

**Urate see** Uric Acid, Urine or Serum

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## Urea Nitrogen to Creatinine Ratio

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**Related Information:** Creatinine, Serum or Plasma  
Osmolality, Serum  
Urea Nitrogen, Serum or Plasma

**Synonyms:** BUN to Creatinine Ratio

**Test includes:** Serum creatinine and serum urea nitrogen.

**Background:** Useful to distinguish between pre- and postrenal diseases, gastrointestinal bleeding, and renal diseases.

High BUN/creatinine ratio: Decreased renal perfusion, hypovolemia, hypotension, catabolic state (creatinine normal), upper gastrointestinal bleeding with very high ratios above 36, high protein diet, urinary tract obstruction. Steroids and tetracyclines may increase the ratio.

Decreased ratio: Low protein intake, malnutrition, ketosis, liver diseases, rhabdomyolysis, low levels of antidiuretic hormone, late pregnancy. Drugs increasing creatinine, but not urea nitrogen: cimetidine, trimethoprim, anti-anabolic effects of tetracyclines.

**Sampling:** 2 mL serum

**Reference Interval:** 10–20, infants higher (10-30)

## Urea-Nitrogen and Urea, Serum or Plasma

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**Related Information:** Creatinine, Serum or Plasma  
Cystatin C, Urine, Urine  
Osmolality, Serum  
Sodium (Na), Serum  
Urea Nitrogen to Creatinine Ratio

**Synonyms:** Blood Urea Nitrogen; BUN

**Background:** Urea is the end product of protein metabolism and is renal excreted by glomerular filtration. BUN is a useful parameter in assessing renal function, particularly in combination with serum creatinine.

Elevated in: Acute or chronic renal diseases, severe congestive heart diseases, shock, dehydration.

Bleeding into the GI may increase urea nitrogen without larger elevation of creatinine levels.

Decreased in: Late in pregnancy, low protein diet, severe liver diseases.

Limitations: BUN is specific for glomerular function and less sensitive for early stages of renal diseases and may be earlier abnormal than creatinine. In patients undergoing dialysis, the urea reduction in percent during dialysis is a parameter although less sensitive than serum albumin for successful treatment.

**Sampling:** 1 mL serum or plasma, heparinized sample is not accepted.

**Reference Interval:** urea (mg/dL)

Children	Newborn		6-53
	1-3 year(s)		11-36
	4-13 years		15-36
	14-19 years		18-45
Adults	Female	< 50 years	15-40
		> 50 years	21-43
	Male	< 50 years	19-44
		> 50 years	18-55

(Urea-Nitrogen = urea / 2.14)

Critical value: Possible panic range: Urea above 210 mg/dL is defined as uremia (BUN &gt;100)

**Ureaplasma Urealyticum see** *Mycoplasma hominis***Uric Acid, Serum**

**Related Information:** Ammonia, Plasma  
Creatinine, Serum or Plasma  
Molybdenum (Mo), Serum or Urine  
Sodium, Serum  
Synovial Fluid Analysis  
Uric Acid, Urine

**Synonyms:** Urate

**Background:** The end product of purine metabolism is uric acid. As one marker for gout serum levels do not establish or rule out the diagnosis, more specific are demonstrated uric acid crystals in an aspirate of joint fluid. Clinically, typically gout is located monoarticular in a lower extremity joint. However, in an acute episode of gout uric acid must not necessarily be elevated. Elevated levels occur in renal diseases, prerenal azotemia, preeclampsia. Acute uric acid nephropathy, nephrolithiasis and chronic urate nephropathy are renal diseases caused by uric acid. Other Impairments of renal function are lead poisoning, acidosis, and hemolytic anemia. Drugs which cause higher levels of uric acid are cancer chemotherapeutics such as cyclosporine by cell destruction, diuretics, anti-infectiva in Tbc such as ethambutol, niacin pyrazinamide and salicylate.

Decreased levels occur during xanthinuria, liver disease, hyponatremia, low protein intake.

**Sampling:** 1 mL serum or plasma (EDTA, citrate or sodium fluoride tubes are not accepted). Stable for 3 days at room temperature, at 4C for one week.

**Reference Interval:** Male 4.4-7.0 mg/dL  
Female 2.4-5.7 mg/dL  
Children 2.0-6.0 mg/dL

## Uric Acid, Urine

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**Related Information:** Calcium (Ca), Urine  
Creatinine, Urine  
Synovial Fluid Analysis  
Uric Acid, Serum

**Synonyms:** Urate, Urine

**Background:** Urate is reabsorbed by the proximal and distal tubules and excreted by the distal portion of the proximal tubules, within a total elimination of urate by the kidney of 75%. 25% are secreted by the intestinal tract.

Use: Patients with hyperuricosuria and hyperuricemia are on risk for renal uric acid and calcium oxalate calculus formation.

A secretion > 1000 mg/24h should prompt a screening for hypoxanthine-guanine phosphoribosyltransferase deficiency (Lesh-Nyhan syndrome). Another indicator used is the uric acid to creatinine ratio: Normal: 0.21-0.59, enzyme defect: 0.62-2, complete absence of enzyme function: 2-5.

Used in differential diagnosis of acute renal failure: A ratio > 1 favors acute renal failure due to acute uric acid nephropathy, a ratio < 1 favors failure due to other causes.

**Sampling:** 24 hour urine collection in a container prefilled with 10 mL of a sodium hydroxide solution for preventing a precipitation in acid urine. Do not refrigerate! Send an aliquot of 5 mL to the laboratory.

**Reference Interval:** 250 – 750 mg / 24h

Correlation between urine uric acid and nephrolithiasis:

< 300 mg/24h	11%
300-699 mg/24h	42%
700-899 mg/24h	34%
900-1099 mg/24h	41%
> 1000 mg/24h	50%

## Urin Analysis Chemical, Screening

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**Related Information:** Albumin, Urine  
Cystine, Urine  
Osmolality, Urine  
Oxalate, Urine  
Primidone, Serum  
Protein, Quantitative, Urine  
Urine Analysis, Microscopic  
Vitamin C, Serum or Plasma

**Test includes:** Opacity, color, appearance, specific gravity, ph, protein, glucose, occult blood, ketones, bilirubin, urobilinogen, leucocytes

**Background:** The tests are for screening purposes. If a parameter is positive, a confirming chemical method will be used.

**Sampling:** For screening purposes, 10 mL of first voided morning urine may be preferred, since later specimens are more diluted and small increases in protein red cells or leucocytes are less likely to be detected. 10 mL of urine should be transported to the laboratory as soon as possible, otherwise refrigerate.

Reference Interval:	Test	Reference Interval
	Specific gravity	1.003-1.029
	Ph	4.5-7.8
	Protein	negative
	Glucose	negative
	Ketones	negative
	Bilirubin	negative
	Occult blood	negative
	Leucocyte esterase	negative
	Nitrite	negative
	Urobilinogen	0.1-1 EU/dL
	RBC s	0-3/ $\mu$ l
	WBC s	0-10/ $\mu$ l

## Urine Analysis, Microscopic

**Synonyms:** Microscopic Urine Examination, Microscopic Urine Analysis

**Test includes:** Casts, Crystals, Erythrocytes, Leucocytes, and Spermatozoa

**Background:** The microscopy on urine is one of the oldest diagnostic procedures in medicine providing useful information on renal, bladder, biochemical disorders and on intoxication.

Interpretation:

Crystalluria: Urine should be fresh and not refrigerated.

Calcium oxalate crystals: Are uniform, small double pyramids in a base to base order, similar to crosses on a square, but sometimes ovoid forms are present which can be confused with red cells and yeast cells. To distinguish under polarized light oxalate crystals are birefringent, cells are not anisotropic and cell lysis with acetic acid (2 - 3%). Abundant calcium oxalate or hippurate crystals may suggest ethylene glycol ingestion.

Uric acid crystals: Are brown to reddish brown, rectangular, rhomboidal.

Ammonium urates: Are irregular blobs and crescents in alkaline urine and may be confused with red cells.

Calcium phosphate: Crystallizes as flower like narrow rectangular needles.

Cystine crystals: Large hexagonal irregular plates, and are limited to patients with cystinuria.

Triple phosphate crystals (calcium-magnesium-ammonium-phosphate): Form coffin-lid shaped angularly domed rectangles, particularly in alkaline urine. They may suggest urea splitting bacte-

rial infection particularly in the presence of leukocyturia.

Protease inhibitor medication: Is associated in up to 50% of the patients with crystalluria with radial clusters in starburst form.

Casts:

White cell casts: Are renal originating leucocytes, particularly in pyelonephritis.

Red cell casts: Are of renal origin, suggest glomerulonephritis as do dysmorphic red cells.

Hyaline casts: Are observed after intensive exercise and in various kidney diseases.

Epithelial casts: Occur in acute tubular injuries, tubular necrosis, in eclampsia, heavy metal poisoning, and ethylene glycol intoxication.

Granular casts: Suggests intensive exercise, glomerular and tubulointerstitial disorders.

Waxy casts: Are characteristic in severe chronic renal diseases.

Fatty casts: Are seen in nephrotic syndrome, glomerular diseases, such as minimal change disease, membranous glomerulopathy, and membranoproliferative glomerulonephritis.

Broad casts: Are shed by damaged tubules or collecting ducts.

Others:

Hematuria: Dark brown urine indicates a renal cause, red urine suggest an extrarenal source.

Spermatozoa: Seen after retrograde ejaculation.

**Sampling:** 10 mL urine. Avoid contamination, use sterile tube and midstream urine. Casts are more likely to be observed in morning urine sample, as well as due to higher concentration erythrocytes and leucocytes. To obtain best results urine should be fresh and warm. If the specimen can not be transported to the laboratory immediately, refrigerate to 4-8°C.

<b>Reference Interval:</b>	(per high power field)	
	Casts	0-4
	Erythrocytes	0-2
	Leucocytes	0-4
	Bacteria	negative

**Uroporphyrins** see Porphyrins, Urine, Stool, Quantitative

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## Valproic Acid, Serum or Plasma

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**Related Information:** Carbamazepine, Serum  
Phenobarbital, Serum  
Phenytoin (Diphenylhydantoin, DPH), Serum  
Primidone, Serum

**Synonyms:** Depacon®; Depakene®; Depakote®XR; Depamide®; Dipropylacetic® Acid; Divalproex Sodium; Epilim®; Ergenyl®; Leptilan®; 2-Propylpentanoic Acid; 2-Propylvaleric Acid; Valkote®; Valproate Semisodium; Valproate Sodium