

# Urinalysis Result Interpretation Chart

The values below are primarily based on normal values as stated in the National Library of Medicine's MedlinePlus encyclopedia and the StatPearls online encyclopedia; we opted to indicate the safer values whenever sources provide different values.

Component	Normal	Interpretation of abnormal results
<b>Physical examination</b>		
<b>Color</b>	Yellow/clear	<ul style="list-style-type: none"> <li>• Brown/black (Tea-colored): Bile pigments, cascara, chloroquine, fava beans, homogentisic acid (alkaptonuria), levodopa, melanin or oxidized melanogen, methemoglobin, methyl dopa, metronidazole, myoglobin, nitrofurantoin, primaquine, rhubarb, riboflavin, senna</li> <li>• Dark yellow: Concentrated specimen (dehydration, exercise)</li> <li>• Green/blue: Amitriptyline, asparagus, biliverdin, cimetidine, clorets (breath mint), indicans, indigo carmine, indomethacin, methocarbamol, methylene blue, promethazine, propofol, pseudomonas UTI, triamterene</li> <li>• Orange: Bile pigments, carrots, coumadin, nitrofurantoin, phenothiazines, phenazopyridine, rifampin, vitamin C</li> <li>• Pink/red: Beets, blackberries, chlorpromazine, food dyes, hematuria, hemoglobinuria, menstrual contamination, myoglobinuria, phenolphthalein, porphyrins, rifampin, rhubarb, senna, thioridazine, uric acid crystals.</li> </ul>
<b>Clarity or turbidity</b>	Clear	Turbid urine may mean bacteria, blood clots, contrast media, a diet high in purine-rich foods, fecal contamination or material (i.e., gastrointestinal-bladder fistula), lipids such as chyluria (chylomicrons in the urine), lymph fluid, mucus, precipitation of cells (red blood cells (RBC), white blood cells (WBC), squamous and non-squamous epithelial cells), casts or crystals (calcium phosphate, calcium oxalate, uric acid), pyuria, semen, small calculi, talcum powder, vaginal creams or secretions, yeast or non-specific/normal
<b>Volume</b>	0.5 to 1.5 cc/kg/hour or 600 and 2,000 mL daily in adults	<ul style="list-style-type: none"> <li>• Anuria (less than 100 cc/day) and oliguria (less than 500 cc/day): Severe dehydration from vomiting, diarrhea, hemorrhage or excessive sweating; renal disease, renal obstruction, renal ischemia secondary to heart failure or hypotension</li> <li>• Polyuria (greater than 2,500 - 3,000 cc/day): Alcohol or caffeine consumption, diabetes mellitus, diabetes insipidus, diuretics, increased water intake, saline or glucose intravenous therapy</li> </ul>
<b>Chemical examination</b>		
<b>pH</b>	4.6 – 8.0	<ul style="list-style-type: none"> <li>• High values: Stale/old urine specimens (most common), hyperventilation, presence of urease-producing bacteria, renal tubular acidosis, vegetarian diet, vomiting. A urinary pH greater than 5.5 in the presence of systemic acidemia (serum pH less than 7.35) suggests renal dysfunction related to an inability to excrete hydrogen ions.</li> <li>• Low values (acid): Cranberry juice, dehydration, diabetes mellitus, diabetic ketoacidosis, diarrhea, emphysema, high protein diet, starvation, potassium depletion, medications (methionine, mandelic acid, etc.), and a possible predisposition to the formation of renal or bladder calculi</li> </ul>
<b>Urinary specific gravity</b>	1.005 – 1.030 (lab dependent)	<ul style="list-style-type: none"> <li>• High values: Contrast media, dehydration, decreased renal blood flow (shock, heart failure, renal artery stenosis), diarrhea, emesis, excessive sweating, glycosuria, hepatic failure, syndrome of inappropriate antidiuretic hormone (SIADH)</li> <li>• Low values: Acute tubular necrosis, acute adrenal insufficiency, aldosteronism, diuretic use, diabetes insipidus, excessive fluid intake (psychogenic polydipsia), impaired renal function, interstitial nephritis, hypercalcemia, hypokalaemia, pyelonephritis</li> </ul>
<b>Osmolality</b>	50-1,200 mOsm/kg (lab dependent)	<ul style="list-style-type: none"> <li>• False elevation: Dextran solutions, intravenous (IV) radiopaque contrast media, proteinuria</li> <li>• False depression: Alkaline urine</li> </ul>

Component	Normal	Interpretation of abnormal results
<b>Chemical examination</b>		
<b>Glucose</b>	Negative or trace (0-0.8 mmol/L or 0-15 mg/dL)	Higher values than normal may indicate diabetes mellitus, Cushing syndrome, Fanconi syndrome, glucose infusion, pregnancy
<b>Ketones</b>	Negative; higher normal value range vary among labs	<ul style="list-style-type: none"> <li>Uncontrolled diabetes mellitus (diabetic ketoacidosis), pregnancy, carbohydrate-free diets, starvation, febrile illness.</li> <li>False-positive triggers: Acid urine, elevated specific gravity, mesna, phenolphthalein, some drug metabolites (e.g., levodopa, captopril)</li> <li>False-negative triggers: Stale/old urine specimens</li> </ul>
<b>Nitrites</b>	Negative	<ul style="list-style-type: none"> <li>Associations: Urinary tract infection (UTI) from a nitrate reductase-positive bacteria (E. coli, Proteus, Enterobacter, Klebsiella, Streptococcus faecalis and Staphylococcus aureus)</li> <li>False-positive triggers: Contamination, exposure of dipstick to air, pigmented materials, phenazopyridine</li> <li>False-negative triggers: elevated specific gravity, elevated urobilinogen levels, nitrate reductase-negative bacteria, acid urine, vitamin C, urine with less than 4 hours of bladder resting, absent dietary nitrates</li> </ul>
<b>Proteins</b>	Negative or trace (random <10 mg/DL, 24 hours <80mg/dL)	<ul style="list-style-type: none"> <li>Albuminuria of 30 mg/day to 300 mg/day is an indicator of early renal disease, glomerular injury, and risk of progression of renal disease</li> <li>Other Associations: Multiple myeloma, congestive heart failure, Fanconi syndrome, Wilson disease, pyelonephritis, and physiological conditions (strenuous exercise, fever, hypothermia, emotional distress, orthostatic proteinuria, and dehydration)</li> <li>False-positive triggers: Alkaline or concentrated urine, phenazopyridine, quaternary ammonia compounds</li> <li>False-negative triggers: Acid or dilute urine, primary protein is not albumin</li> </ul>
<b>Bilirubin</b>	Negative	<ul style="list-style-type: none"> <li>Traces indicate liver dysfunction, biliary obstruction, congenital hyperbilirubinemia, viral or drug-induced hepatitis, cirrhosis</li> <li>False-positive triggers: Medications such as phenazopyridine that have a similar color at the low pH of the reagent pad</li> <li>False-negative triggers: Stale/old urine specimens, chlorpromazine, selenium</li> </ul>
<b>Blood cells</b>	Negative or traces (< 5 RBCs per mL, lab-dependent)	<ul style="list-style-type: none"> <li>Hematuria: Renal calculi, glomerulonephritis, pyelonephritis, tumors, trauma, anticoagulants, strenuous exercise, exposure to toxic chemicals</li> <li>Hemoglobinuria: Hemolytic anemias, RBC trauma, strenuous exercise, transfusion reactions, severe burns, infections (i.e., malaria)</li> <li>Myoglobinuria: Muscle trauma eg, rhabdomyolysis, prolonged coma, convulsions, drug abuse, extensive exertion, alcoholism/overdose, muscle wasting diseases</li> <li>False-positive triggers: Dehydration, exercise, hemoglobinuria, menstrual blood, myoglobinuria</li> <li>False-negative triggers: Captopril, elevated specific gravity, acid urine, proteinuria, vitamin</li> </ul>
<b>Urobilinogen</b>	0.1-1 mg/DL (random) or up to 4 mg/day	<ul style="list-style-type: none"> <li>High values: Hemolysis, liver disease (cirrhosis, hepatitis), sickle cell disease, thalassemia</li> <li>Low values: Antibiotic use, bile duct obstruction</li> <li>False-positive triggers: Elevated nitrite levels, phenazopyridine, porphobilinogen, sulfonamides, and aminosalicylic acid</li> <li>False-negative triggers: Prolonged exposition to daylight, formaldehyde, high levels of nitrites</li> </ul>

Component	Normal	Interpretation of abnormal results
<b>Microscopic examination</b>		
<b>Red blood cell casts</b>	Negative	Presence suggests glomerulonephritis, vasculitis, intrinsic renal disease (tubulointerstitial nephritis, acute tubular injury/necrosis), strenuous exercise
<b>White blood cell casts</b>	Negative	Presence suggests pyelonephritis, interstitial nephritis, glomerulonephritis, renal inflammatory processes
<b>Epithelial cell casts</b>	Negative	Presence suggests acute tubular injury/necrosis, interstitial nephritis, glomerulonephritis, eclampsia, nephritic syndrome, transplant rejection, heavy metal ingestion, renal disease
<b>Granular casts</b>	Negative	Presence suggests glomerular or tubular disease, pyelonephritis, advanced renal disease, viral infections, stress/exercise, non-specific
<b>Waxy (broad) casts</b>	Negative	Presence suggests glomerular or tubular disease, pyelonephritis, advanced renal disease, viral infections, stress/exercise, non-specific
<b>Hyaline casts</b>	0 – 5 casts/low power field	Normal finding in concentrated urine, but may suggest fever, exercise, diuretics, pyelonephritis, chronic renal disease
<b>Fatty casts</b>	Negative	Presence suggests heavy proteinuria (nephrotic syndrome), renal disease, hypothyroidism, acute tubular necrosis, diabetes mellitus, severe crush injuries
<b>Uric acid crystals</b>	Negative	May appear as yellow to orange-brown, diamond- or barrel-shaped crystals; presence is associated with acid urine, hyperuricosuria, uric acid nephropathy, normal
<b>Calcium oxalate crystals</b>	Negative	Looks like refractile square "envelope" shape; presence suggests ethylene glycol poisoning, acid urine, hyperoxaluria, normal
<b>Amorphous phosphate (calcium and magnesium phosphate)</b>	Negative	Presence suggests alkaline urine, decreased urine volume, a diet rich in calcium, prolonged immobilization, overactive parathyroid glands, bone metastases, normal
<b>Triple phosphate (struvite)</b>	Negative	Crystals look like coffin lids; presence suggests alkaline urine, decreased urine volume, UTI from urease-producing bacteria
<b>Cysteine</b>	Negative	Looks like colorless crystals with a hexagonal shape; presence suggests cystinuria
<b>Sulfur</b>	Negative	Presence indicates antibiotics containing sulfa
<b>Red blood cell</b>	0-5 cells/high-power field	Presence suggests UTI, inflammation
<b>White blood cells</b>	0-5 cells/high-power field	
<b>Eosinophile</b>	Negative	Presence suggests interstitial nephritis, acute tubular necrosis, UTI, kidney transplant rejection, hepatorenal syndrome
<b>Epithelial cells</b>	≤ 15-20 squamous epithelial cells/high-power field	<p>Can be squamous, transitional, or renal tubular cells; type of cell encountered depends on the location of the disease process and each type's presence suggests different issues:</p> <ul style="list-style-type: none"> <li>• Squamous (most common): Contamination</li> <li>• Transitional: Normal, UTI</li> <li>• Renal tubular: Heavy metal poisoning, drug-induced toxicity, viral infections, pyelonephritis, malignancy, acute tubular necrosis</li> </ul>

Component	Normal	Interpretation of abnormal results
Bacteria	Negative	Presence suggests UTI, contamination
Yeast	Negative	
Parasites	Negative	

### Additional notes

When interpreting urinalysis results, always consider both the clinical context and the patient's history. Values can fluctuate based on hydration status, medications, and other transient conditions. It's important to check for consistency across different results and monitor any deviations from the normal range. If multiple indicators suggest abnormalities, further investigation through additional tests may be necessary. Always document any unusual findings and consult with attending physicians to ensure proper follow-up.

Milani, D. A. Q., & Jialal, I. (2023). Urinalysis. In StatPearls [Internet]. StatPearls Publishing. <https://www.ncbi.nlm.nih.gov/books/NBK557685/>  
 Bethesda (MD): National Library of Medicine. (2013). Urinalysis. In MedlinePlus Medical Encyclopedia. National Institutes of Health. <https://medlineplus.gov/ency/article/003579.htm>