Atlas of Urine Sediment

siemens-healthineers.com

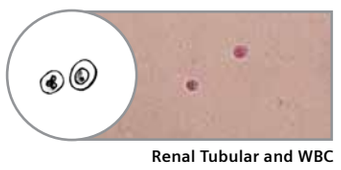
Cells Found in Urine

Renal Tubular

Transitional

Squamous

RBCs



Renal Tubular and WBC

WBCs

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 1/3 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.

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 per high power field (hpf) in the urine sediment, or blood in the urine from menstrual contamination, should not be considered abnormal.

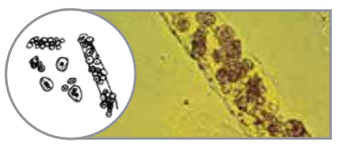
WBCs White blood cells in the urine (pyuria) may originate from any part of the renal system. The presence of more than 5 WBCs per high power field (hpf) may suggest infection, cystitis, or pyelonephritis.

Casts Found in Urine

Hyaline Casts

Granular Casts

RBC Casts



WBC Casts

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

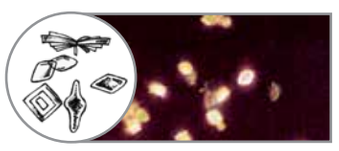
Granular Casts Granular casts are casts with granules present throughout the cast matrix. They are quite refractile. If the granules are large, it is termed a coarsely granular cast. If the granules are small, the cast is defined as a finely granular cast. Granular casts can appear in urine in normal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

RBC Casts RBC casts are pathological and their presence is usually indicative of severe injury to the glomerulus. Rarely, transtubular 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.

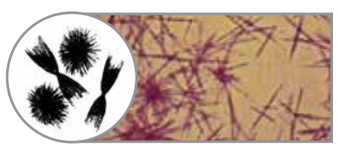
WBC Casts WBC casts occur when leukocytes are incorporated within the cast matrix. WBC casts will usually indicate an infection, most commonly pyelonephritis. They may also be seen in glomerular diseases. WBC casts may be the only clue to pyelonephritis.

Crystals Found in Acid Urine

Uric Acid (brightfield)



Uric Acid (polarized)



Tyrosine (brightfield)

Leucine (brightfield)

Cystine (brightfield)

Cystine (polarized)

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.

Leucine/Tyrosine Crystals Leucine and tyrosine are amino acids that 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 appears yellow. Leucine is usually yellow, oily-appearing spheres with radial and concentric striations.

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.

Crystals Found in Acid, Neutral, and Alkaline Urine

Calcium Oxalate (brightfield)

Hippuric Acid (brightfield)

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.

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 and have little clinical significance.

Crystals Found in Alkaline Urine

Ammonium Urates (brightfield)

Triple Phosphate (brightfield)

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.

Triple Phosphate Triple phosphate crystals are common in urine sediment. They have a “coffin-lid” shape, are colorless, and appear in alkaline urine. The ingestion of fruit may cause triple phosphate to appear in urine.

Bacteria, Fungi, and Parasites Found in Urine

Bacteria

Yeast

Trichomonas Vaginalis

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

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.

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

Contact your Siemens Representative to help you with educational materials and product information relating to the specialized field of urinalysis.

Note: Selected photomicrographs credited to Bowman Gray School of Medicine, Wake Forest University, NC and Rachel Lehman, MS, MT(ASCP).

40-19-14121-01-76 · 11-2019 ·

SIEMENS Healthineers