

ATLAS OF URINE SEDIMENT

CELLS IN URINE

Epithelial Cells Three types of epithelial cells may appear in urine sediment: renal tubular, transitional and/or squamous. Other types of cells may appear in urine but are difficult to identify due to morphologic changes caused by urine. Tubular cells are approximately 1/2 larger than white blood cells. Transitional epithelial cells may arise from the renal pelvis, ureters, bladder or urethra. They tend to be pear-shaped. Squamous cells are large and flat with a prominent nucleus. They originate in the urethra.



RENAL TUBULAR



TRANSITIONAL



CRYSTALS FOUND IN ACID URINE

Uric Acid Crystals Uric acid has birefringent characteristics; therefore, it polarizes light, giving multi-colors. Uric acid crystals are found in acid urine. Uric acid may assume various forms, e.g., rhombic, plates, rosettes, small crystals. The color may be red-brown, yellow or colorless. Although increased in 16% of patients with gout, and in patients with malignant lymphoma or leukemia, their presence does not usually indicate pathology or increased uric acid concentrations.



URIC ACID (BRIGTHFIELD)

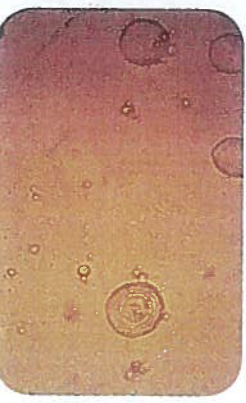
URIC ACID (POLARIZED)

Leucine/Tyrosine Crystals Leucine and tyrosine are amino acids which crystallize and often appear together in the urine of patients with severe liver disease. Tyrosine usually appears as fine needles arranged as sheaves or rosettes and appear yellow. Leucine is usually yellow, oily-appearing spheres with radial and concentric striations.



TYROSINE (BRIGTHFIELD)

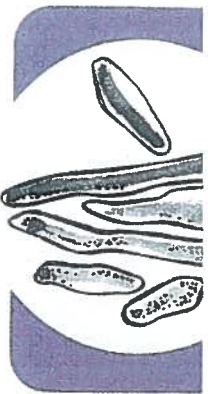
LEUCINE (BRIGTHFIELD)



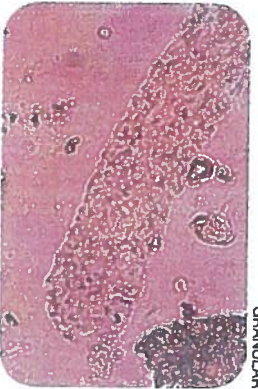
CYSTINE (BRIGTHFIELD)

Cystine Crystals Cystine crystals are thin, hexagonal-shaped (6-sided) structures. They appear in the urine as a result of a genetic defect. Cystine crystals and stones will appear in the urine in cystinuria and homocystinuria. Cystine crystals are frequently confused with uric acid crystals. Cystine crystals do not polarize light.





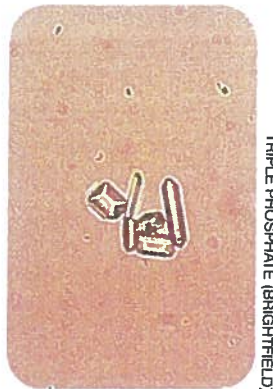
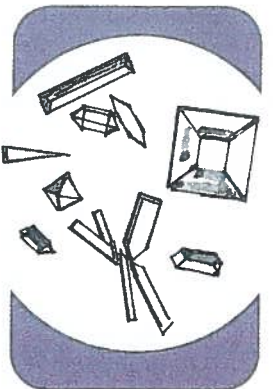
Granular Casts Granular casts are casts with granules present throughout the cast matrix. They are quite refractile. If the granules are small, the cast is defined as a finely granular cast. If granules are large, it is termed a coarsely granular cast. Granular casts can appear in urine in normal or abnormal states.



RBC Casts RBC casts are pathologic and their presence is usually indicative of severe injury to the glomerulus. Rarely, transubular bleeding may occur, forming RBC casts. RBC casts are found in acute glomerulonephritis, lupus bacterial endocarditis and septicemias. "Blood" casts are granular and contain hemoglobin from degenerated RBCs.



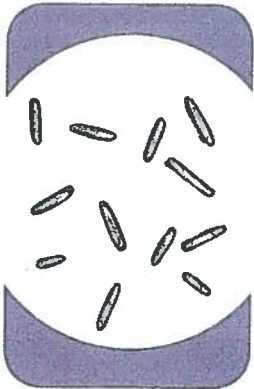
WBC Casts WBC casts occur when leukocytes are incorporated within the cast matrix. WBC casts will usually indicate an infection, most commonly pyelonephritis. They may also be seen in glomerular diseases. WBC casts may be the only clue to pyelonephritis.



MULTIPLE PHOSPHATE (BRIGHFIELD)

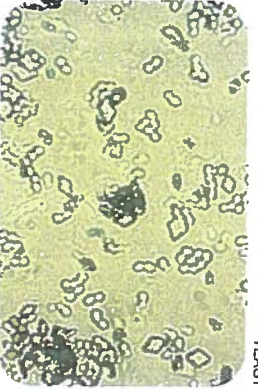
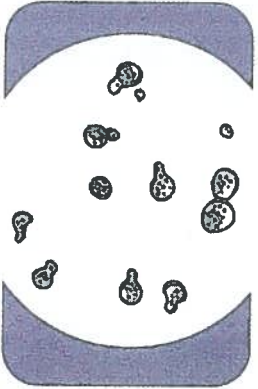
BACTERIA, FUNGI, PARASITES IN URINE

Bacteria Bacteria in the urine (bacteriuria) can result from contaminants in collection vessels, from perineurethral tissues, the urethra, or from fecal or vaginal contamination as well as from true urinary infection.



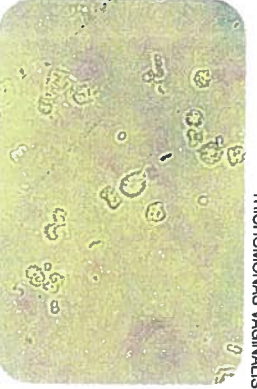
BACTERIA

Yeast Yeast cells vary in size, are colorless, ovoid, and are often budding. They are often confused with RBCs. *Candida albicans* is often seen in diabetes, pregnancy, obesity and other debilitating conditions.



YEAST

Trichomonas Vaginalis Trichomonas vaginalis is a flagellate protozoan which affects both males (urethritis) and females (vaginitis).

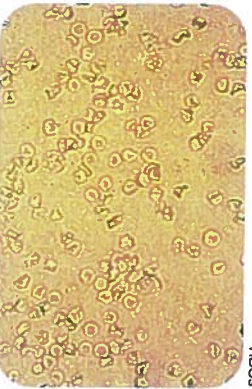
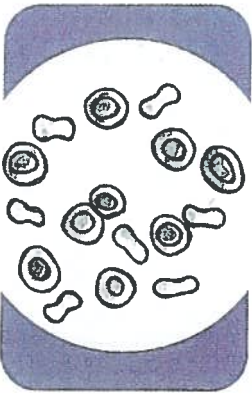


TRICHOMONAS VAGINALIS



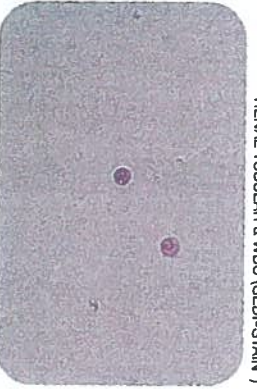
SQUAMOUS

RBCs Red blood cells may originate from any part of the renal system. The presence of large numbers of RBCs in the urine suggests infection, trauma, tumors, renal calculi, etc. However, the presence of 1 or 2 RBC/(HPF) in the urine sediment, or blood in the urine from menstrual contamination, should not be considered abnormal.

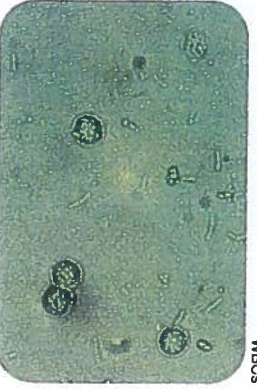
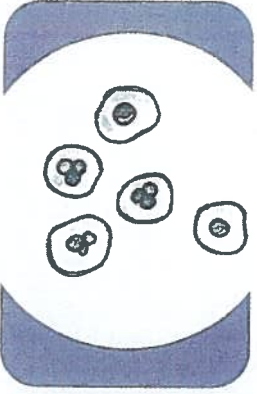


RBCs

WBCs White blood cells in the urine (pyuria) may originate from any part of the renal system. The presence of more than 5 WBCs per HPF may suggest infection, cystitis, or pyelonephritis.



RENAL TUBULAR & WBC (SEDI-STAIN¹)

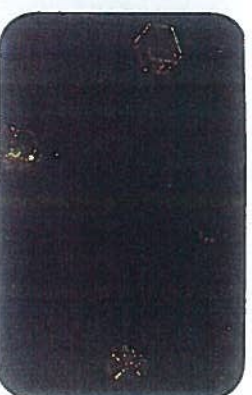


WBCs

CASTS IN URINE

Hyaline Casts Hyaline casts are formed from a protein gel in the renal tubule. Hyaline casts may contain cellular inclusions. Hyaline casts will dissolve very rapidly in alkaline urine. Normal urine sediment may contain 1 to 2 hyaline casts per low power field (LPF).

HYALINE



CRYSTALS FOUND IN ACID, NEUTRAL AND ALKALINE URINE

Calcium Oxalate Calcium oxalate crystals most frequently have an "envelope" shape and appear in acid, neutral or slightly alkaline urine. They appear in the urine after the ingestion of certain foods, i.e., cabbage, asparagus.

CALCIUM OXALATE (BRIGHTFIELD)



Hippuric Acid Hippuric acid crystals are colorless or pale yellow. They occur as needles, six-sided prisms, or star-shaped clusters. They appear in urine after the ingestion of certain vegetables and fruits with benzoic acid content. They have little clinical significance.

HIPPURIC ACID (BRIGHTFIELD)



CRYSTALS FOUND IN ALKALINE URINE

Ammonium Biurate or Ammonium Urates Ammonium urates are yellow-brown in appearance and occur in urine as spheres or spheres with spicules ("thorny apples"). Both forms are frequently seen together. They appear in urine when there is ammonia formation in the urine present in the bladder. They are considered to have little clinical significance.

AMMONIUM URATES (BRIGHTFIELD)



Triple Phosphate Triple phosphate crystals are common in urine sediment. They have