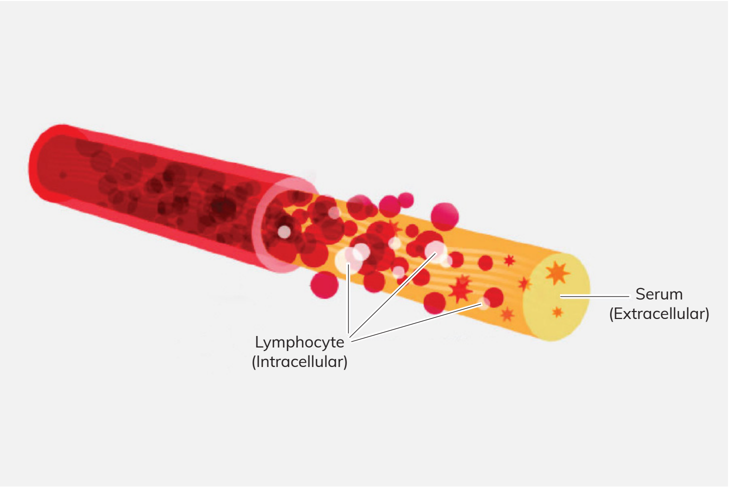
SpectraCell Laboratories
Science + Health + Solutions

SERUM vs. INTRACELLULAR 101

A serum test measures something outside of cells in the liquid (plasma) part of the blood which is known as an ***extracellular*** *blood test. An* ***intracellular*** *blood test measures something inside the red and white blood cells that are essentially floating around in the plasma.*



WHY IS IT IMPORTANT TO MEASURE INTRACELLULAR NUTRIENT STATUS VERSUS EXTRACELLULAR (SERUM)?

The reason is because every biochemical reaction needed to sustain life—like energy production, cellular repair, detoxification, growth, protein synthesis, genetic expression—all occur inside the cell. Measuring nutrient levels outside the cell tells you nothing about what is going on intracellularly, where metabolism takes place (and where micronutrients do their job).

Imagine you have a car that has a full gas tank. The gas gauge says FULL. But for whatever reason—perhaps the fuel line is broken—that fuel is not reaching the engine, thus, your car will not function. Your cells are like that engine. It doesn't matter if there is gas in the tank (or nutrients in the serum) if that gas cannot get to the engine (inside the cell), it won't drive. If nutrients don't get inside the cell, metabolic function doesn't happen.

CAN I HAVE HIGH SERUM BUT LOW INTRACELLULAR MICRONUTRIENT STATUS?

Yes, in fact this is common. There are many reasons that a nutrient may be low inside the cell:

- Poor transport of nutrients accross the cell membrane
- Cofactors needed to utilize the nutrients are missing or low
- Malabsorption of nutrients into cells
- Circadian rhythms alter serum levels but not intracellular levels
- Serum levels fluctuate with recent supplement or food intake

Functional deficiencies often exist when serum levels are "normal."

IS INTRACELLULAR TESTING THE SAME AS FUNCTIONAL TESTING?

Not necessarily. **Intracellular** testing simply means that micronutrients are measured *inside* the cell wall (versus outside the cell in the blood serum). However, measuring the mass *quantity* of a nutrient in a cell is different than measuring the **function** *(performance)* of a nutrient within a cell. *It doesn't matter how much of a vitamin exists in or out of the cell, if that cell is incapable of utilizing that nutrient.* Ideally, micronutrient status should be assessed both intracellularly and functionally.

Measuring levels instead of function would be akin to measuring the amount of fuel in the engine (cell) and discovering the car still won't drive (function) because it didn't need gas, it needed oil. Gasoline levels would be fine in the engine, but the engine still won't function if gas is not what it needs. SpectraCell's Micronutrient Test is both **intracellular** and **functional**.

MEASUREMENT UNITS

Serum testing: ng/mL, nmol/L

Intracellular, non-functional testing: ng/mL, nmol/L, mcg/dL, mcg/mL, mcg/L

Functional intracellular testing: % change in growth

IF SERUM TESTING IS LESS USEFUL, WHY IS IT SO COMMON?

The simple reason is because serum testing has been around for decades, is widely available, easy to perform, and very inexpensive. A serum test can be run in any hospital or national laboratory because it is a commodity, non-specialty type of blood test. As far back as the 1970s, medical literature demonstrated that **serum tests will miss functional deficiencies and that intracellular nutrient function is more clinically reliable than serum**, but the relative cost and availability of serum testing obscured the clinical superiority of functional testing.

Serum testing may still appear cheaper, even though functional nutrient testing is more clinically informative. But for those who really delve into the research, *the notion of serum testing of nutrients being less useful (at best) and misleading (at worst), is highly substantiated.*

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NOTE - Serum testing is actually much more expensive if all nutrients were ordered separately, usually thousands of dollars more. When serum testing is ordered, it is often for only one or two nutrients (vitamin D and B12 are the most common, for example). So, although serum tests may appear less expensive, it is only because of the fewer number of analytes included.