

The Basic Metabolic Panel - BMP

This panel tests for various indicators of metabolic functioning, including blood sugar (glucose levels), electrolyte and fluid balance, kidney function - calcium, sodium, potassium, carbon dioxide, chloride, urea nitrogen, creatinine, and the glomerular filtration rate (GFR) used to diagnose diabetes and kidney disease. It is very important to look at trending values if markers are moving in the wrong direction and addressing the problem before it becomes a serious health condition.

An example in diabetes for every 1 point rise in fasting blood sugar over 84mg/dl an individuals risk of diabetes increases by about 6%. By the time a persons blood sugar goes to 94 their risk increases to 49% if it goes to 100 the risk goes to 84%

Glucose - Blood Sugar

Oral glucose tolerance test

Insulin -

Insulin Resistance -

Hemoglobin A1C - 120 day average - measures the damage to Red Blood Cells (RBC's) - glycosylated.

If blood sugar levels are abnormal - a fasting blood sugar test (FBS) is run also a Fasting Insulin

Reference Ranges for Blood Glucose - fasting mg/dL

> 125 Diabetes

100 - 125. Prediabetes (impaired fasting glucose)

65 - 99. Normal

< 65 Low (hypoglycemic)

Target Range 70 - 84

Measuring for Insulin

Insulin resistance is where the hormone does not bind to cells and activate the insulin receptors, so blood sugar is not lowered. Typically insulin resistance precedes type 2 diabetes for a decade before diabetes develops. Often measuring it 2 hours after a meal containing 75 grams of carbohydrate such as a bagel with jelly.

Reference Ranges for Insulin

Insulin (mg/dl)

> 50. High Alert

25 - 49 High, trending toward insulin resistance

17 - 25. Acceptable

Target Range 5 to 17, with blood glucose < 90 mg/dl

If blood glucose and insulin are both high, you are at the peak of insulin resistance

If blood glucose is high and insulin is very low (2 mg /dl) your most likely in the process of becoming insulin resistant.

If your blood glucose level is somewhere between low and normal and your insulin is high you are in the process of becoming insulin resistant.

Excessive high fructose corn syrup can elevate insulin levels.

While insulin is not included on the BMP - testing for insulin resistance is critical.

Belly fat can lead to insulin resistance, which contributes to weight gain. In general if you have excessive belly fat, it is likely that you will at least be insulin resistant.

Metformin can cause depletion of B12, folate and CoQ10 - if using consider these supplements

Nutritional supplement support:

Chromium GTF, cinnamon 1/4 teaspoon a day, alpha lipoic acid, magnesium, bitter melon, fiber PGX in particular, Mulct-vitamin, Omega 3 fatty acids, vanadium and zinc.

Diabetes and Chronic Kidney Disease

Gradual loss of kidney function over time is known as CKD - Chronic Kidney Disease which affects 1/3 of diabetic patients. This is one of the biggest health crises in the US right now. High levels of BUN and Creatinine 2 waste products are key indicators of a kidney problem. The presence of albums in the urine also signals kidney damage. High blood pressure can damage the kidneys, especially in people with diabetes.

Calcium

The amount of calcium is regulated by a complex feedback loop involving parathyroid hormone (PTH), vitamin D, and calcitonin. Magnesium and phosphorus in the body also affects calcium levels.

Hypercalcemia can put you at risk for kidney problems

Hypocalcemia can typically lead to osteoporosis

The blood calcium test (called an ionized calcium test) indicates the amount of calcium in the blood not the bones.

Results that fall in the normal range means the calcium is being metabolized normally

Reference ranges for Calcium

Calcium (mg/dL)

> 12. Very High (Moderate to severe hypercalcemia)

10.2 - 12 High (Mild hypercalcemia)

8.6 - 10.2 Normal

< 8.6. Low (hypocalcemia)

A urine calcium test may be ordered if a person is exhibit classic symptoms of kidney stones

Men should produce less than 300mg of urinary calcium per day and women 250mg a day.

Parathyroid disorders are often the first place to look

Green tea, Magnesium and the Indian herb Shatavari can be supportive for elevated calcium

Low calcium - supplementing with Calcium Magnesium and Vitamin D

Potassium

An essential mineral and electrolyte. It controls fluid balance in the body. It is required for nerve impulse transmission and muscle contraction. It can affect your risk of hypertension and stroke. A study showed that chronically low potassium in the low normal range can increase the likelihood of developing diabetes.

Reference ranges for Potassium

Potassium (mEq/L)

> 7.0. Extremely high (Severe hyperkalemia)

6.1 - 7.0 Very high (Moderate hyperkalemia)

5.5 - 6.0 High (Mild hyperkalemia)

3.5 - 5.4. Normal

3.1 - 3.4. Low (mild hypokalemia)

2.5 - 3.0 Very low (Moderate hypokalemia)

< 2.5 Extremely low (Severe hypokalemia)

Target Range 3.5 to 4.5

Very high potassium look at kidney issues where the kidneys can't excrete the potassium.

Sodium

Along with potassium sodium works to balance fluids in the body. It influences blood pressure regulation, heart rhythm, muscle contraction, and nerve impulse transmission. Abnormal sodium levels may indicate issues with the adrenal glands

Reference Ranges for Sodium

Sodium (mEq/L or mmol/L)

>155	Very High (Critical level of hypernatremia)
144 to 155	High (Hypernatremia)
134 - 143.	Ideal
120 - 133	Low (Hyponatremia)
< 120	Very low (Critical level of hyponatremia)

Elevated sodium Hypernatremia is often caused by not drinking enough water or through water loss such as diarrhea, sweating and urination. More common in older adults who lose their thirst mechanism. Processed foods are exceptionally high in sodium.

Low Sodium Hyponatremia is caused from numerous causes - congestive heart failure, kidney disease, loss of body fluids, over hydration, physical trauma such as burns. Drug interactions between ACE inhibitors and angiotensin receptor blockers.

Chloride

Chloride is an electrolyte that helps to balance fluids inside and outside your body's cells. It is instrumental in maintaining proper blood volume, blood pressure and pH. A disturbance in chloride levels often signals a problem with your kidneys, hormones, acid-alkaline balance

Reference Ranges for Chloride

Chloride (mmol/L)

> 108	High Hyperchloremia
97 - 108	Normal
< 97	Low Hypochloremia

Carbon Dioxide

Reference Ranges for Carbon Dioxide

Carbon Dioxide (mmol/L)

> 33	High (Hypercapnia)
21 - 33	Normal
< 21.	Low (Hypocapnia)

Target Range: 23 - 29 mmol/L

Sleep apnea, COPD, alcoholism, certain auto-immune conditions and motor neuron disease are some of the causes of low carbon dioxide.

Kidney Function tests:

Blood Urea Nitrogen BUN

It is a form of nitrogen in the urea, a waste product produced during protein metabolism. Nitrogen by products are first made into ammonia, and the liver converts it to urea. Urea is then transported to the kidneys which filter it out. If BUN levels are higher than normal, the problem has to do with the kidneys.

BUN levels vary with according to a persons age and gender. Older men typically have higher BUN

6 - 20 mg /dL .

< 6 is considered low

> 20 is considered high. Azotemia is a sign of impaired kidney function.

Acetaminophen (Tylenol), aspirin and arthritis drugs.

People with high BUN

Kidney. Dysfunction symptoms are generalized and difficult to detect, and include fatigue, lack of appetite, poor concentration, and trouble sleeping. They might experience mid back pain.

People with high levels often experience itchy skin, body odor, and breath that has a urine-like odor.

Supplement support:

Stinging Nettle Seed Extract, Milk Thistle extract, Cordyceps, CoQ10 and eating asparagus are some of the things you can do to support kidney function

Low BUN

Whey Protein, Creatine and probiotics support low BUN

Creatinine

Creatinine is a chemical waste product of muscle metabolism. It is generated by creatine a compound manufactured by the liver and serves as a source of energy to the muscles. Blood Creatinine test along with BUN serves as a reliable measure of kidney function. Men usually have higher numbers than women because they have more muscle mass.

Reference Ranges for Creatinine

Men. 0.6 to 1.2

Women 0.5 to 1.1

Children < 13 0.3 to 0.7

Long term diabetes, high blood pressure, or obesity. When high blood pressure and diabetes are poorly managed the risk of kidney failure increases. Severe bacterial infections can damage the kidneys. Heavy metal toxicity can damage the kidneys too.

Supplement support:

NAC - N-acetyl Cysteine, Glutamine, Cordyceps, Goldenrod, Stinging Nettle Seed Extract

BUN/Creatinine Ratio

The ratio of these markers provides a more accurate picture of kidney health.

A normal BUN/Creatinine ratio is between 10:1 and 20:1

Target range 12:1 and 16:1

High and low ratios can be indicative of kidney dysfunction.

The most common cause of high BUN/Creatinine ratio is dehydration.

Kidney stones and urinary tract obstruction

Low BUN/Creatinine ratio look for liver disease such as cirrhosis or low protein diet, malnutrition.

Supplemental support for stabilizing BUN/Creatinine ratios:

CoQ10, Cordyceps, Goldenrod, Green Tea or green tea extract, L-Arginine sustained release, Stinging Nettle seed, selenium

Glomerular Filtration Rate (GFR)

GFR reflects the amount of blood that is filtered per minute and generally correlates with urinary output. When GFR falls below a certain level, it indicates kidney dysfunction. It is not a separate test - it is calculated by plugging a person's blood creatinine value, age, sex height

and weight into an equation. Race is taken into consideration, since the genetics of African Americans affect how their kidneys process and filter wastes. GFR values are measured in milliliters per minute (mL/min).

Reference Ranges for Glomerular Filtration Rate (GFR)

<u>GFR (ml/min)</u>	<u>Severity of Kidney Damage</u>
90 to 120 with no evidence of kidney damage	Normal
> 90 with evidence of kidney damage	Stage 1 (Beginning of kidney damage)
60 - 89	Stage 2 (Mild kidney damage)
30 - 59	Stage 3 (Moderate kidney damage)
15 - 29	Stage 4 (Severe kidney damage)
< 15	Stage 5 (Kidney failure)

Similar supplemental support as above to support kidney function.

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