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Minerals, Part IV

By Tim O'Shea, DC

Editor's note: This is the final part in Dr. O'Shea's "Minerals" series. Part I was in the 10-5-98 issue; Part II (11-2); and Part III (12-1).

Quality Control in Mega-Mineral Supplements

Let's talk about quality control and the consistency of percentages of each mineral from batch to batch. There's very little quality control with mega-mineral supplements, as the manufacturers themselves will admit. Such a range of variation might be acceptable in grenade tossing or other areas where high standards of precision are not crucial, but in a nutritional supplement that is supposed to enhance health by drinking it, this is an area in which the details of composition should be fairly visible, verifiable, and identical every time. In these 80-trace-mineral toddies, there is no way of testing the presence or absence of many of the individual minerals.

Many established essential trace minerals do not even have an agreed-upon recommended daily allowance, and with good reasons:

1. The research has never been done.
2. The amounts are too small to be measured.

There's even less known about the amounts and toxicities of those minerals which are claimed to be present in these "miraculous" toddies.

Many essential minerals are toxic in excess, but essential in small amounts. Iron, chlorine, sodium, zinc and copper are in this category. Toxic levels have been established and resulting pathologies have been identified. How risky is it to imbibe 40 or 50 minerals for which no toxicity levels have ever been set?

Nutritionist Doug Grant cites several minerals that frequently appear on the ingredient labels of certain mega-mineral products. The manufacturers of these products admit that their supplements contain or "may contain" some of the following:

Aluminum: Clearly associated with senile dementia (Alzheimer's), aluminum blocks absorption of essential minerals like calcium, iron, and fluoride.

Silver: Questionable as a single-dose antibiotic, the consistent intake of silver accumulates in the blood-forming organs (spleen, liver, and bone marrow) and the skin, lungs, and muscles. Serious pathologies have resulted from silver ingestion: blood disorders, cirrhosis, pulmonary edema, chronic bronchitis, and a permanent skin condition known as argyria, to name a few. Silver is better left in the ancient lakes and in tableware.

Gold: Manufacturers of mega-minerals hawk that there's more gold in a ton of seawater than there is in a ton of ore. So what? Our blood is not seawater. Gold used to be included in the treatment of rheumatoid arthritis, but it has largely been abandoned since it was proven that it caused kidney cell destruction, bone marrow suppression and immune-system abnormalities.

Lithium: Rarely used as an antipsychotic medication, lithium can cause blackouts, coma, psychosis, kidney damage and seizures; outside of these, it should be fine.

These are just a few examples of mineral toxicities about which we have some idea. But for at least half the minerals in the mega toddies, we know next to nothing.

Chelated

The fourth form of supplemental minerals is the chelated variety. Some clarification of this term is immediately necessary. "Chelated" is a general term that describes a certain chemical configuration or shape of a compound in which some molecules hook up with other chemical structures. When a mineral is bound or stuck to certain carrier molecules, which are known as chelating agents, or ligands, and a ring-like molecule is the result, we say that a chelate is formed. Chelate comes from the Greek word for claw, suggested by the open v-shape of the two ligands on each side, with the mineral ion in the center.

Many things can be chelated, including minerals, vitamins and enzymes. Minerals in food may be bound with organic molecules in a chelated state. Many molecules in the body are chelated in normal metabolic

processes. The carrier proteins in the intestinal wall, whose job it is to transport ionic minerals, chelate the ions.

"Chelation therapy" is a mainstream therapy for removing heavy metals from the blood. The toxic metals are bound to a therapeutic amino acid ligand called EDTA. With a Pac-Man-like action, the metals are removed from the blood.

Molecular weight is measured in units called daltons. The ligands or binding agents may be very small (800 daltons) or very large (500,000 daltons), resulting in many sizes of chelates. A mineral plus a ligand equals a chelate. The largest chelates are generally the most stable, and also the most difficult to absorb. Ionic minerals absorbed through the intestine are chelated to the carrier proteins in at least two different instances.

Chelation with respect to mineral supplements refers to a very specific type of chelation. The idea is to bind the mineral ion to ligands that will facilitate absorption of the mineral through the intestine into the bloodstream, bypassing the pathway used for ionic mineral absorption. Minerals prepared in this way are sometimes described as "pre-chelated," since any ionic mineral will be chelated once it is taken up by the intestinal membrane.

After decades of research at Albion Laboratories in Utah, it was learned that small amino acids, especially glycine, are the best ligands for chelating minerals. There are three reasons why this is true:

1. The small amino acids bypass the entire process of chelation by the intestine's own carrier proteins.
2. The small amino acids facilitate absorption by an entirely different pathway of intestinal absorption, skipping the intermediate steps which ionic minerals go through.
3. With small amino acids, the chelate will be at the most absorbable molecular weight for intestinal transfer: less than 1,500 daltons.

It has also been established beyond controversy that certain pairs of amino acids (dipeptides) are the easiest of all chelates to be absorbed, often easier than individual amino acids. Proteins are made of amino acids. Normal digestion presumably breaks down proteins to their amino-acid building blocks so they can be absorbed, but a total breakdown is not always necessary. It has long been known that many nutrient chains of two, three or even more amino acids may be absorbed just as easily as single amino acids. Food-bound copper, vitamin C with hemoglobin molecule, and animal protein zinc are some examples of amino acids chelates that are easily absorbed intact. (Source: *Intestinal Absorption of Metal Ions*, Chapter 7.)

To take another example, in abnormal digestion it is well-known that chains of amino acids (dipeptides, tripeptides, even polypeptide proteins) sometimes become absorbed intact in a pathology known to gastroenterologists as Leaky Gut Syndrome. Obviously this is not healthy and has many adverse consequences, but the point is that amino acids chains are frequently absorbed for many different reasons. It's not always like it says in the boldface section headings in *Guyton's Dictionary*.

The reason these dipeptide chelates are absorbed faster than ionic minerals is that the chelated minerals are bonded tightly enough so that they do not dissociate in the acidic small intestine and offer themselves for capture by the intestinal membrane's carrier proteins. That whole process was avoided because chelates were absorbed intact. This is the most concise summary of why chelated minerals may be superior to ionic, provided it's the right chelate. Only a specific chelate can resist digestion and maintain its integrity as it is absorbed through the gut. Again, all chelates are not created equal. Inferior chelates, used because they are cheaper to produce, include the following:

- carbonates
- citrates
- oxides
- sulfates
- chlorides
- phosphates

If the label lists one of these chelates, it means the mineral is bound either too strongly or not tightly enough and will be released at the wrong time and the wrong place. Chelation of minerals in nutrient supplements is a very precise science, yielding chelates superior to those occurring naturally in foods. Intact absorption is faster, easier, and requires less metabolic energy, provided the chelate is about 1,500 daltons.

After comparing the evidence, there is really not much of a dispute about which is absorbed faster, ionic minerals or dipeptide-like amino acid chelates. Meticulous isotope testing has shown the following increases in percent absorption of chelates as compared with ionic absorption:

Iron	490% greater
Copper	580% greater
Magnesium	410% greater
Calcium	421% greater
Manganese	340% greater

Source: *Journal of Applied Nutrition*, 1970:22:42

This is just the briefest glance at the prodigious amount of research comparing ionic with chelated minerals, but the results are uniform. The winner of the bioavailability contest is chelated minerals, provided the chelate was maintained as small as possible, generally using glycine as the amino acid ligands at a total weight of about 1,500 daltons.

Marketing is a wonderful thing. Two different companies are now attributing the longevity of the Hunza tribe in Pakistan to two entirely different properties of their water: mineral content and molecular configuration. This classic error in logic is described as post hoc, ergo propter hoc (after this, therefore because of this). Maybe it was the weather that made the Hunzas live longer, or their grains, or the absence of toothpaste or web servers. Marketing is the art of persuasion by suspending logic.

The average lifespan of an American is about 75 years. No one has ever proven that taking mineral supplements will extend life. Many older people have never taken mineral or vitamin supplements. It really comes down to genetics, quality of life and incidence of disease. How many days or months was a person ill during his lifespan?

We are the walking petri dishes of Alexis Carrell. Dr. Carrell was a French biochemist and Nobel Prize winner who performed the famous experiment in which he kept chicken heart cells alive in a petri dish for 28 years just by changing the solutes every day. He could have continued, but figured he'd proven his point. Mineral content factors largely in the quality of our solutes: the blood.

The U.S. has the highest incidence of degenerative diseases of any developed country on earth. In addition, the infectious diseases are coming back; antibiotics are getting less effective with each passing year. Our confidence in prescription drugs is weakening. Allow me to disabuse you of unfounded hopes. Cancer and AIDS will never be cured by the discovery of some new drug. It's not going to happen. There probably will never be another Alexander Fleming. As it turned out, penicillin was just a brief detour. Bacteria have had

50 billion years to figure out ways to adapt. People recover from illness because the immune system overcomes the problem. Allergy shots never cured an allergy; people who take allergy shots always have allergies.

Our only hope of better health is to do everything possible to build up our natural immune system. One of these preventative measures is nutritional supplements. It may not be dramatic, but daily deposits to the immune system bank account will pay off down the road. Healthy people don't get sick.

With respect to minerals, then, what are our goals? My opinion is that having once realized the necessity for mineral supplements, our objectives should be simple:

- Take only the minerals we absolutely need.
- Take the smallest amounts possible.
- Ensure that nothing is left over (no metabolic residue).

Some of these ideas may seem strange and difficult to understand on first reading. But it is a very simplified version of what actually takes place. Most of the technical details were omitted for the sake of clarity and brevity. However, the correctness of this basic framework is verifiable.

We are living in the age of the Junk Science Hustle. Everyone's an expert, often quoting shaky sources, facts and claims which may have no foundation in physical reality. Seems there's a formula:

- Get a product.
- Get a marketing company (preferably in Utah or Texas).
- Get some university MD endorsements.
- Get some miraculous testimonials.
- Get a downline.

In a certain way all this is a good sign, a natural consequence of the explosion in holistic nutrition and supplementation. In the midst of the quagmire of hype and junk science, some truly superlative items have emerged onto the marketplace which have benefited indirectly from biotechnical advances evolved in the challenged, time-bomb world of mainstream pharmacology. Most of the new holistic supplements are less toxic than standard pharmaceutical drugs, because they're in a category the FDA calls GRAS (Generally Regarded As Safe). That's probably more than we can say for Prozac, fen-phen, and Viagra.

Many of the extraordinary holistic supplements won't be sold in stores, and no one is going to give them away. Welcome to the American marketplace. Very time-consuming and confusing is the screening process one must go through to unearth the treasures that can reward the patient and resolute search. Caveat emptor.

Are minerals important? Two-time Nobel prize winner Linus Pauling thought so: "You can trace every sickness, every disease, every ailment to mineral deficiency." Using the image of Carrell's solutes in the petri dish as the analogue of blood in our bodies, adequate mineral content is undoubtedly an advantage and a vital component of the body's own solutes in its constant effort to cleanse and operate all the body's cells at an optimum metabolic vibrancy and resilience. Healthy people don't get sick.



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