INTRODUCTION TO MINERALS

EARTH ELEMENTS REQUIRED FOR LIFE

While *vitamins* are organic substances (derived from plants and animals), *minerals* are inorganic elements (derived from earth). Once a mineral is absorbed into a plant or animal it becomes biologically bound into the organic plant or animal system, but still remains inorganic in nature. Both vitamins and minerals are essential in small amounts for normal mental and physical functioning. But since the body cannot manufacture either they must be consumed in foods or supplements.

Our ancestors treated mineral deficiencies even though they did not understand the scientific basis of their treatments. For instance, 5,000 years ago the Chinese recommended seaweed and burnt sponge — good sources of iodine — to treat goiter. Similarly, the ancient Greeks treated anemia by providing iron-containing water in which heated swords had been cooled.

Only in the last two centuries have we been able to understand what minerals are and the roles they play in the body. In 1801, the Swedish chemist Jîns Jakob Berzelius reported the calcium and phosphorus content of bone, and in 1838 he discovered that iron was necessary for the blood protein hemoglobin to carry oxygen. Yet by the end of the 19th century, only one-third of the minerals now accepted as essential were known to be required in the diet.

We now know that minerals are absolutely critical for normal body function. Almost every chemical reaction that occurs in the body requires *at least* one mineral. Energy production, tissue manufacture, protein synthesis, cellular growth and reproduction, water balance, and function of the immune system all require one or more minerals. Due to this extreme involvement, metabolic upset and symptoms of a mineral deficiency occur more rapidly and can be more dramatic than those of a vitamin deficiency.

Minerals make up 4-5% of body weight. Their functions include:

- providing strength to bones and teeth
- serving as building blocks of organs, muscles, blood, nerves, and other tissues
- activating enzyme systems
- controlling fluid balance
- regulating acid-base balance
- insuring the responsiveness (contraction and relaxation) of muscles
- taking part in nervous system communication
- acting together with hormones, vitamins, and other metabolic regulators in various body systems
- participating in digestion and metabolism
- supporting the production of hormones and antibodies

VITAMINS AND MINERALS — BETTER TOGETHER THAN ALONE

Vitamins and minerals work better when taken in combinations than alone. For example, **phosphorus** is required for the absorption of some B-complex vitamins, and vitamin D is necessary for the absorption of **calcium.** Vitamin C enhances **iron** absorption, whereas zinc is required for the release of vitamin A from the liver. In addition, some critical enzymes (proteins that speed biochemical reactions but that remain unchanged in the process) require vitamins and minerals to do their jobs (governing oxidation, growth, metabolism, cellular reproduction, digestion, etc.). For instance, minerals and enzymes work together to control the responses of our muscles, the electrical impulses that surge through our nervous systems, the beating of our hearts, the delicate balance of our body fluids, and many other complex events that must occur to maintain life.

MINERALS ARE CLASSIFIED ACCORDING TO BODY NEEDS

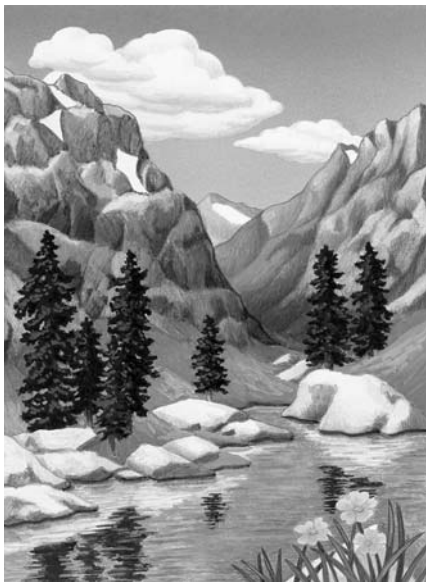
Minerals are classified primarily according to the amount required to meet our basic needs. Macrominerals are required daily by the human body in amounts ranging from a few tenths of a gram to one or more grams. Microminerals (trace minerals), on the other hand, are required daily by the human body in minute quantities, ranging from millionths of a gram (micrograms) to thousandths of a gram (milligrams).

ESSENTIAL MACROMINERALS

- Calcium
- Chlorine
- Potassium
- Sodium
- Phosphorus
- Magnesium
- Sulfur

ESSENTIAL MICROMINERALS (TRACE MINERALS)

- Zinc
- Copper
- Iodine
- Iron
- Manganese
- Fluorine
- Selenium
- Molybdenum
- Chromium



Other Important Minerals (Not Essential to Humans)

- Nickel
- Vanadium
- Silicon
- Cobalt (a vital constituent of vitamin B_{12} that is not essential by itself)

The above classifications do not represent a relative importance, but only the relative amount required. A deficiency of a trace mineral, such as selenium, may cause just as much damage as deficiency of a macromineral, such as calcium. For this reason, no one essential mineral is more important than any other. An adequate intake of all the essential minerals is important.

The Mineral Gap: Deficiencies are Widespread and Dangerous

Recently, the U.S. National Academy of Sciences reviewed the scientific data for vitamins and minerals and set new Daily Reference Values (DVs). The updated DVs reflect the growing scientific evidence supporting minerals and the key roles they play.

Just a few of the ailments to which mineral deficiencies may contribute include:

- weak bones (calcium)
- goiter (iodine)
- anemia (iron, copper)
- impaired glucose tolerance, adult-onset diabetes (chromium)
- tooth decay (fluorine)
- cardiovascular diseases, including heart disease, high blood pressure, and stroke (magnesium, calcium, potassium, copper)
- slowed growth (zinc)
- weakened immunity (zinc)
- cancer (selenium)
- muscle spasm (magnesium)
- poor appetite (magnesium, zinc)
- confusion, hallucinations, disorientation (magnesium)
- demyelination and degeneration of the nervous system (copper)

Factors that Contribute to the Mineral Gap

The mineral composition of the soil on which fruits and vegetables were grown can vary considerably, creating regions of mineral deficiency. In the United States, for instance, soils in Oregon, Florida, and some of the Mid-Atlantic states are deficient in copper. Soils of the southwestern U.S. are phosphorus-deficient whereas those of the northwestern U.S. and Great Lakes region are iodine-deficient.

Food processing may also lessen the mineral value of foods. During the canning of fruits and vegetables, for instance, minerals may escape into the packing fluid, which is often discarded. And calcium and phosphorus can be lost during cheese making. Similarly, milling of grains removes the mineral-rich outer layers, which are often fed to livestock, who in this respect are eating better than we do! Further, sugar refining removes most of the mineral content of raw sugar.

Certain naturally occurring substances in foods may interfere with the absorption and utilization of minerals, including:

- fiber
- goitrogens (plant substances that interfere with iodine utilization)
- interacting minerals if the diet lacks variety and large excesses of particular foods are consumed
- oxalates (calcium-binding substances in rhubarb and spinach)
- phytates (present in the outer layers of grains)

Certain dietary practices can hinder the body's use of minerals. Overconsumption of alcohol, for instance, can lead to deficiencies of magnesium, potassium, and zinc. Similarly, nutrient-poor diets and food preparation practices such as removing the peelings from fruits and vegetables reduce the mineral content of foods consumed.

Food choices and dietary preferences contribute to the widespread prevalence of mineral deficiencies. For instance, in 1995 more than 20 million Americans — 80% of them women — had osteoporosis, or bone thinning due to calcium loss. A major reason is that many mineral-rich foods, such as dairy products, are unpopular in the diets of adult Americans seeking to avoid fat and cholesterol. Conversely, processed and refined foods are popular but contain few minerals.

Some groups of people may require greater-than-normal amounts of minerals on a daily basis than is supplied by their normal diet. Athletes, for instance, often require additional electrolytes (salts of minerals such as sodium, potassium, magnesium, calcium, phosphate, sulfate, and chloride). People considered at risk for mineral deficiencies include: the elderly, pregnant women, patients on certain medications, people who eat low-calorie diets, and strict vegetarians.

Does your diet place you at risk for mineral deficiencies?

- If you don't eat many dairy products or green, leafy vegetables, you may be at risk for **calcium** deficiency.
- If you live in a region where the soil is deficient in iodine and you do not consume iodized salt or iodine-fortified foods, you may be at risk for **iodine** deficiency.
- If you do not eat much meat, you may be at risk for **iron** deficiency. (Iron from meat is utilized about three times as well as iron in cereals, legumes, and vegetables.)
- If your diet consists mostly of milled grains and lacks whole grains, leafy green vegetables, nuts, legumes, fish, and meats, you may be at risk for **magnesium** deficiency.
- If you don't eat meat, poultry, or fish, you may be at risk for **zinc** deficiency.

Stress, both physical and mental, can deplete minerals. The prolonged secretion of stress hormones may lead to depletion of potassium, phosphorus, calcium, magnesium, and zinc in the urine.

A sedentary lifestyle may place individuals at risk for mineral deficiencies, as physical activity supports bone mineralization. Conversely, people who drink excessive amounts of water without a proper balance of electrolytes may require mineral supplementation.

Certain drugs can reduce the utilization of minerals by the body. These include:

- antacids
- antibiotics
- anticonvulsants
- blood-cholesterol-lowering agents
- diuretics (water pills)
- hormones
- laxatives
- excessive amounts of certain supplemental minerals

The GNLD Difference in Mineral Supplementation

Knowledge of Nutrition

Diet is what you eat, and nutrition is what your cells actually receive. GNLD researchers always give a great deal of thought to what happens to a particular nutrient once it is consumed. What problems me likely to impede the digestion of this particular mineral? What obstacles stand in the way of its absorption? Once the problems have been identified, attention is focused upon methods of maximizing product effectiveness within the body's natural processes.

To maximize the body's utilization of supplemental minerals, GNLD products provide related nutrients that help digest minerals and/or aid their absorption. For example, in Neo-Cal we add vitamin C to enhance calcium absorption and betaine hydrochloride to assist calcium digestion. Similarly, we include vitamin D in Cal-Mag to aid mineral utilization in individuals who may not be getting enough vitamin D in their diets.

Raw Material Selection

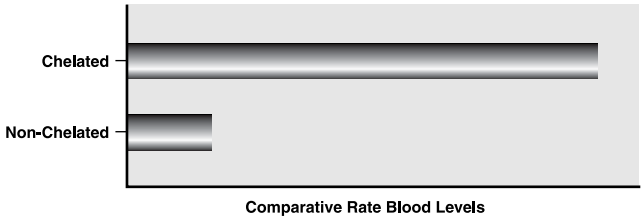
Although all minerals are inorganic, GNLD seeks to use minerals from organic sources wherever possible. For example, calcium can be mined from the earth or obtained from organic sources such as seashells. GNLD chooses to use calcium carbonate organically derived raw material base for its calcium supplements. This choice provides several advantages. Of the utmost importance is purity. Mined calcium carbonate may contain small but significant amounts of other elements, both desirable and undesirable, including lead and aluminum. Our high standards for purity and our low tolerance for contaminants steers every choice of raw materials used in GNLD products.

When formulating GNLD's mineral supplements, our Scientific Advisory Board looks first to natural sources. For instance, seashells provide Multi-Min's calcium, whereas kelp provides some of its iodine. If an organic source is not feasible, however, we look next to pure, high-quality, pharmaceutical grade minerals.

Amino Acid Chelation and Complexation Improve Absorption

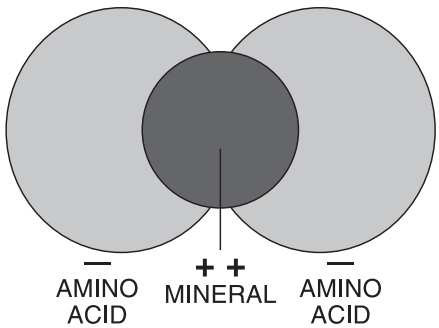
The body absorbs only a small portion of the minerals we eat. GNLD's scientific and medical experts long ago recognized the nutritional significance of improving absorption. In the mid-seventies, under the direction of the Scientific Advisory Board's Senior Member, Dr. Arthur Furst, GNLD researchers undertook development of dietary supplements that would provide increased absorption of essential minerals. Using amino acid chelation and complexation, it was possible to *significantly* increase the absorption rate of minerals. For instance, the absorption of minerals chelated with amino acids may be six times greater than that of non chelated varieties!

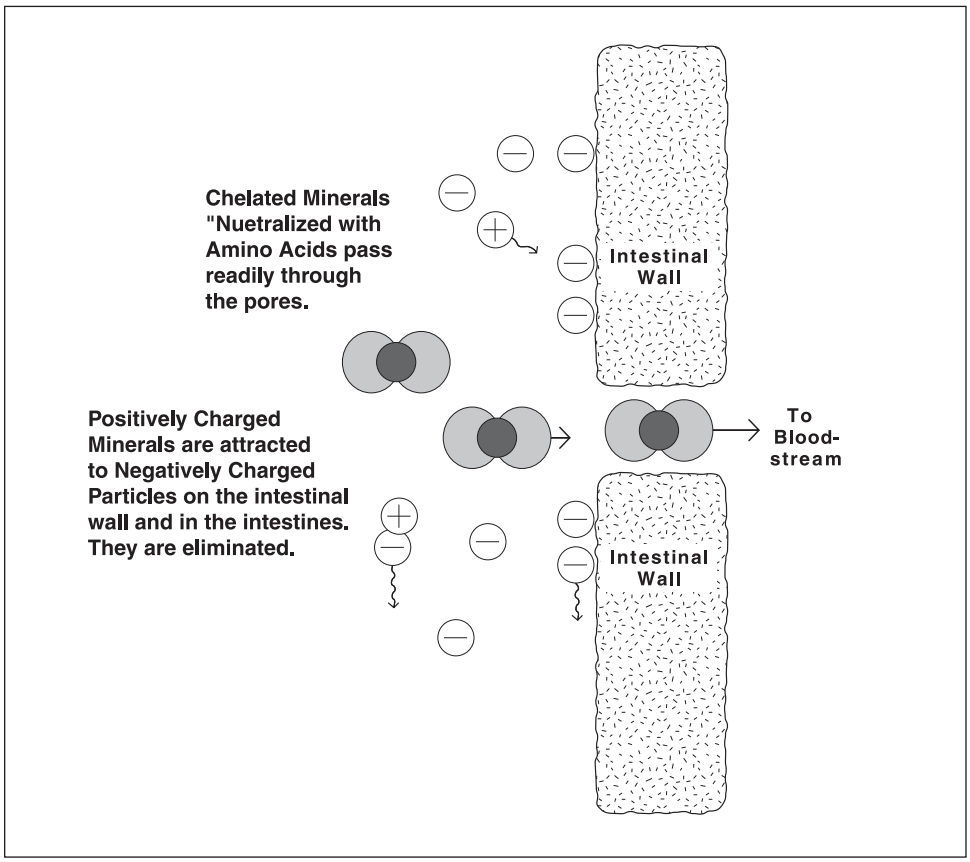
CHELATED MINERALS CAN YIELD UP TO 6 TIMES THE ABSORPTION RATE OF NON-CHELATED MINERALS



To understand the benefits of chelation, it is necessary to understand why the body's absorption of minerals is so inefficient and how chelation enhances a mineral's nutritive potential. When minerals are solubilized in the digestive tract they exist as positively charged ions. Like charges repel each other, but opposites attract. Thus the positively charged ions have a strong affinity for negatively charged ions, which are present in the intestines and on the surface of the intestinal wall. The positively charged mineral ions collect on the intestinal wall and are then removed. The result of this fatal attraction is that only a relatively small amount of the ingested mineral crosses the intestinal wall and enters the bloodstream.

Chelation and complexation use negatively charged amino acids — the natural building blocks of proteins — to shield the positive charge of minerals. The amino acids wrap themselves around the minerals, much like a protective overcoat, neutralizing the positive charge of the mineral. The neutralized mineral is not attracted by the negatively charged ions in the intestine and along the intestinal wall. Thus it is better able to disperse and pass through the intestinal wall and into the bloodstream. In addition, chelation presents nutrients to the body in an organic, natural form that facilitates their passage through intestinal membranes.





The GNLD chelation process provides several distinct advantages. First, GNLD chelated minerals are manufactured using the most soluble forms of minerals, so their dissolution is speedy. Second, chelation dramatically enhances the mineral absorption rate. Third, compared to non-chelated products, chelated minerals are less irritating to the stomach and intestines. In sum, no matter what factors may influence your ability to absorb nutrients, GNLD's high-quality chelated minerals set the industry's "gold standard" for mineral supplementation!

SPECIAL NOTE TO DISTRIBUTORS

Chelation therapy — a means by which a physician injects EDTA intravenously to detoxify heavy metals — is not related to chelation of minerals, although the terms used are similar.