

Urinalysis in urinary tract infection

When a urinary tract infection is suspected, we examine the urine chemically and evaluate the urinary sediment. In indicated cases, we also use urine culture with antibiotic susceptibility testing.

Chemical examination of urine

A number of abnormalities can be found in urinary tract infections during **chemical urinalysis**:

Alkaliuria

Some bacteria (e.g. *Pseudomonas*, *Klebsiella*^[1]) decompose urea by the enzyme urease into ammonia. This alkalinizes the urine. Infection of the urinary tract should therefore always be considered if the urine pH is higher than 6.5. However, more acidic urine does not exclude a urinary infection. Other causes of alkaline urine are more rare. Higher urine pH tends to be found in people with a diet rich in plant components.

Nitrites

In particular, Gram-negative bacteria (mainly *E. coli*, **Proteus**, **Klebsiella**, **Aerobacter**) can reduce nitrate to nitrite. The presence of nitrite is thus an indirect sign of bacteriuria. This test is very specific, but its sensitivity is only around 50%.^[2]

Hematuria

It is demonstrable in most urinary infections. Positivity of urine chemistry for blood can also be caused by the presence of peroxidases in bacteriuria. Unfortunately, the test is not very specific.

Leukocyturia

It also accompanies a large proportion of urinary tract infections. Quantitative urine sediment testing is more sensitive than chemical urinalysis.

Proteinuria

The amount of protein in the urine in urinary tract infections varies from concentrations that are not detectable by basic techniques to values around 2 g/l.

Other findings in urine chemistry

In urinary tract infections, bilirubin, urobilinogen and ketone bodies are often false positives.

It follows that the result of urine chemistry can be very rich in urinary tract infection. On the other hand, we also encounter bacteriuria with completely normal chemical findings. Any combination of results between these two extremes is therefore compatible with the diagnosis of urinary tract infection. However:

- If nitrites are positive, urinary infection is almost certain (specificity > 95%). However, quite often nitrites remain negative in urinary infection (sensitivity around 50%).
- 98% of urinary infections are positive for at least one of the parameters hematuria, leukocyturia, nitrites, proteinuria^[3].

However, with the exception of nitrites, the finding is often due to another cause and urinary tract infection must therefore be confirmed by further examination (microscopic and culture).



Diagnostic strips for urinalysis

Sediment examination

In urinary **sediment** in urinary tract infections we usually find higher numbers of **erythrocytes and leukocytes**; in these parameters sediment examination is usually more sensitive than chemical examination. There are also higher numbers of **epithelial cells** corresponding to the site of inflammation and, of course, more **bacteria** are found.

Links

References

1. PECKOVÁ, Marie. *Základní soubory laboratorních vyšetření : Chemické, mikroskopické a bakteriologické vyšetření moče* [online]. ©2011. [cit. 2014-05-27]. <http://www.propedeutika.cz/met_lab_moc.html>.
2. FOX, Gary N. Sensitivity and specificity of urinary nitrite for UTIs. *Am Fam Physician* [online]. 2005, vol. 72, no. 11, p. 2180; author reply 2180, 2182, Available from <<https://www.ncbi.nlm.nih.gov/pubmed/16342841>>. ISSN 0002-838X.
3. PATEL, H D - LIVSEY, S A - SWANN, R A. Can urine dipstick testing for urinary tract infection at point of care reduce laboratory workload?. *J Clin Pathol* [online]. 2005, vol. 58, no. 9, p. 951-4, Available from <<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1770822/?tool=pubmed>>. ISSN 0021-9746.