

**Name of the test**

Ionized Calcium

**Alternative name(s) of the test**

Free Calcium

**What is this test used for?**

Calcium is one of the most important minerals in the body. It is essential for formation of bones and teeth, for functioning of all the muscles including the heart, for nerve-signaling and blood clotting. Some amount of calcium is lost from the body every day, so eating calcium-rich foods (yogurt, cheese, eggs, milk, spinach, almonds, fish) plays an important role in maintaining normal calcium levels in the blood. If there is excess loss of calcium or not enough is ingested, then it is taken from the bones.

Only 1% of calcium circulates in the blood, the rest is found in the bones. Almost half of the calcium in the blood is attached to proteins. Calcium that is not bound with these proteins is called ionized calcium or free calcium.

This test is used to measure the amount of ionized calcium in the blood. The total calcium test measures the level of both ionized and bound forms.

**When is the test ordered?**

Total calcium is measured as a part of routine health screening. Sometimes, performing the total calcium test alone is not enough though and is even misleading. In these circumstances the ionized calcium test is necessary.

There are factors that might affect the level of total calcium without affecting the ionized calcium level and vice versa. For example, ionized calcium levels may increase or decrease depending on pH.

Because total calcium test also measures the amount of calcium attached to proteins, total calcium depends on protein levels as well. So for example, if blood protein levels are low, then total calcium will be low too, even though the free calcium levels may be normal – this is called pseudohypocalcemia.

Performing ionized calcium test is more useful than total calcium test in the following conditions:

- when a patient has a chronic kidney or liver disease
- when the albumin level in blood is low
- in newborns to monitor neonatal hypocalcemia
- when a patient is suspected to have hypocalcemia
- in critically ill patients

**How is this test performed?**

A blood sample is taken from a vein.

**How to prepare for the test**

Fasting might be required several hours prior to the test.

Some medications might affect the test results: for example, thiazide diuretics and thyroxine increase ionized calcium levels, while heparin and epinephrine decrease it. Consult your doctor for detailed instructions on how to prepare for the test.

### **Interpretation of results**

The results of ionized calcium test are interpreted in conjunction with the total calcium test results.

Some of the causes of high levels of ionized calcium are:

- Hyperparathyroidism
- Tumors and malignant neoplasms
- Sarcoidosis

Some of the causes of low levels of ionized calcium are:

- Hypoparathyroidism
- Rickets
- Vitamin D deficiency
- Malabsorption