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## Comprehensive Metabolic Panel (CMP)

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**Also known as:** CMP; Chem 12; Chemistry Panel; Chemistry Screen; SMA 12; SMA 20; SMAC (somewhat outdated terms)

**Formal name:** Comprehensive Metabolic Panel

**Related tests:** [Basic Metabolic Panel](#)



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### At a Glance

#### Why Get Tested?

To give your healthcare provider important information about the current status of your **metabolism**, including the health of your kidneys and liver as well as electrolyte and **acid/base balance** and levels of blood glucose and blood proteins; to monitor known conditions, such as **hypertension**, and to monitor the use of medications to check for any kidney- or liver-related side effects

#### When to Get Tested?

As part of a routine health exam; when you are being monitored for a specific condition or are taking medications that may impact your kidney or liver

#### Sample Required?

A blood sample drawn from a vein in your arm

#### Test Preparation Needed?

You may need to fast for 10-12 hours prior to sample collection; follow any instructions you are given.

### The Test Sample

#### What is being tested?

The comprehensive metabolic panel (CMP) is a frequently ordered panel of 14 tests that gives a healthcare provider important information about the current status of a person's **metabolism**, including the health of the kidneys and liver, electrolyte and **acid/base balance** as well as levels of blood glucose and blood proteins. Abnormal results, and especially combinations of abnormal results, can indicate a problem that needs to be addressed.

The CMP includes the following tests:

- **Glucose** - energy source for the body; a steady supply must be available for use, and a relatively constant level of glucose must be maintained in the blood.
- **Calcium** - one of the most important minerals in the body; it is essential for the proper functioning of muscles, nerves, and the heart and is required in blood clotting and in the formation of bones.

#### Proteins

- **Albumin** - a small protein produced in the liver; the major protein in **serum**
- **Total Protein** - measures albumin as well as all other proteins in serum

#### Electrolytes

- **Sodium** - vital to normal body processes, including nerve and muscle function
- **Potassium** - vital to cell metabolism and muscle function
- **CO<sub>2</sub>** (carbon dioxide, bicarbonate) - helps to maintain the body's acid-base balance (**pH**)

- **Chloride** - helps to regulate the amount of fluid in the body and maintain the acid-base balance

#### *Kidney Tests*

- **BUN (blood urea nitrogen)** - waste product filtered out of the blood by the kidneys; conditions that affect the kidney have the potential to affect the amount of urea in the blood.
- **Creatinine** - waste product produced in the muscles; it is filtered out of the blood by the kidneys so blood levels are a good indication of how well the kidneys are working.

#### *Liver Tests*

- **ALP (alkaline phosphatase)** - enzyme found in the liver and other tissues, bone; elevated levels of ALP in the blood are most commonly caused by **liver disease** or bone disorders.
- **ALT (alanine amino transferase, also called SGPT)** - enzyme found mostly in the cells of the liver and kidney; a useful test for detecting liver damage
- **AST (aspartate amino transferase, also called SGOT)** - enzyme found especially in cells in the heart and liver; also a useful test for detecting liver damage
- **Bilirubin** - waste product produced by the liver as it breaks down and recycles aged red blood cells

#### **How is the sample collected for testing?**

A blood sample is obtained by inserting a needle into a vein in the arm.

#### **Is any test preparation needed to ensure the quality of the sample?**

You may need to fast (nothing but water) for 10 to 12 hours prior to the blood draw. Depending on the reason for ordering the CMP, it may be drawn after fasting or on a random basis.

## The Test

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#### **How is it used?**

The comprehensive metabolic panel (CMP) is used as a broad screening tool to evaluate organ function and check for conditions such as **diabetes**, **liver disease**, and **kidney disease**. The CMP may also be ordered to monitor known conditions, such as **hypertension**, and to monitor people taking specific medications for any kidney- or liver-related side effects. If a health practitioner is interested in following two or more individual CMP components, he or she may order the entire CMP because it offers more information.

#### **When is it ordered?**

The CMP is routinely ordered as part of a blood work-up for a medical exam or yearly physical. While the individual tests are sensitive, they do not usually tell a health practitioner specifically what is wrong. Abnormal test results or groups of test results are usually followed up with other specific tests to confirm or rule out a suspected diagnosis.

#### **What does the test result mean?**

Results of the tests that are part of the CMP are typically evaluated together to look for patterns of results. A single abnormal test result may mean something different than if several test results are abnormal. For example, a high result on just one of the liver enzyme tests has different implications than high results on several liver enzyme tests.

Sometimes, especially in hospitalized patients, several sets of CMPs, often performed on different days, may be evaluated to gain insights into the underlying condition and response to treatment.

Out-of-range results for any of the tests in the CMP can be due to a variety of different conditions, including, for example, kidney failure, breathing problems, and diabetes-related complications. Typically, if any results are out-of-range, one or more follow-up tests are performed to help pinpoint the cause and/or help establish a diagnosis.

See the articles on the individual tests for more detailed information about each one.

- **Glucose**
- **Calcium**

#### *Proteins*

- **Albumin**

- [Total Protein](#)

#### [Electrolytes](#)

- [Sodium](#)
- [Potassium](#)
- [CO2 \(carbon dioxide, bicarbonate\)](#)
- [Chloride](#)

#### [Kidney Tests](#)

- [BUN \(blood urea nitrogen\)](#)
- [Creatinine](#)

#### [Liver Tests](#)

- [ALP \(alkaline phosphatase\)](#)
- [ALT \(alanine amino transferase\)](#)
- [AST \(aspartate amino transferase\)](#)
- [Bilirubin](#)

#### **Is there anything else I should know?**

A variety of prescription and over-the-counter drugs can affect the results of the components of the CMP. Be sure to tell your healthcare provider about any medications you are taking. Likewise, it is important to give a complete history as many other factors can also affect the interpretation of your results.

## **Common Questions**

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### **1. How is the CMP different than the BMP and why would my doctor order one over the other?**

The CMP is made up of 14 tests; the [basic metabolic panel \(BMP\)](#) is a subset of those and has 8 tests. It does not include the liver (ALP, ALT, AST, and bilirubin) and protein (albumin and total protein) tests. A healthcare provider may order a CMP rather than a BMP if he or she wants to get a more complete picture of the status of a person's organ function or to check for specific conditions, such as [diabetes](#) or liver or [kidney disease](#).

### **2. One of the results from my CMP is slightly out of range. What does this mean?**

The results of your CMP are interpreted by your healthcare provider within the context of other tests that you have had done as well as other factors, such as your medical history. A single result that is slightly high or low may or may not have medical significance. There are several reasons why a test result may differ on different days and why it may fall outside a designated reference range.

- **Biological variability** (different results in the same person at different times): If a health practitioner runs the same test on you on several different occasions, there's a good chance that one result will fall outside a reference range even though you are in good health. For biological reasons, your values can vary from day to day.
- **Individual variability** (differences in results between different people): Reference ranges are usually established by collecting results from a large population and determining from the data an expected average (mean) result and expected differences from that average (standard deviation). There are individuals who are healthy but whose test results, which are normal for them, do not always fall within the expected range of the overall population.

Thus, a test value that falls outside of the established reference range supplied by the laboratory may mean nothing significant. Generally, this is the case when the test value is only slightly higher or lower than the reference range and this is why a health practitioner may repeat a test on you and why he or she may look at results from prior times when you had the same test performed.

However, a result outside the range may indicate a problem and warrant further investigation. Your healthcare provider will evaluate your test results in the context of your medical history, physical examination, and other relevant factors to determine whether a result that falls outside of the reference range means something significant for you.

For more, read the articles on [Reference Ranges and What They Mean](#) and [How Reliable is Laboratory Testing?](#)

## **Related Pages**

**On This Site**

Conditions: [Diabetes](#), [Kidney Disease](#), [Liver Disease](#), [Hypertension](#)

**Elsewhere On The Web**

[MedlinePlus Medical Encyclopedia: Comprehensive metabolic panel](#)

[KidsHealth: Blood Test: Comprehensive Metabolic Panel \(CMP\)](#)

## Article Sources

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