

3 - Microscopic examination of Urine

Methodology

- A sample of well-mixed urine (usually 10-15 ml) is centrifuged in a test tube at relatively low speed (about 2-3,000 rpm) for 5-10 minutes until a moderately cohesive button is produced at the bottom of the tube.
- The supernatant is decanted and a volume of 0.2 to 0.5 ml is left inside the tube. The sediment is re_ suspended in the remaining supernatant by flicking the bottom of the tube several times. A drop of resuspended sediment is poured onto a glass slide and cover slipped

Examination

The sediment is first examined under low power to identify most crystals, casts, squamous cells, and other large objects. The numbers of casts seen are usually reported as number of each type found per low power field (LPF). Example: 5-10 hyaline casts/LPF.

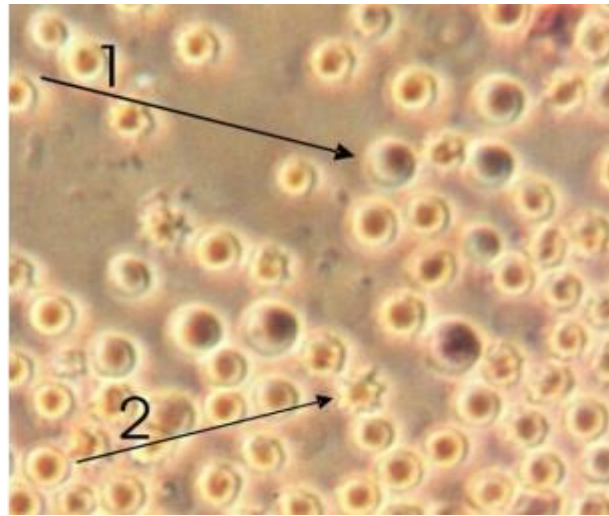
Next, examination is carried out at high power to identify crystals, cells, and bacteria. The various types of cells are usually described as the number of each type found per average high power field (HPF). Example: 1-5 WBC/HPF .

1 -Red Blood Cells

Hematuria is the presence of abnormal numbers of red cells in urine due to:

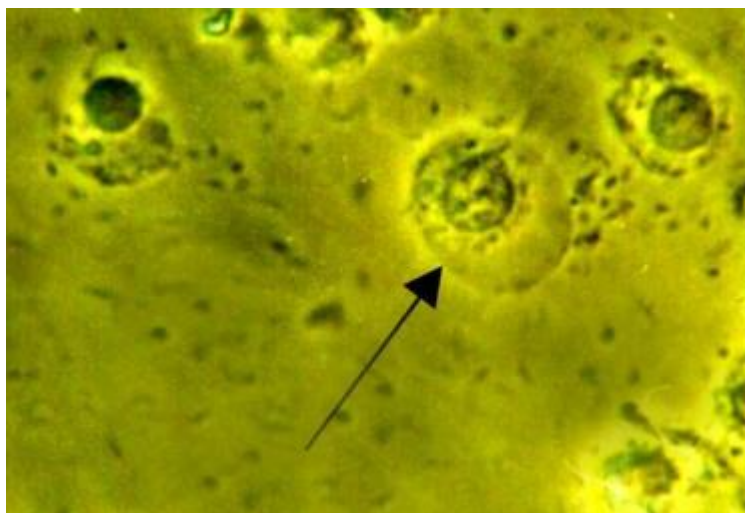
- glomerular damage.
- kidney trauma.
- urinary tract stones.
- upper and lower urinary tract infections.
- nephrotoxins.
- physical stress.

- Red cells may also contaminate the urine from the vagina in menstruating women.



2 -White Blood Cells (Pus Cells)

- Pyuria refers to the presence of abnormal numbers of leukocytes that may appear with infection in either the upper or lower urinary tract or with acute glomerulonephritis.
- Usually, the WBC's are granulocytes. White cells from the vagina, especially in the presence of vaginal and cervical infections.
- If two or more leukocytes per each high power field appear in non-contaminated urine, the specimen is probably abnormal.
- Leukocytes have lobed nuclei and granular cytoplasm.



3 -Epithelial Cells

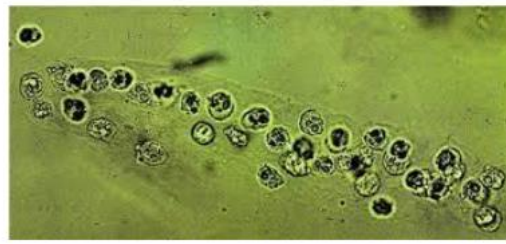
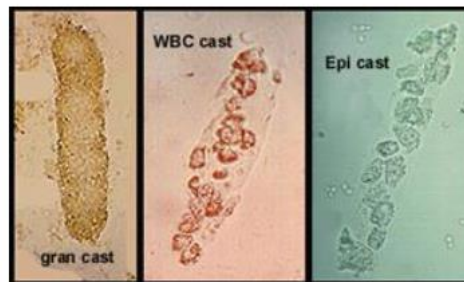
Renal tubular epithelial cells, usually larger than granulocytes, contain a large round or oval nucleus and normally slough into the urine in small numbers.

However, with nephrotic syndrome and in conditions leading to tubular degeneration, the number sloughed is increased.



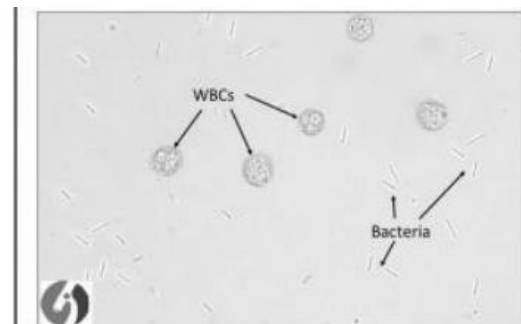
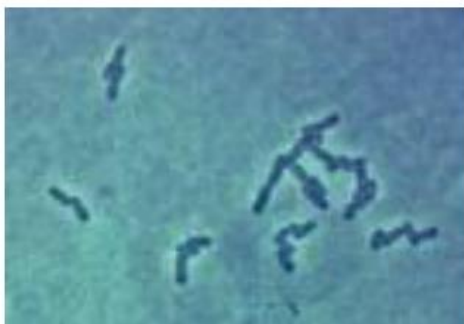
4 -Casts

- They are solid and cylindrical structures formed by precipitation of debris in the renal tubules.
- Urinary casts are formed only in the distal convoluted tubule (DCT) or the collecting duct (distal nephron). The proximal convoluted tubule (PCT) and loop of Henle are not locations for cast formation.
- Hyaline casts are composed primarily of a mucoprotein secreted by tubule cells, hyaline casts are seen in healthy individuals.
- RBCs casts are formed when RBCs stick together and in glomerular disease.
- WBCs casts are seen in acute pyelonephritis and glomerulonephritis.
- Granular and waxy casts are seen in nephrotic syndrome.



5 -Bacteria

- Bacteria are common in urine specimens because of the abundant normal microbial flora of the vagina or external urethral and because of their ability to rapidly multiply in urine standing at room temperature.
- Therefore, microbial organisms found in all but the most carefully collected urines should be interpreted in view of clinical symptoms.



6 -Yeast

Yeast cells may be contaminants or represent a true yeast infection. They are often difficult to distinguish from red cells and amorphous crystals but are distinguished by their tendency to bud. Most often they are *Candida*, which may colonize bladder, urethra, or vagina .

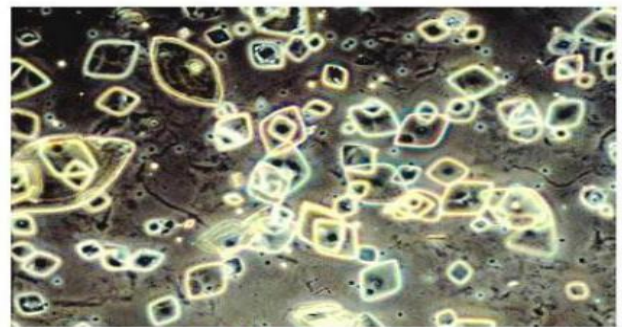


7 - Crystals

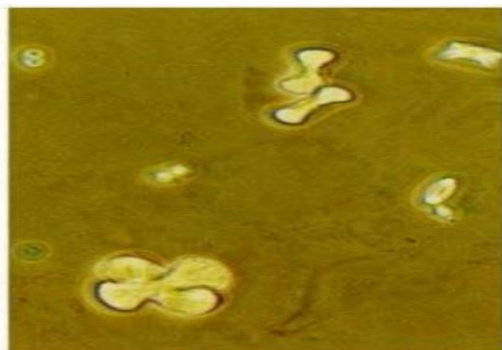
Common crystals seen even in healthy patients include calcium oxalate, triple phosphate crystals and amorphous phosphates.



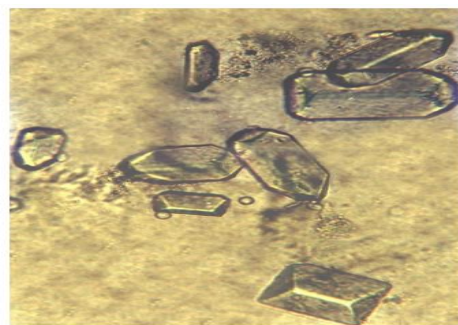
Calcium oxalate



Uric Acid



Calcium oxalate (monohydrate)



Amonium megnesium (triple phosphate)