urine, it is released from PMN cells reacts with an esterified chemical compound in the reagent strip yielding a violet azo dye, the intensity of which correlates to leukocyte count. Number of researchers refers that Leukocyte esterase, produced by neutrophils at the site of inflammation is qualitatively detected to indicate infection by bacteria. However, localization of leukocytes could also be due to urethritis, tuberculosis, viral infections, steroids and exercise.