

Microscopic investigation of urinary sediment

Investigation of urinary sediment is used in the diagnostics of acute and chronic inflammatory processes in the kidneys and the rest of urinary tract, as well as in the diagnostics of other diseases. The urinary sediment in healthy person contains just rare epithelial cells and some crystals. The most frequent pathological findings in the sediment are: red blood cells (RBC), cells of reticuloendothelial system (white blood cells (WBC), macrophages), epithelial cells, casts (hyaline, granulated, cellular, granular, lipid, waxy), crystals (calcium oxalate, cystine, tyrosine etc.), infectious agents etc. (see attached atlas of urinary sediment findings).

RBC have typical discoid shape with central bleach. Their occurrence is called *haematuria* and may result from bleeding in any part of urinary tract, from trauma, neoplasia or inflammation.

WBC are round cells bigger than RBC with granulated structure and segmented nucleus. Their presence in the urine is called *pyuria* and is a mark of inflammation.

Epithelial cells of round or polygonal shape occur very often in the urine. We can distinguish squamous cells, urothelial (transitional) cells or renal tubular cells.

Casts are cylindrical structures composed mainly of coagulated mucoprotein, which is secreted by epithelial cells of renal tubules, and may contain also cells.

Hyaline casts of serpentine shape are formed in the absence of cells in the tubular lumen, they are markers of *proteinuria*.

Granular casts have clubbed shape and granulated structure and origin from damaged tubular epithelial cells.

RBC casts are created by sticking RBC on hyaline or granular casts and they are typical for glomerulonephritis.

WBC casts are created by sticking leukocytes on any basic type of casts, usually in chronic infections of urinary tract.

Epithelial casts occur in abundant number of desquamated epithelial cells in the urine and after their sticking on any basic type of casts, e.g. in chronic cystopyelonephritis.

Colour and shape of **crystals** may vary, however, several of them are typical for several pathological situations, e.g. crystals of calcium oxalate may be found in ethyleneglycol intoxication (component of non-freezing cooling mixtures) or in excessive vegetarians, crystals of tyrosine and leucine may be observed in acute hepatic injury, crystals of bilirubin in parenchymatous and obstructive icterus etc.

Occurrence of **bacteria** gives an evidence of infection in urinary tract, usually by *E. coli*.

Material

Urinary glass, fresh urine, test-tubes, centrifuge (3000 rpm), microscope, slides, cover-slips, pipette.

Methods

Urinary sediment is usually investigated from fresh morning urine, not older than 4 hours. Pour 5 ml of urine into the test-tube and let it centrifuge in 3000 rpm for 5-10 minutes. Then pour off most of the supernatant, keep just 0.5 ml of sediment. After mixing with glass stick take 1 drop of the urinary sediment and put it on the slide and cover it by the cover-slip. The material may be stained, e.g. by Giemsa. Observe the urinary sediment in the microscope firstly in smaller (objective 10x), than in bigger magnification (objective 40x). Standards for cells are <1 RBC resp. <5 WBC in one high-power field (objective 40x).