

Know

YOUR LAB
RESULTS

Tests to measure kidney function and to control your diet

SUPPORTING YOU THROUGH YOUR LIFE WITH CKD.



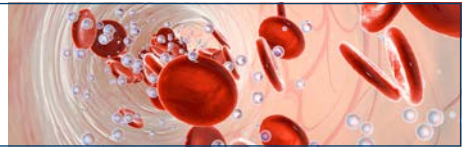
DEAR PATIENT

Healthy kidneys remove wastes, toxins and excess fluid from the blood. Since a person can have kidney disease without any symptoms, your doctor may initially discover a reduced func-

tion of your kidneys through routine blood and urine tests. Here you have a quick guide to kidney function tests and tests to control your diet which might be part of your therapy.



BLOOD TESTS



Blood tests are performed with whole blood, blood plasma, or blood serum as required. Serum is the liquid part of the blood that remains after the blood has clotted. Plasma is the liquid that remains when clotting is prevented with the addition of an anticoagulant. Both are obtained by centrifugation.

SERUM CREATININE

A serum creatinine test measures the amount of creatinine in your blood. Creatinine is a waste product that arises by the normal wear and tear on muscles in the body. It is produced at a rather constant rate and is only removed from the body by blood filtration through the kidneys. That is why the creatinine level in the blood can be used to track how well the kidneys are working and clearing waste products: **if the kidney function declines, serum creatinine level goes up.**

Normal levels will depend on your sex, age, and the amount of muscle mass your body has.

Normal range: 0.5 - 1.2 mg/dL (44 - 106 mmol/L) for males; 0.5 - 1.0 mg/dL (44 - 88 mmol/L) for females

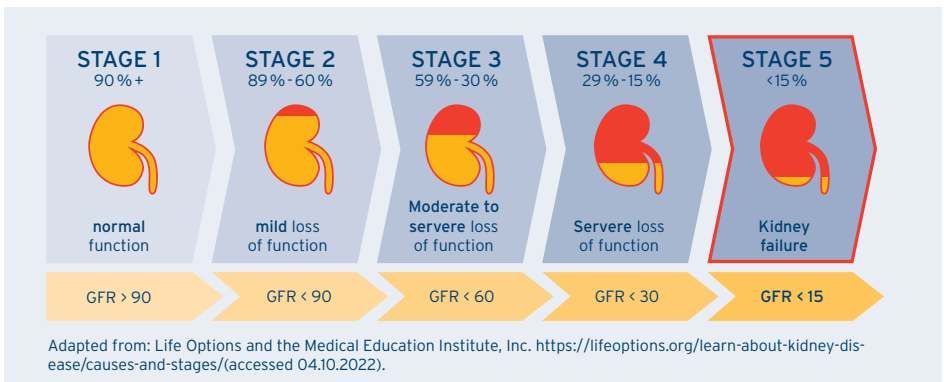
GLOMERULAR FILTRATION RATE (GFR)

A common measure that indicates your level of kidney function is the glomerular filtration rate (GFR). GFR describes how many milliliters of blood the kidneys are able to filter within one minute. As direct measurement of GRF is very complicated and needs a specialist provider, it is normally estimated using validated formulas based on your serum creatinine level

and factors like age, weight, body size and gender.

As kidney disease progresses, your eGFR decreases.

The normal value is 90 ml/min/1.73 m² or higher. It can vary according to age (as you get older it can decrease).

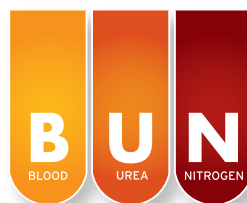


BLOOD UREA NITROGEN (BUN)

A blood urea nitrogen (BUN) test measures the nitrogen content of urea in your blood. Urea is a waste product your body produces from the breakdown of protein. Healthy kidneys filter urea out of your blood and it leaves your body through your urine. This process helps keep your BUN level within a normal range, which also depends on your age and other health conditions you may have. **As kidney disease progresses, your BUN level goes up.**

Normal range: 6 - 25 mg/dL (2.1 - 8.9 mmol/L)

Since BUN reflects the nitrogen content of urea in your blood it indirectly also indicates the blood urea level as a whole molecule, which is BUN x 2.14.



CALCIUM (Ca)



Calcium is an essential mineral in your body. The levels of calcium in your blood and bones are controlled by hormones including

Vitamin D, which is needed to absorb calcium. **If you have strikingly high or low levels of**

calcium in your blood, it may indicate that you have an imbalance pointing to a medical problem, which may include kidney disease.

In most cases, a normal blood calcium level for adults is 8.4 - 10.6 mg/dL (2.1 - 2.7 mmol/L).

PHOSPHATE (P)



Phosphate contains the mineral phosphorus which works together with calcium to build strong bones and teeth, to help nerves

to function and make muscles contract.

The amount of phosphate in the blood affects the level of calcium in the blood. A hormone called parathyroid hormone (PTH) regulates these levels. (Normal range of PTH: 15 - 65 pg/mL)

Therefore PTH, calcium and phosphate levels might be measured at the same time. And as Vitamin D is needed for your body to absorb phosphate, it is usually measured in addition to that. (Optimal range of Vit. D: 25 - 80 ng/mL)

Normally, your kidneys filter and remove excess phosphate from the blood. **If phosphate levels in your blood are too high, it can be a sign of kidney disease.** A high phosphate level can cause a high calcium level in the blood. This can lead to bone weakness, muscle cramps and spasms, severe itching, or chalk-like calcium deposits (calcification) in tissues and walls of blood vessels. It may be necessary to reduce the phosphate in your diet.

Normal range in adults is 2.5 - 4.9 mg/dL (0.8 - 1.6 mmol/L). This fluctuates with dietary intake, acid-based status and age (higher in children than in adults).

POTASSIUM (K)



Potassium is an essential mineral that helps nerves to function and your muscles to contract, including those in your heart.

It helps your heartbeat stay regular and moves nutrients into and waste products out of cells.

Healthy kidneys keep the right amount of potassium in your body.

If you have chronic kidney disease, your kidneys may not remove extra potassium from the blood. If you have high potassium levels, your heart muscle activity may be reduced. If you have low potassium levels, you may have a heart problem, such as an irregular heartbeat. Both situations are serious and can be life threatening.

Normal range:
137 - 215 mg/L (3.5 - 5.5 mmol/L)

SODIUM (Na)



Sodium is an important mineral in your blood and other body fluids that helps your body and cell function.

Sodium in the form of table salt (Sodium Chloride: NaCl) is in almost everything you eat. When you take in too much sodium, your kidneys have the job of clearing it from your body. But if your kidneys are damaged, the organs can't remove sodium efficiently. A sodium test can help to examine whether your kidneys are working as they should to remove sodium.

Having too much or too little sodium can mean there's an issue with your kidneys or perhaps another health matter.

The measurement of sodium in the urine is particularly important as supplementary information. If sodium in the blood is too high, a low concentration in the urine indicates that the kidney is excreting too little sodium or too much water. If sodium in the blood is too low, a high excretion in the urine indicates that sodium is lost via the kidneys or that too little water is excreted.

For the 24-hour urine test (see next page), normal values range from 0.9 - 5.1 g/day (40 - 220 mmol/day). The wide range reflects your dietary salt intake.

Normal range:
3.11 - 3.34 g/L (135 - 145 mmol/L)

BICARBONATE (HCO₃⁻)

Bicarbonate is a substance called a base, which the body needs to help keep a normal acid-base (pH) balance. This balance prevents your body from becoming too acidic, which can cause many health problems. The lungs and kidneys keep a normal blood pH by removing excess acid.

Healthy kidneys remove acid from the body through urine and they keep the right amount of bicarbonate (base) in

the blood. When kidneys do not work properly, acid can cumulate in your body which is bad for your heart and may also accelerate the deterioration in your kidney function. **In renal insufficiency, the level of bicarbonate in the blood decreases.**

Normal range:
1.34 - 1.77 g/L (22 - 29 mmol/L)

PREALBUMIN (TRANSTHYRETIN)

Prealbumin is a protein made in your liver that helps to carry specific hormones and vitamin A through your bloodstream. It also regulates how your body uses energy. The test may be used to find out, if you are getting

enough nutrients, especially protein, in your diet.

Normal range in adults:
0.2 - 0.4 g/L

C-REACTIVE PROTEIN (CRP)

CRP is a type of protein that is associated with inflammation in the body. It is made by your liver and sent into your bloodstream in response to inflammation.

Normally, you have low levels of c-reactive protein in your blood. **High levels may be a warning of a serious infection or other disorder.**

Normal range:
< 10 mg/L



URINE TESTS



Urine test sometimes only need a one-off sample and sometimes all your urine from a full day. In the latter case you must collect your urine in a special container over a full 24-hour period.

ALBUMIN-TO-CREATININE RATIO (ACR)

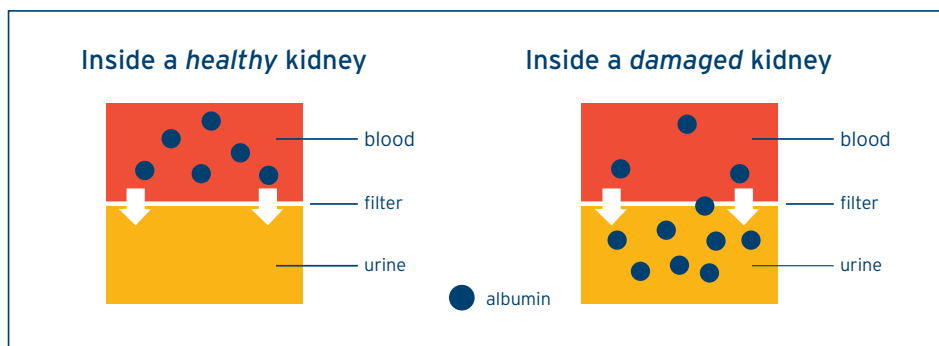
This is a test to check whether you have albumin in your urine. Albumin is a protein that is normally in the blood. It can find its way into the urine when the kidneys are damaged. When albumin is found in your urine, it is called albuminuria or proteinuria. If there is any albumin in your urine, the amount can vary greatly throughout the day. But creatinine, a normal waste product found in urine, is released at a steady rate. Because of this, your doctor can more accurately measure the amount of albumin when comparing it to the amount of

creatinine in your urine by dividing the two concentrations.

People with a high amount of albumin in their urine are at an increased risk of having chronic kidney disease progress to kidney failure.

An ACR below 30 mg/g is considered normal. An ACR between 30-300 mg/g means you have moderately increased albuminuria.

An ACR above 300 mg/g could be a sign of kidney disease.



URINE UREA NITROGEN

The urine urea nitrogen test determines how much urea is in the urine. Urea is a waste product that is created when proteins are broken down. It is excreted by the kidneys when you urinate. The test can help to determine how well the kidneys are working. **Low levels usually indicate kidney problems.** It also helps to

determine whether their intake of protein is too high or low.

Normal values in the 24-hour urine test range from 12 - 20 g/day (428 - 714 mmol/day).



GENERAL INFORMATION

The reference values (normal ranges) given in this brochure as well as the determined values may differ among laboratories. In addition, there may be diurnal and seasonal fluctuations. Therefore, ask your doctor to explain

your personal data to you. Moreover, individual laboratory values alone are usually not meaningful. They often must be assessed in conjunction with other values and over time.

Medical tests often report results as concentration in mass per volume (unit e.g., g/L) or number of particles per volume (unit e.g., mol/L). One mole corresponds to approx. 6.022×10^{23} particles. Both are different units for the same laboratory parameter and can be converted into each other.

- Volume units can be liter (L), deciliter (dL) or milliliter (mL).
- Mass units can be gram (g), milligram (mg), nanogram (ng), or picogram (pg).
- Molar units can be mole (mol), millimole (mmol), micromole (μmol), or nanomole (nmol).



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