TEST

Comprehensive metabolic panel

A comprehensive metabolic panel is a blood test measuring glucose, electrolytes, proteins, and markers related to kidney and liver health.

WHAT IT MEASURES
Fourteen markers of blood sugar, electrolytes, kidney and liver health

SAMPLE
Blood

FASTING NEEDED?
Sometimes, when fasting glucose or other tests are included

HOW LONG IT TAKES
About five minutes for the blood draw

RESULTS IN
Usually same day to two days; varies by laboratory

USED FOR
Screening, diagnosis, and monitoring

MAIN LIMITATION
Abnormal results are nonspecific and easily affected by hydration

Overview

A comprehensive metabolic panel, or CMP, is a group of blood tests usually performed on one sample. It provides a broad view of blood sugar, fluid and mineral balance, kidney function, and certain aspects of liver health.

A typical CMP measures 14 substances:

Carbon dioxide mainly reflects bicarbonate, which helps control the blood's acid balance. Blood urea nitrogen, or BUN, and creatinine are waste products used to assess kidney filtration. ALT, AST, and alkaline phosphatase are enzymes that may change with liver or bile duct problems. Bilirubin comes from the breakdown of red blood cells. These results cannot identify a cause by themselves.

- Glucose
- Calcium
- Sodium, potassium, chloride, and carbon dioxide

- Blood urea nitrogen and creatinine
- Albumin and total protein
- Alkaline phosphatase, ALT, AST, and bilirubin

Why the test is ordered

A CMP may provide a general health overview or help investigate a specific concern. It may be ordered to:

A CMP does not diagnose most conditions on its own. Results must be considered alongside symptoms, medical history, examination, and other tests.

- Check blood sugar, electrolytes, kidney function, or liver health
- Investigate vomiting, weakness, swelling, or jaundice
- Monitor a kidney, liver, or metabolic condition
- Check how an illness or medicine is affecting the body
- Assess dehydration or another acute illness
- Establish baseline results before some treatments or procedures

Who should have the test

You may have a CMP during a health assessment, while unwell, or when being monitored for a known condition. It is also commonly included before surgery or after starting medicines that may affect electrolytes, the kidneys, or the liver.

There is no single testing schedule for everyone. Repeat testing may be useful to follow an abnormality or determine whether results are changing.

How to prepare

Ask whether you need to fast. A CMP does not always require fasting, but it may be requested when glucose must be interpreted as a fasting level or when other tests are collected at the same time.

Fasting usually means no food or drinks other than plain water for the specified period. Coffee, tea, juice, gum, and sweetened drinks may interfere with fasting instructions.

Tell the person ordering the test about all medicines, vitamins, and supplements. Do not stop taking them unless specifically instructed. Unless told otherwise, drink water normally because dehydration can affect results and make blood collection harder. Avoid unusually intense exercise shortly before the test if practical.

What happens during the test

A healthcare professional inserts a small needle into a vein, usually inside your elbow or in your hand. Blood is collected into one or more tubes.

You may feel a brief sting. The draw usually takes only a few minutes, and a small dressing is placed over the site afterward.

Understanding your results

Your report lists each measurement, its unit, and the laboratory's reference interval. A value outside this interval is not automatically evidence of disease. Ranges and interpretation may vary with the laboratory, age, sex, pregnancy, medicines, and clinical circumstances. Use the range on your own report rather than one found online.

Results are often interpreted in groups:

Trends across several tests can be more informative than one result. Small abnormalities are common and may be rechecked before further investigation.

- Glucose shows blood sugar at that moment
- Sodium, potassium, chloride, and bicarbonate reflect fluid, mineral, and acid balance
- BUN and creatinine help assess kidney filtration and hydration
- ALT, AST, alkaline phosphatase, and bilirubin provide clues about the liver and bile ducts
- Albumin, total protein, and calcium may be affected by nutrition, organ function, hormones, or other processes

What affects the results

Eating can raise glucose. Dehydration may concentrate BUN, creatinine, sodium, albumin, total protein, and calcium, while unusually high water intake may have the opposite effect.

Strenuous exercise can temporarily change creatinine, potassium, bicarbonate, AST, ALT, and

glucose. Pregnancy, age, and muscle mass may also affect results, particularly creatinine, albumin, and alkaline phosphatase.

Medicines including diuretics like furosemide or hydrochlorothiazide , corticosteroids like prednisone or hydrocortisone , some blood pressure medicines, antibiotics like amoxicillin or doxycycline , diabetes medicines, and mineral supplements can alter measurements. This does not necessarily mean a medicine is harmful.

Sample problems can mislead. Hemolysis, in which red blood cells break open, may falsely raise potassium and AST. Delayed processing can alter glucose and carbon dioxide. The laboratory may request another sample if necessary.

Accuracy and limitations

CMP measurements are generally reliable when samples are collected and handled correctly, but the panel may miss early disease. Creatinine can remain within range during early loss of kidney function, especially in someone with low muscle mass. Liver enzymes may also be normal in some liver conditions.

Results may appear abnormal because of food, hydration, exercise, pregnancy, medicines, or sample handling. Testing 14 substances also increases the chance that one value will fall slightly outside its range by chance.

Abnormalities are nonspecific. Raised AST or ALT cannot establish the cause or extent of liver injury, creatinine does not directly measure kidney filtration, and one glucose result does not show average blood sugar over several months.

More targeted tests may be needed, such as HbA1c or fasting glucose, estimated glomerular filtration rate and urine albumin, or specific liver, bile duct, muscle, hormone, or protein tests.

Risks and complications

Routine blood-draw risks include a small bruise, mild soreness, brief bleeding, lightheadedness, or fainting. Serious complications are uncommon.

What happens next

If results are within the expected range, no action may be needed, although they must still be interpreted according to why the test was ordered.

A mild abnormality may lead to a repeat CMP under standard conditions, a review of medicines and supplements, or a more specific test. Do not change medicines based on one result without appropriate advice.

Laboratories have procedures for reporting results that may require prompt attention. If a result is seriously abnormal, the service that ordered the test may contact you urgently.

Seek emergency care for confusion, a seizure, fainting, inability to stay awake, severe shortness of breath, or chest pain. Do not wait for routine follow-up if you feel seriously unwell, regardless of the report.

Common questions

Can I drink coffee before a CMP?

If asked to fast, avoid coffee, including black coffee. Plain water is usually allowed.

Does the time of day matter?

For most measurements, consistent preparation matters more than the exact time. Fasting samples are often collected in the morning for convenience.

Can I exercise beforehand?

Light activity is unlikely to be a problem, but strenuous exercise can temporarily affect several CMP results.

Should I take my medicines before the test?

Take them as usual unless instructed otherwise. Tell the testing service about medicines and supplements, and do not skip prescribed medicine solely to change a result.

Can I drink water while fasting?

Plain water is usually permitted and may make the blood draw easier. Follow the instructions provided for your appointment.

Why was only one result abnormal?

A mild isolated abnormality may reflect normal variation, hydration, food, exercise, medicine, or sample handling. Its size, related results, symptoms, and changes over time determine whether follow-up is needed.

Sources

- MedlinePlus Medical Test: Comprehensive Metabolic Panel , U.S. National Library of Medicine
- Mayo Clinic: Comprehensive Metabolic Panel , test and procedure overview
- National Institute of Diabetes and Digestive and Kidney Diseases: Identify and Evaluate Patients with Chronic Kidney Disease , kidney function testing overview
- KDIGO 2024 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease , Kidney Disease: Improving Global Outcomes
- Kwo PY, Cohen SM, Lim JK. ACG Clinical Guideline: Evaluation of Abnormal Liver Chemistries , American Journal of Gastroenterology , 2017
- WHO Guidelines on Drawing Blood: Best Practices in Phlebotomy , World Health Organization, 2010