
Comprehensive Metabolic Panel

By Gigi Reed, MD October 16, 2026

A little while ago I discussed a blood test, the CBC which explained the cells and cell fragments in a blood sample. Today, let's have a look into a blood test that evaluates 14 substances of the blood chemistry, called the comprehensive metabolic panel, or CMP. The CMP evaluates electrolyte levels as well as liver and kidney function.

Electrolytes such as sodium, potassium, chloride, bicarbonate, and calcium help regulate fluid balance, nerve signals, muscle contractions, heart rhythm, and the balance between acids and base.

High blood sodium often means dehydration. Low sodium may follow vomiting or diarrhea, can be caused by medications, or can be an indication of certain organ damage.

Potassium is particularly important to muscles and the heart's electrical system. Low potassium can follow vomiting, diarrhea, or the use of certain drugs commonly called water pills. High potassium may occur when the kidneys cannot eliminate enough of it or when medications affect potassium handling. Significant abnormalities in either direction can disrupt the heart rhythm.

Chloride helps maintain fluid and acid-base balance. Low levels can occur with prolonged vomiting or diuretic use; high levels may accompany dehydration or certain acid-base disturbances.

The result labeled carbon dioxide, or CO₂, mostly measures bicarbonate—not the carbon dioxide being breathed out. Bicarbonate helps to have our blood in a neutral pH. Low levels may occur with kidney disease, severe diarrhea, or uncontrolled diabetes with acid accumulation. High levels can accompany prolonged vomiting or other acid-base disturbances. Lung conditions can also influence this result because the lungs and kidneys work together to regulate blood acidity.

Calcium supports nerves, muscles, and the heart, but blood calcium does not directly measure bone strength or how much calcium someone eats. High calcium may result from overactive parathyroid glands, excessive calcium or vitamin D intake, or even certain cancers.

Low calcium can occur with vitamin D or magnesium deficiency, kidney disease, poor nutrient absorption, or underactive parathyroid glands.

The CMP's main kidney measurements are creatinine, blood urea nitrogen (BUN) and glomerular filtration rate, GFR. Creatinine and BUN are waste products associated with muscle activity and protein breakdown. Their numbers often rise when kidney filtration declines, but dehydration, intense exercise, muscle injury

and a meat-heavy diet can also increase them. Low creatinine and BUN generally reflect less muscle mass or muscle loss—not exceptionally healthy kidneys.

The GFR is an estimate of the kidneys' filtering capacity: a lower number generally means poorer filtration.

There are seven labs that we use to evaluate the liver function - or liver associated functions.

ALT and AST are enzymes released when cells are injured. ALT is more closely associated with the liver, while AST also occurs in muscles and other tissues. Elevated levels may accompany fatty liver disease, hepatitis, alcohol-related injury, or medication effects.

AST can also rise with muscle damage. These numbers do not indicate what percentage of the liver is functioning. Low levels are generally much less concerning than high levels. Alkaline phosphatase, or ALP, comes from both the liver and bones. High levels may indicate impaired bile flow or a bone disorder; additional testing can help identify the source. Low ALP is less common and may occur with nutritional deficiencies, thyroid disease, or a rare inherited bone condition.

Bilirubin forms when red blood cells break down and is processed by the liver. High levels can result from liver disease, blocked bile ducts, or accelerated red-cell breakdown. Enough accumulation produces jaundice, the yellowing of the skin and eyes. Low bilirubin generally is not a concern.

Albumin is a protein made by the liver that helps keep fluid inside blood vessels. Low albumin may accompany advanced liver disease, protein loss through the kidneys, or nutritional problems; it does not, by itself, prove liver failure. High albumin commonly reflects dehydration. Total protein measures albumin plus other blood proteins. Low total protein may accompany liver or kidney disease, malnutrition or poor absorption, while high total protein may require testing to identify which proteins are elevated.

Glucose is the body's main circulating fuel. I personally like to not rely on that one snapshot glucose value, as there is another much better test out there to use for the potential diagnosis of diabetes.

Ultimately, a chemistry panel is a collection of connected clues. The useful questions are not merely "Is this high or low?" but "How abnormal is it, is it new, and what explains the pattern?" Reviewing the numbers alongside symptoms, medications, and previous results turns an intimidating laboratory report into meaningful information about health.