



RENAL TESTS

Decoding Your Renal Tests and Results

Not sure what your creatinine, microglobulin, and other renal test results mean? Learn about each test and what low, optimal, and high results signify so you can work with your doctor to choose appropriate treatment.

	Name of Test	Optimal Range
1	Blood Urea Nitrogen (BUN)	7 – 20 ml/dL
2	Serum Creatinine (Male)	0.6 – 1.2 mg/dL
	Serum Creatinine (Female)	0.5 – 1.1 mg/dL
3	BUN/Creatinine Ratio	10:1 – 20:1
4	Estimated Glomerular Filtration Rate (eGFR)	90 ml/min/1.73 sq M
5	Creatinine Clearance	90 ml/min/1.73 sq M
6	Urine Creatinine (Male)	14 – 26 mg/kg of body mass per 24 hours
	Urine Creatinine (Female)	11 – 20 mg/kg of body mass per 24 hours
7	Microalbumin/Creatinine Ratio (Albumin/Creatinine Ratio)	0 – 29.9 mcg albumin per 1 mg creatinine
8	Beta-2 Microglobulin	0 – 300 mcg/L



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Blood Urea Nitrogen (BUN)

Optimal: 7 – 20 ml/dL
Low: < 7 mg/dL
High: > 20 mg/dL

Urea is a waste product that results from the breakdown of protein. The excretion of urea by the kidneys is the most important way the body has to get rid of excess nitrogen. The measurement of urea in the blood (the BUN) is a useful way of screening for kidney disease.

Low Results

A low BUN level may indicate low protein consumption, starvation, or liver disease.

Optimal Results

A normal BUN level usually means an absence of severe kidney disease. However, the BUN is not a very sensitive measure of kidney problems, since up to 50% of kidney function may be lost before the BUN becomes elevated.

High Results

An elevated BUN level may indicate a significant loss of kidney function, but it can also occur with conditions that reduce blood flow to the kidneys, dehydration, high protein intake, conditions in which tissue breakdown is occurring, or gastrointestinal bleeding.

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Serum Creatinine

Optimal (Male): 0.6 – 1.2 mg/dL
Optimal (Female): 0.5 – 1.1 mg/dL
Low (Male): < 0.6 mg/dL
Low (Female): < 0.5 mg/dL
High (Male): > 1.2 mg/dL
High (Female): > 1.1 mg/dL

Creatinine is a waste product of normal muscle metabolism, and is excreted by the kidneys. When kidney function is impaired, blood levels of creatinine become elevated.

Low Results

Low serum creatinine levels may occur in people who are malnourished or chronically ill, whose muscle mass is significantly diminished.

Optimal Results

A normal serum creatinine level usually indicates normal kidney function. However, a substantial loss of kidney function may occur in some people before the serum creatinine level exceeds the optimal range.

High Results

An elevated serum creatinine level occurs with a significant loss of kidney function. High creatinine levels can also be seen with kidney infections, urinary obstruction, after eating a lot of meat, and with some drugs.



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BUN/Creatinine Ratio

Optimal: 10:1 – 20:1
Low: < 10:1
High: > 20:1

The BUN/creatinine ratio is a way of assessing the BUN and serum creatinine measurements together, and is calculated simply by dividing the BUN level by the creatinine level. Because these two measurements may change differently in response to different medical problems, their ratio is sometimes helpful in distinguishing among possible diagnoses. At best, however, this ratio serves only as a provider of clues, and not of an actual diagnosis.

Low Results

A low BUN/creatinine ratio usually only occurs with a reduced blood BUN level, and may be seen with low protein consumption, starvation, or liver disease.

Optimal Results

A BUN/creatinine ratio in the optimal range is by far the most common result, and by itself generally does not provide useful information about the presence or absence of kidney problems.

High Results

Interpreting a BUN/creatinine ratio in the high range depends on the serum creatinine level. If the creatinine level itself is high, an elevated ratio suggests both underlying kidney disease and either urinary obstruction or reduced blood flow to the kidneys. If the ratio is elevated and the serum creatinine is normal, this may suggest normal underlying kidney function along with reduced blood flow to the kidneys, dehydration, high protein intake, tissue breakdown, or gastrointestinal bleeding.



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Estimated Glomerular Filtration Rate (eGFR)

Normal: ≥ 90 ml/min/1.73 sq M
Mildly Low: 50 – 89 ml/min/1.73 sq M
Moderately Low: 30 – 49 ml/min/1.73 sq M
Severely Low: < 29 ml/min/1.73 sq M

The eGFR (estimated glomerular filtration rate) uses the serum creatinine level plus a person's age, sex, and race (of African descent vs. not of African descent), to estimate overall kidney function by means of a complex formula. The GFR refers to the volume of blood per minute that is filtered by the kidneys. Worsening kidney function correlates with a progressive drop in GFR. This test attempts to measure the same thing as the far more accurate creatinine clearance test, but is much easier to perform. In people with suspected kidney disease, a creatinine clearance test and eGFR are often performed together at least once; if the eGFR accurately reflects the measured creatinine clearance, it can be used to track kidney function over time.

Normal Results	Mildly, Moderately, or Severely Low Results
A normal GFR indicates that the filtering function of the kidneys remains optimal.	A low GFR indicates that the ability of the kidneys to filter impurities from the blood is reduced. In people with chronic kidney disease, repeated measures of eGFR can help to determine the rate of progression of kidney disease, and can help to determine whether and when dialysis may become necessary.



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Creatinine Clearance

Normal: ≥ 90 ml/min/1.73 sq M
Mildly Low: 50 – 89 ml/min/1.73 sq M
Moderately Low: 30 – 49 ml/min/1.73 sq M
Severely Low: < 29 ml/min/1.73 sq M

Creatinine is a waste product of normal muscle metabolism, and is excreted by the kidneys. The creatinine clearance test, which requires a 24 hour collection of urine, measures glomerular filtration rate (GFR), which is the volume of blood per minute that is filtered by the kidneys. Measuring GFR by creatinine clearance is more accurate but much more difficult to perform than the eGFR blood test. Often a creatinine clearance test will be done along with an eGFR test; if the two values correlate, subsequent measurements of kidney function will usually rely on the much simpler eGFR test.

Normal Results	Mildly, Moderately, or Severely Low Results
A normal creatinine clearance indicates that the filtering function of the kidneys remains optimal.	A low creatinine clearance indicates that the ability of the kidneys to filter impurities from the blood is reduced. In people with chronic kidney disease, repeated measures of creatinine clearance (or the eGFR blood test) can help to determine the rate of progression of kidney disease, and can help to determine whether and when dialysis may become necessary.

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Urine Creatinine

Optimal (Male): 14 – 26 mg/kg
Optimal (Female): 11 – 20 mg/kg
Low (Male): < 14 mg/kg
Low (Female): < 11 mg/kg
High (Male): > 26 mg/kg
High (Female): > 20 mg/kg

Creatinine is a waste product of normal muscle metabolism, and is excreted by the kidneys. In the urine creatinine test, a 24-hour collection of urine is tested for its creatinine content. This test is seldom performed by itself, but rather is performed in conjunction with a creatinine clearance test.

Low Results	Optimal Results	High Results
Reduced urine creatinine correlates with a reduced creatinine clearance and reduced GFR. It can be seen with many types of kidney disease.	Normal urinary creatinine suggests the absence of kidney disease.	Elevated urine creatinine can be seen in pregnancy or in people who eat high amounts of protein.



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Microalbumin/ Creatinine Ratio

Optimal: > 30 mcg albumin per 1 mg creatinine
High: ≤ 30 mcg albumin per 1 mg creatinine

Very small amounts of albumin in the urine is called microalbuminuria. The amount of microalbumin in the urine can fluctuate over short periods of time, making it difficult to detect whether microalbumin in a particular urine sample represents a kidney problem or not. On the other hand, creatinine is excreted by the kidneys in a constant amount. So, by comparing the amount of urinary albumin to urinary creatinine, it is possible to tell whether microalbumin in the urine is likely to represent an actual kidney problem. This test is commonly used to screen people with diabetes for early signs of diabetic kidney disease. It can be done either from a random urine sample or with a 24 hour urine collection.

Optimal Results

A normal result suggests that the kidneys are not leaking an abnormal amount of protein into the urine.

High Results

An elevated urine albumin/creatinine ratio suggests the kidneys have been damaged by some form of kidney disease, and should trigger an evaluation to identify the underlying problem.

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Beta-2 Microglobulin

Optimal: ≤ 300 mcg/L
High: > 300 mcg/L

Beta-2 microglobulin is a protein that is shed into the bloodstream by many of the body's cells. This protein is filtered by the kidneys, but then is reabsorbed as the filtered urine passes through the renal tubules on its way to the urinary collection system. Elevated beta-2 microglobulin levels in the urine indicate that the renal tubules have become damaged, and are no longer able to conduct their reabsorption function normally. This test is used to screen for renal tubular disease.

Optimal Results

Beta-2 microglobulin levels in the optimal range are compatible with normal renal tubular function.

High Results

Beta-2 microglobulin levels in the high range is evidence that renal tubular damage has occurred. An evaluation should be done to look for the cause of renal tubular damage.