

The Minerals You Need

A complete and unique guide to
all the minerals necessary for
better health and longer life

-Roger Mason

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The Minerals You Need

The most complete, researched, comprehensive, and unique guide in print. This book explain all the elements necessary for better health and longer life. All illnesses and medical conditions are due in part to mineral deficiency. All of us are deficient in some of the vital elements we need.

Roger Mason

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About This Book

My nine other books - *The Natural Prostate Cure*, *What Is Beta Glucan?*, *Zen Macrobiotics for Americans*, *Natural Health for Women*, *Testosterone Is Your Friend*, *Lower Blood Pressure Without Drugs*, *The Supplements You Need*, *The Natural Diabetes Cure*, and *Lower Cholesterol Without Drugs* - are all very heavily documented with published international studies from the most prominent scientific journals. In this book there is, instead, a partial list of the many dozens of studies used. Your author went through *Chemical Abstracts* (the “Scientist’s Bible”) last twenty years of research on all these elements. Everything you read here comes directly from the world’s published clinical research. You will find unique information here that’s not found in any other books or articles.

There are only ten minerals with an established RDA (Recommended Daily Allowance), yet we know of at least that many more that are known to be essential. There are still some ultratrace elements that will also eventually prove to be essential. There is usually a lag of many years between scientific discovery and application in the everyday world we live in. Science has known for a long time we need to fortify both our soils and domestic animal feed with a variety of minerals, so that our foods will be nutritious, rather than mineral deficient. **Research has proven lack of minerals is responsible in part for EVERY disease, condition, and illness known to man.** Supplementing our diets with these vital elements will go a long way towards preventing and curing the endless list of health problems we suffer from. We live in the richest, most affluent and productive country on earth, but, ironically, suffer from more disease and illness. **We are all mineral deficient.**

Why aren’t people demanding real, effective nutritional supplements with all the known minerals we need? There is only one complete mineral supplement available in the entire world. Just Google “mineral supplements” and you’ll find it.

Please read this book so you’ll know the minerals you need to be in the best of health and live a long, happy life.

Put the Periodic Table on this page

Chapter 1: Minerals in General

Ninety-one natural elements exist. There are only 73 elements we may need to supplement though. There are only ten with an established Recommended Daily Allowance (RDA). Those include calcium, magnesium, iron, zinc, manganese, copper, iodine, chromium, selenium, and molybdenum. There are at least ten more known to be needed in human nutrition, with no RDA set. It is well-known, for example, that boron is necessary for life, but no RDA has been set for it at this point. Just recently, it has become well-known that vanadium is also necessary for life, but it is difficult to even find any vanadium in a vitamin/mineral supplement. There is no doubt silicon is a necessary mineral, but you will rarely find it offered in any supplement. There is good initial evidence that such other minerals as barium, beryllium, cerium, europium, indium, lanthanum, lithium, neodymium, praseodymium, samarium, scandium, thulium, tungsten, yttrium and other ultratrace minerals may also well be necessary for plant and animal life. We only need about 100 mcg (micrograms) of these ultratrace elements (one tenth of one milligram).

We basically just do not show any deficiencies of phosphorous, potassium, sodium, sulfur, chlorine, or fluorine. These are often used as “filler” in promotional vitamin mineral supplements.

If there is one thing to understand, it is that **all minerals work together in harmony as a biological team**, just like a sports team. When one mineral is deficient, the others simply cannot do their jobs well. It is important to get all the known minerals we need, in the necessary biological amounts. Minerals often work together in pairs, synergistically. There are a few relationships we do know, such as the calcium-to-magnesium ratio, and the zinc-to-copper ratio, but there are more relationships we have no idea of yet, and have not discovered.

Americans are overfed and undernourished. We eat twice the calories we need from refined and devalued foods. We eat an amazing eight times the fat we need - 42% of our caloric intake - and most all of this is saturated animal fat. We eat twice the protein we need. We eat an unbelievable 160 pounds of various simple sugars we do not need at all. Yet we still don't get the vitamins and

minerals we need in our daily food! *Overfed and undernourished.* The wealthiest country in the world is also the most mineral deficient of all. America leads the world in obesity, coronary heart disease, most cancers, blood sugar disorders (especially diabetes), arthritis and rheumatism, osteoporosis, PMS and menstrual problems, menopausal conditions, kidney disease, lung disease, and most every other illness that plagues human beings.

The question comes up about which forms of the minerals to take. The various bioavailable forms of each mineral will be mentioned in following chapters. Some are inexpensive common salts, such as zinc sulfate. Some others are chelates (KEE-lates), which are simply minerals bound in a manner so they can easily be digested. Should you take your minerals before meals, during meals, or after meals? It just doesn't matter. The important thing is that you take them every day for the rest of your life, and get all the ones you need in the biologically required amounts.

Due to highly sophisticated analytical techniques such as PIXE, SRFXA, ANN, ICP-AES, and ICP-MS, we can now pinpoint minerals down to picograms- trillionths of a gram. (There are one million picograms in a microgram!) We can now easily and accurately measure the precise mineral content in our soils, the food we eat, our bodies, and all important actual blood levels. It would be wonderful if we could just go to the doctors office and get our blood analyzed for dozens of different vital minerals. This way we would know which ones we are deficient in. We could also test the toxic, harmful ones - lead, aluminum, arsenic, cadmium, mercury, and others. This is costly though, and, currently we can only practically and inexpensively test a few like iron, calcium and magnesium. Urine analysis only tells us what we excrete, and not what we retain in our blood. Hair analysis does not parallel blood levels, and is more suited for revealing such things as arsenic and cadmium poisoning. In the next 20 years the price for blood element testing will come down, and we will be able to measure all our basic mineral's level inexpensively.

No matter how well you eat, how many other supplements you take, how much you exercise, or anything else, you are never going to enjoy the health you want unless you have all the vital minerals you need. Mineral nutrition still is not well understood, and the mineral supplements available are woefully incomplete.

Chapter 2: Where Can I Find A Good Mineral Supplement?

It is simply unbelievable that it is almost impossible to find a complete mineral or vitamin/mineral supplement anywhere in the world, in the year 2011. Look in the biggest vitamin catalogs and see what kind of mineral supplements they offer – or don't offer!

Now look in any health food stores and drug stores, especially the mega-chain stores, and see if you can find a good mineral supplement. Go to the Internet and you'll see almost nothing but promotions with very poor products. What you find will be woefully incomplete and lacking not only in the minerals themselves, but in the biological amounts you need of them.

The key to finding a valid mineral supplement is to READ THE LABEL. *If it's not on the label, it's not in the bottle.* You must see all the minerals listed, *and the exact amount contained* in each tablet or capsule. If the manufacturer hides behind the loophole phrase “proprietary formula”, put it back on the shelf, as there is nothing in there. Don't settle for one that contains a mere dozen minerals, even if they are in the biological amounts you need. Also, do not be taken in by “window dressing”, such as potassium, sodium, phosphorous, sulfur, chlorine, fluorine, and other minerals that are not needed. Adding these just makes the label *appear* better and more complete.

The biggest fraud to ever hit the natural health industry was colloidal minerals – that's until coral calcium came along a few years later. Millions of people were taken in by the most asinine claims and assertions. Pyramid schemes sold these by passing out audio tapes. If you ever read the label on a bottle of colloidal minerals, you noticed that dozens and dozens of minerals were listed, but never the AMOUNTS. Obviously, that's because there was almost nothing of any biological value in there. Merely containing meaningless amounts, such as one microgram of a certain mineral, gave them the legal right to list it on the label. You could drink a whole bottle of colloidal minerals every day and not get any benefit, except for two or three minerals at most. Fortunately this has faded into obscurity, except for some Internet advertisements.

Coral calcium succeeded colloidal minerals in the honor of being the biggest fraud in the natural health industry. This is just regular calcium carbonate with a high price tag. They also claim to have dozens and dozens of minerals contained in the formula, The facts are it is just calcium carbonate with one or two other minerals. Fortunately, this has almost disappeared from the market.

Why won't the largest pharmaceutical and vitamin companies in the world put out a good mineral supplement that has all the minerals we need, in the biologically required amounts? Don't these companies have extensive research facilities to develop cutting-edge products? No, they don't! They have extensive ADVERTISING departments to promote second rate products with very little actual benefits. These corporations spend almost nothing on research and development, but endless millions on clever advertising.

Look at the best-selling and most popular mineral and vitamin/mineral formulations in the world. READ THE LABEL. You'll rarely find boron, vanadium, or silicon at all, and substandard amounts of selenium, chromium, and molybdenum, even in their premier, top-of-the-line formulas. You'll never find realistic amounts of such important minerals as germanium, tin, nickel, cesium, rubidium, strontium, gallium, or cobalt.

You will sometimes hear that only liquid or encapsulated supplements work, as tablets and caplets do not dissolve in your stomach, and merely pass through your digestive system intact. This is merely advertising gimmickry. You can prove this to yourself by putting any tablet in a glass of warm water with a tablespoon of vinegar and watching it dissolve in a few hours. The human stomach is much more acidic, much warmer, and subject to a lot of physical motion. Tablets will dissolve much better in your body. You can also prove this by taking a dozen tablets of a certain product and watching your stool the next day. You will not find them in your stool as all tablets have a dissolving agent added to them at time of their manufacture.

You will also hear a lot of talk about how only a certain salt or form of a vitamin or mineral is actually bio-available. Of course it always turns out that the company saying this has a patented form of this supplement that no one else can use without paying a royalty. The absorbable forms of each mineral you need are discussed in each chapter.

Chapter 3: Calcium

Calcium is number 20 on the Periodic Table, the fifth most abundant element, and was discovered in 1808. It has an atomic weight of 40.0, so it is a light mineral and toxicity is unknown. The RDA for calcium, in adults, is set at 1,000 mg a day. Calcium is the most abundant mineral in our bodies by far, because 99% of it is in our bones. Calcium carbonate, citrate, and other forms are very bioavailable and inexpensive. Being the most abundant mineral just does not make it the most important mineral, however.

The government established daily allowance is very scientifically incorrect. Asians, Africans, Mid-easterners, and Latins eat a fraction of the calcium Europeans (and Indians) eat. The people in these countries eat little or no dairy products, take in less than 400 mg of calcium every day at most, and have far less bone and joint disease than do Europeans. The RDA is simply Eurocentric and can only be met by eating large amounts of milk and dairy products. Of the six billion people on earth only about one billion regularly eat dairy products as a staple food. People of all races stop secreting lactase (the enzyme that digests lactose, or milk sugar) at about the age of three. All adults, therefore, are lactose intolerant, and should not drink milk or eat dairy products. Most dairy foods, like milk, cream, cheese, cream cheese, and sour cream are very high in saturated fats, and not good food choices anyway. The **only** abundant dietary source of calcium (other than sea vegetables) is dairy food; no other food group contains nearly as much.

Take a look at any list of the calcium content of common foods we eat. Other than dairy products, there is very little calcium in whole grains, beans, vegetables, fruits, seafood, or meat. To demonstrate how little calcium there is in ALL other foods, other than dairy, let's look at a generous and varied sample daily menu. If you ate three cups of brown rice, two cups of oatmeal, one cup of dried beans, two cups of a green vegetable, eight ounces of fish, eight ounces of beef, a salad with dressing, four slices of whole grain bread, four pieces of fresh fruit and a cup of vegetable soup you would get less than 400 mg of calcium. That's all we need.

The research on calcium is simply too much to digest, and every year even more is done. Calcium is the most popular of all

mineral supplements because people are led to believe they are deficient in it. The problem, however, is NOT deficient dietary intake at all - it is the lack of ABSORPTION.

Western people take in more calcium by far than anyone else, yet have the highest rate of bone and joint disease in the world, especially arthritis and osteoporosis. The Asian, African, Mideast, and Latin cultures, take in the least amount of calcium. They generally have far stronger bones and joints, and far less arthritis, osteoporosis and other such conditions. These people do not get, and cannot get, anywhere near the official U.S. government recommendation of 1,000 mg every day from their diets of meat, fish, poultry, eggs, grains, vegetables, beans, and fruit. True vegetarians who don't eat dairy products also have less bone and joint conditions. The fact that five billion people eat a fraction of the suggested RDA of calcium, and have far less bone and joint disease is inarguable, real world proof we just don't need 1,000 mg a day. You can take ten grams of calcium a day, and it isn't going to make your bones any stronger, unless you also get sufficient magnesium, boron, strontium, vitamin D, and omega-3s. These are just the four major synergists we know of, but there are others which play smaller roles, such as manganese, zinc, and silicon. *Calcium just cannot work by itself* to make new bone cells (osteoblasts). Calcium needs helpers. The fact is that we need less calcium after the age of eighteen, when our skeletons are fully formed. As we age, we need less calories and less calcium than when we were younger. To have strong bones and avoid arthritis and osteoporosis, we have to take in ALL the known minerals to work with calcium as a biological team. Again, the problem is not the amount of calcium we take in, at all, but rather the ABSORPTION of it. We generally don't get enough magnesium, boron, strontium, vitamin D, nor omega-3s to help the calcium to be absorbed and grow new bone cells.

Should we take calcium supplements? Are there benefits to adding calcium to the food we eat? Yes. Studies show that supplementation helps to slightly lower blood pressure, is good for our heart and artery health, can alleviate some symptoms of PMS, is necessary for brain metabolism, helps prevent intestinal tumors (colorectal adenomas), is necessary for blood clotting, and has many other uses other than making new bone cells.

Chapter 4: Magnesium

Magnesium is number 12 on the Periodic Table, and the seventh most abundant element. Discovered in 1808, it has an atomic weight of only 24.3. It is one of the ten essential minerals with an RDA of 400 mg a day. It is the fourth most abundant mineral in our bodies, and fifth most in the oceans. While mammals use iron as the center of their blood molecules, plants use magnesium as the center of their chlorophyll molecules. Chlorophyll, of course, is the life blood of the plant world. Many soils are deficient in magnesium, as farmers rarely replace it when using commercial fertilizers. Studies consistently show that most people *do not get sufficient intake of magnesium*, and Americans generally take in only about 300 mg, at best. Fortunately, you can easily obtain an inexpensive supplement of 200 mg or more. Common salts such as citrates, lactates, or oxides are all bio-available. The American diet has been shown to be generally low, due to the extensive refining and processing of our foods, especially whole grains. We only eat about 1% whole grains. The best dietary sources of magnesium are plant sources, especially whole grains, dried beans, and nuts. The fact Americans consume so little whole grains leads to common deficiencies. Black Americans have been shown to be especially low, due to their ethnic diets. It is well-documented that the elderly show an increased need resulting in the many problems of aging. People of all economic levels generally don't get enough, and one-in-seven Americans has seriously low serum levels. Toxicity is not a concern, so everyone should consider a daily supplement, since this has been so conclusively shown to be beneficial. The research every year on magnesium is overwhelming, because it is such a vital and essential nutrient. Four hundred years ago people were eating Epsom salts (magnesium sulfate) as a "cure-all", as well as a laxative. The nutritive benefits they got were not realized, since vitamin and mineral nutrition simply has not been understood until recently.

Magnesium is used in so many biological functions it is impossible to cover them all. It affects numerous processes and actually may be the most important of all minerals in human nutrition. New benefits for healthy magnesium levels are con-

tinually being discovered. Studies of the most common acute and chronic illnesses and conditions that affect us often show low serum levels. Deficiencies of magnesium may be the most under-diagnosed of all mineral shortages. Drinking coffee or alcohol, eating too much salt, drinking sodas (phosphoric acid), coping with the stress of modern life, and taking prescription drugs all help deplete what magnesium we do take in.

Cardiovascular disease is the biggest cause of mortality by far. This includes heart attacks, hypertension, strokes, atherosclerosis (plaque buildup), high blood fats, and congestive heart failure. Study after study shows that people with higher serum levels simply have less heart and coronary disease, lower blood pressure, fewer strokes, and lower cholesterol levels. Heart and artery conditions are THE leading cause of death. Having a high serum magnesium level is a good way to help prevent CHD (coronary heart disease), generally.

Diabetes and insulin resistance have been found to be correlated with hypo-magnesium (low) levels. Oxidative stress is part of the diabetes syndrome. and is shown to be magnesium related. Any program that treats blood sugar disorders should include a magnesium supplement (minimum 200 mg per day). As we age, the bone loss we experience is partly due to magnesium deficiency. Bone mineral density depends on magnesium, boron, strontium, vitamin D, and omega-3s in order for calcium to make new bone cells. There is an important calcium-to-magnesium ratio; therefore you can take half as much magnesium as calcium in your supplement. As much as 40% of asthmatics have been shown to have low serum levels. Treatment of this condition should always include magnesium. Inexpensive supplementation has shown dramatic results from both migraine and muscle tension headaches. Women have found magnesium helps alleviate some of the symptoms of PMS, which affects the great majority of American females.

This wonderful mineral is needed for hormone metabolism, neuromuscular function, energy metabolism, exercise performance, the prevention of various cancers, liver function, skin metabolism, vitamin metabolism, water balance in our bodies, and over 300 known enzyme reactions. It is a basic mineral catalyst to accelerate countless biological reactions.

Chapter 5: Iron

The fourth most abundant element, iron is number 26 on the Periodic Table, and has been known to man since the beginning of time. It has an atomic weight of 55.8 and is, therefore, a heavy metal. The research on iron is very extensive, partly because three-fourths of it is the “heme” in hemoglobin, or red blood cells. Iron makes blood red and transports oxygen from our lungs. This is one of the ten minerals with an RDA, which is 10 mg for men, and 18 mg for women. Most all vitamin/mineral supplements have iron in them as common sulfates, fumarates, and gluconates. Children, pregnant women, those who are ill, and older people, have higher needs for iron generally.

A good supply of iron is found in most any seafood, meat, poultry or organ food like liver, and also in many vegetables such as beans and peas, nuts, seeds, and green vegetables.

The body only absorbs iron as it is needed and simply excretes the excess. Sufficient copper in the body is needed for its proper absorption. There is an important iron-to-copper relationship in mammals. Recently the media has focused attention to the very few people who have too much iron, and require “iron-free” vitamin/mineral supplements. One contributing factor is that these people nearly always take in far too much iron from meat, poultry, and other animal foods. The real problem is that they have an *excretion* malfunction, in which they store iron they don’t need. *Iron deficiency remains the real concern for the vast majority of people.*

Studies consistently show that most Americans, especially women and vegetarians, simply don’t get enough iron in their diets. People with deficiencies suffer from anemia and weak blood function. Symptoms of low iron can include heartburn, dizziness, headaches, sore tongue, hair loss, digestive problems, nausea, sensitivity to cold, irritability, and loss of appetite. Older people often respond well to iron supplements, with more energy and endurance, even though they show no evidence of iron deficiency. While the main use for iron is by the red blood cells, every cell in our bodies contains it. It is necessary for support of our immunity, enzyme reactions, energy metabolism, muscle function, and many other uses. Make sure you add this to your supplement program.

Chapter 6: Zinc

Number 30 on the Periodic Table is zinc. This element was discovered back in the 13th Century. It has an atomic weight of 65.4, and is considered a heavy metal. Our bodies contain about 2.5 grams which is found throughout our entire system, with half in our muscle tissue. The male prostate gland contains ten times as much as other organs. The established RDA is 15 mg, and most Westerners simply do not meet those levels. Especially at risk are alcoholics, the elderly, and poor people. Zinc can easily be toxic, and you should *never take in more than about 50 mg a day*. Excess quantities will cause negative side effects such as cholesterol dysmetabolism, low HDL cholesterol, low white cell blood count, and gastrointestinal disturbances. Zinc is found in most vitamin mineral supplements as sulfate, citrate, or oxide, and these are inexpensive, bioavailable sources. Zinc has an important relationship with both copper and iron in mammals.

There is so much research on zinc in the last 40 years it is overwhelming. Entire books could be written about the volumes of research done on zinc- one of the most studied of all minerals. It is found in whole wheat, brown rice, oats, lentils, soybeans, dried peas, black-eyed peas, lima beans, walnuts, peanuts, cashews, brazil nuts, many cheeses, any kind of liver, and animal flesh such as beef, lamb, chicken, turkey, and various fish and seafood. Deficiencies include anemia, delayed growth in children, birth defects, spontaneous abortion, sterility, impaired sexual maturity, glucose intolerance, and various bone conditions.

Zinc is needed for the synthesis of RNA and DNA, growth and development, fighting inflammation, sexual maturity, reproduction, immunity, healing wounds, thyroid function, production of prostaglandins, blood clotting, development of the fetus, production of sperm, building bone cells, for over 100 body enzyme reactions, skin metabolism, good vision, our senses of taste and smell, and too many other processes to even try to list. Zinc has powerful topical uses as well, especially zinc oxide and zinc pyrithione creams or sprays. Zinc deficiency is common in America, especially in children, mostly due to refined foods in our diets, but is very easy to remedy with a simple 15 mg supplement every day.

Chapter 7: Boron

Boron is number 5 on the Periodic Table and was discovered in 1808. It has an atomic weight of only 10.8, making it the lightest of all essential minerals. It is now firmly established as vital to plant and animal life, but it wasn't until 1990 that it was finally accepted as essential for humans. This is truly the most overlooked and neglected mineral -even though the research on it is very extensive and has been available for almost two decades now. There still has been no RDA established, but a daily intake of 3 mg is considered sufficient.

Due to modern farming methods, our soils are boron deficient. Therefore, you cannot rely on whole grains, beans, vegetables, and fruits to consistently supply this vital mineral. Sea vegetables may be the only reliable food source. Toxicity is rare, except in factory workers who are exposed to it. In areas where the crops and the soil are rich in this mineral, longer life spans and less morbidity (disease rates) are found. You would think all vitamin and mineral supplements would contain a mere 3 mg of boron, but such is not the case. Take a look in the largest vitamin catalogs in the world and you will rarely even see boron in their top-of-the line premier formulas, much less in the 3 mg amount you need. One of the top three vitamin catalogs refuses to add it to any of their vitamin/ mineral formulas, and offers only 0.75 mg (one-fourth of what you need) in its boron-only product! It is vital to take a boron supplement, no matter how well you eat, because our daily food contains so little. Any reasonable salt including inexpensive boric acid is bioavailable. Some farmers do add boron salts to their soils, but this is not common practice at all. Few ranchers add boron to their livestock's feed.

The research on boron is overwhelming, yet most people are seriously deficient. Study after study shows that Americans only eat about 1 mg a day, with vegetarians getting the most. Boron is necessary for bone and cartilage metabolism, so people suffering from arthritis or osteoporosis should be taking it. Bone and cartilage metabolism may be the most important of all benefits, especially since arthritis and osteoporosis are such epidemics. Human clinical research shows boron supplementation helps relieve arthritis and osteoporosis. Boron and other mineral

deficiencies are one of the basic reasons for these conditions. Taking calcium, magnesium, strontium, and vitamin D along with it makes a powerful healing combination. Westerners take in more calcium than anyone else, but have the most bone and joint diseases, because the calcium cannot be *absorbed* without boron (along with magnesium, vitamin D and omega-3s). Boron is vital to hormone metabolism, especially for testosterone function. It is also vital to reproduction and pregnancy, countless enzyme reactions, athletic performance, vitamin D metabolism, brain function and cognition, blood metabolism, immune function, and many other important health factors. Research keeps proving the importance of boron in plants, animals, and humans.

Boron has been shown to be an important factor in cardiovascular health with deficiencies contributing to high blood pressure. Cholesterol levels and metabolism depend on boron, as does hormone metabolism, especially our sex hormones. Athletes have shown better performance, while weightlifters and bodybuilders have achieved impressive results from taking boron. In our brains, boron levels show positive effects on cognition, memory and even mental diseases. Women given boron supplements got relief from PMS, as well as menopausal symptoms. This is important for women of all ages. Boron has been shown to be important in diabetes and insulin resistance. Boron has been shown to be necessary in thyroid metabolism, and low thyroid activity is epidemic in Americans over the age of 50. Laboratory animals given boron in their feed lived 10% longer than controls, with no other changes.

We are finding that a common factor in certain cancer rates is boron deficiency. More research is needed on the relationship between cancer and boron along other minerals. This is infinitely better than allopathic (covering up the symptom while ignoring the cause) surgery, radiation and chemotherapy. Science has been clear on the vital need for adequate boron intake for over twenty years, but most of us still aren't taking a simple, inexpensive, safe 3 mg dose every day. For all the proven benefits and protection it provides, add this mineral to your daily supplement regime.

Make sure you get your 3 mg of boron every day. More uses are found for this all the time.

Chapter 8: Manganese

Number 25 on the Periodic Table and discovered back in 1774. It has an atomic weight of 54.9. The research on manganese can be overwhelming in many aspects. Manganese is one of the ten minerals with an established RDA, which was only recently set at 2 mg. We only have less than 20 mg in our bodies. Most people get enough in their diets especially vegetarians who eat more grains, beans, nuts, seeds, and green vegetables. Common vitamin and mineral supplements contain this as simple sulfates or oxides. Even though it is a heavy metal, manganese is not considered toxic, and people with illnesses can take up to ten times the RDA (i.e. 20 mg) without side effects. This is not recommended, however.

Common dietary sources are whole grains (such as wheat, rye, oats, brown rice, and corn), various dried beans and peas, nuts and seeds, leafy greens, root vegetables (such as sweet potatoes and beets), and, of course, sea vegetables. The refining of grains takes much of the manganese out of our diets. This is one of the minerals that scientific farmers put in their soils to insure good crops, as it is well known how important soil manganese is to crop production. Ranchers often use manganese in the mineral supplements they give to farm animals.

Excessive manganese intake is basically confined to factory workers at refineries and smelters. Manganese is necessary in such diverse areas as insulin production, fat metabolism, growth factors, reproduction, muscle coordination, neurotransmitter function, lipoprotein metabolism, our oxidation defense system, bone and cartilage growth, enzyme activity, proper blood clotting, oxidative stress, and SOD (superoxide dismutase) function. Deficiencies result in such problems as bone and cartilage disease, some cases of deafness, carpal-tunnel syndrome, repetitive-motion syndrome, infertility and stillbirths, low libido, menopausal problems, and convulsions.

Recently, research has shown the benefits of supplementation in arthritis and osteoporosis. This is due to the necessity of synthesizing mucopolysaccharides, which make up support and connective tissue, especially cartilage, tendons, and bone cells. Other research has shown promise in such diverse conditions as epilepsy and tardive dyskinesia.

Chapter 9: Copper

Number 29 on the Periodic Table and discovered over 6,000 years ago. It has an atomic weight of 63.5, and is a heavy metal. Copper is one of the ten minerals with an established RDA, which is 2 mg. Our bodies only contain about 150 mg of this vital mineral. The research on copper is overwhelming and continuing. Some people actually have excessive levels of copper, while others are deficient. Even in arthritis patients, you will find both high and low serum blood copper levels. You will find copper in common vitamin/mineral supplements. Inexpensive copper salts such as citrate, gluconate, or cupric oxide are all easily absorbed and bioavailable. Copper, like zinc, can be toxic. While it is rather difficult to take in excess, as little as 15 mg daily could cause such side effects as nausea, abdominal cramps, vomiting, and diarrhea.

The main reason Western countries often have copper deficient diets is the refining of whole foods, especially whole grains. Americans eat a mere 1% whole grains. Ironically, poor people in Third World countries, who do not refine their foods, have little problem with such deficiencies. Many Americans only get about 1 mg per day in their food- half what they need. Some good dietary sources of copper include wheat, barley, sunflower seeds, almonds, pecans, walnuts, peanuts, cashews, prunes, raisins, apricots, various dried beans, mushrooms, chicken, and most fish. People with copper water pipes in their homes should be getting enough copper (from leaching).

There is an important zinc-to-copper balance and ratio, where these two metals interact and work together. Taking in too much zinc will interfere with copper absorption, for example. Copper also helps us absorb iron and prevent anemia. Copper (and zinc) makes up the main form of superoxide dismutase (SOD), which is a basic anti-oxidant enzyme.

Copper is necessary for nerve metabolism, nerve transmission, many enzyme reactions, blood vessels, fighting inflammation, cholesterol levels, absorption of other minerals such as iron, and cardiovascular health in general. The uses for copper are simply far too numerous and complex to list. Make sure your supplement contains the 2 mg you need.

Chapter 10: Silicon

Silicon is number 14 on the Periodic Table and was discovered in 1824. It is the second-most common element on earth (25% of the earth's crust), yet is often deficient in our diets! It is very light, has an atomic weight of 28.0, and, like iodine, is one of the only two essential non-metallic elements. It has no RDA. A good form is plain silica gel (silicic acid), which is both inexpensive and bioavailable. Taking excess silica gel temporarily has the unique property of absorbing excess aluminum in the body and excreting it. This is of great importance, since excess aluminum is toxic and builds up in the brains of Alzheimer's patients. Americans tend to have high levels of aluminum in their blood. This is not to be confused with silicone - which is a polymer of silicon and oxygen- found in breast implants. There is no doubt at all that silicon is necessary to both plant and animal life, yet it still is not recognized by many scientists as a necessary element. There is extensive research available in the last fifteen years on plant growth, especially for such basic grain crops as rice, wheat, corn, and barley. Farmers should be adding such nutrients as inexpensive calcium silicate to their soils. The research on benefits for farm animals is also extensive. Farmers should routinely feed inexpensive silica gel supplements to their livestock. We need more studies on humans, though, as actual human research is not nearly as extensive as it should be. Animal research leaves no doubt as to the importance of silicon in our diets. Surprisingly, it is very difficult to find silicon in any available vitamin/mineral supplement. It is not toxic, and you can safely take 10 mg a day, which is a generous amount. It is difficult to figure out a daily value for it, as the amount in common foods varies so greatly. You will find silicon in familiar vegetables such as onions, beets, kale, tomatoes (technically a fruit), cabbage, asparagus, cucumbers, and string beans, as well as brown rice, oats, lima beans and some fruits such as strawberries and peaches.

We do know silicon is necessary for bone and cartilage growth. Anyone with arthritis or osteoporosis should be taking silicon in their supplements. It is also very important for cardiovascular health. This is an element you need to add to your daily dietary regime.

Chapter 11: Iodine

Iodine is number 53 on the Periodic Table and was discovered in 1811. It has an atomic weight of 126.9 (the heaviest of the essential minerals) and is the only other essential element, besides silicon, that is non-metallic. It is a trace mineral and one of the ten with an established RDA, which is 150 mcg (micrograms). It is, therefore, the only non-metallic mineral with an RDA. A good source is potassium iodide, and you will find it in most vitamin/mineral supplements, as well as iodized table salt. Table salt has offered an iodized variety (avoid any added aluminum salts) for over 80 years now to combat goiter, which has almost disappeared in America. The best dietary source is seafood and sea vegetables (i.e. seaweeds), but Westerners rarely will eat sea vegetables. Most varieties of sea vegetables like kelp, can actually be too good a source and cause skin problems such as acne, eczema, and dermatitis due to excess iodine intake. A mere teaspoon of kelp powder can contain 20 times the RDA. People who eat seafood even a few times a week need not worry about a deficiency. People who do not eat ocean fish and seafood definitely should take a supplement. Iodine in the soil varies so radically you cannot depend on common food such as grains, beans, vegetables, or fruits to supply it. Milk and dairy products have considerable iodine, but are a very poor dietary choice due to the indigestible lactose.

Iodine is most associated with the thyroid gland, since that contains three-fourths of the approximately 30 mg of iodine we have in our bodies. The other fourth is doing important work in our bodies, along with all the other minerals. Hypothyroid problems are almost never solved by iodine supplements, anyway, but rather require either T4 (L-thyroxine) and/or T3 (triiodothyronine). Both of these bioidentical hormones are iodine based, chemically.

Hypothyroidism (underactive thyroid) is very prevalent among Americans over 50, while hyperthyroidism (overactive) is rare. It is very easy and inexpensive to get either a blood or saliva test for free T3 and free T4 to determine the status of your thyroid function. Low thyroid can have very dramatic effects on our health, metabolism and how much we weigh.

Chapter 12: Chromium

Number 24 on the Periodic Table and was discovered back in 1797. It has an atomic weight of 52.0 and barely qualifies as a heavy metal that can be accumulated easily in the body. Chromium is a trace element with an established RDA of 120 mcg. Many vitamin mineral supplements do contain it, fortunately. Brewer's yeast is highly allergenic and not recommended as a source. People with blood sugar disorders can take up to 400 mcg for the first year. The toxicity is very low, but it is also very difficult to get much chromium unless you work with the refining and manufacturing of it. Research abounds on the value of chromium for our health, especially for blood sugar dysmetabolism such as diabetes, high insulin, insulin resistance, and hypoglycemia.

Much of our soil has sufficient chromium. Many farm animals also get enough if they are fed whole grains or allowed to graze freely. Humans are generally deficient because of the refined foods they eat, especially refined grains. This is more proof that whole grains are a staple food and our most important source of nutrients. Eating unrefined whole grains insures we have a sufficient dietary intake of chromium.

The most dramatic benefit of chromium supplementation is blood sugar metabolism. It helps to normalize both high and low blood glucose levels. Americans have epidemic rates of insulin resistance and diabetes, which is due in part to chromium (and vanadium) deficiency. 1 in 3 American children will grow up diabetic! We eat more than 160 pounds per capita of various simple sugars every year. This overload of sugars also helps deplete what chromium we do consume. High insulin levels contribute strongly to heart disease, and diabetics suffer two to three times the usual heart attack rate. Research has shown a continual and serious decline in serum blood chromium levels in the last 50 years. Some estimates reliably guess that 90% of Americans are deficient. Use any good salt or chelate as your supplement.

Coronary heart health - the leading cause of death in America - and normal cholesterol levels are the second major benefit of getting enough chromium every day. The average American adult has a deadly average total cholesterol level of 240.

Chapter 13: Vanadium

This is number 23 on the Periodic Table and was discovered back in 1801. It has an atomic weight of 50.1 and barely considered a heavy metal. It is an essential trace nutrient for both plants and animals.

It has been known for over 30 years that vanadium is an essential element for mammals, yet there still is no RDA established! The best estimate is that 1,000 mcg (1 mg) is sufficient. A few companies put an irresponsible 10,000 mcg (10 mg) in their products. Vanadium poisoning is extremely rare and confined to specialists who work with the manufacturing and refining of it. Almost no commercial supplements contain any at all. Look at the biggest catalog companies and you'll see they rarely add vanadium to their vitamin/mineral formulas. Whole grains and seafood are good sources of vanadium, but due to our poor soils, deficiencies are very common. Vanadium chelates are good sources as are common salts such as vanadyl sulfate. Prepared foods may show higher analysis levels of vanadium due to intense contact with stainless steel, but this would not be very bioavailable and thus of little value, despite technical analysis showing the amounts in the food.

The animal and human research on vanadium is well-established, especially in the last ten years. Blood sugar metabolism is the most dramatic health benefit. Vanadium is also important for bone, tooth and cartilage repair and maintenance.

The epidemic of insulin resistance and diabetes is certainly due, in part, to vanadium deficiency. The human research on blood sugar dysmetabolism has been known for over a decade now, yet diabetics almost never use vanadium supplements. Vanadium has proven anti-cancer and anti-tumor properties, and should be a part of any cancer prevention or treatment program. Vanadium is crucial to good heart and artery function, and even has blood pressure lowering properties. It is vital to cholesterol and blood lipid metabolism. Vanadium has much to do with bone growth, as well as cartilage and tooth health. Short-term research has used high amounts as much as 10,000 mcg (10 mg) short-term, but this is completely contraindicated in long-term use. Do not use more than 1,000 mcg (1 mg).

Chapter 14: Molybdenum

Number 42 on the Periodic Table and was discovered in 1781. It has an atomic weight of 95.9 and is very heavy. The potential for toxicity is limited mostly to those who work in refining, smelting and manufacturing of alloys with molybdenum. This is a trace mineral with an official RDA of only 75 mcg, but other estimates go as high as 250 mcg. The research on this is extensive and goes back decades. However, most of it is more concerned with soils, plants, livestock, and toxicity, rather than essentiality and therapeutic benefits to humans.

This is one of the very few minerals that are used to fertilize farm soil, and is even found in plant foods for the home gardener. Some modern farmers make sure they enrich their soil with molybdenum for better crop yields and superior plants. Some progressive livestock ranchers also make sure they feed their animals a mineral supplement with molybdenum. Most vitamin and mineral supplements should have the needed 75 mcg. The average American, surprisingly, may get enough of this every day, but soils and foods vary so dramatically that it is good insurance to take 75 mcg a day. This is not very toxic for such a heavy metal, and one would probably need 20 to 40 times the RDA (up to 10 mg) to get side-effects from it.

While there is a great deal of research on molybdenum, there is not enough on various diseases and conditions. It is vital for many enzyme reactions, including over 30 known redox (reduction-oxidation) ones as it functions as an electron carrier. Anti-cancer and anti-tumor properties were attributed to molybdenum over 30 years ago, and this should be a part of any cancer preventive or treatment program. This is needed in bone and joint diseases such as arthritis and osteoporosis, and should be included in any program for healing them. It plays an important role in blood sugar metabolism as well. It was shown to help alleviate iron-deficiency anemia over 40 years ago. It was demonstrated to be an immunity enhancer in lab animals 30 years ago. People with Wilson's Disease also got benefits from supplementation. Since dietary intake varies so much this should be included in your vitamin/mineral formula.

Chapter 15: Selenium

Number 34 on the Periodic Table and was discovered back in 1817. It has an atomic weight of 79.0. It is one of the ten minerals with an established RDA, which is only 70 mcg. Do not take more than 200 mcg, and be sure to take 400 IU of mixed tocopherol vitamin E as a synergist, for even better results. Chelates are a good choice here. The best food sources are whole grains and most any seafood. This is just one more reason to eat whole grains at every meal. The RDA was only recently established, and selenium previously was considered toxic, rather than essential. You will find this in most vitamin and mineral supplements fortunately. This is a very powerful anti-oxidant, and is considered a “catalyst” element that accelerates other reactions. Most of our soils have enough selenium, and farm animals generally get enough selenium, but farmers rarely test their soils or give selenium supplements to their livestock. Levels therefore vary greatly in various foods. It is the *processing* and *refining* of such basic foods as whole grains that has led to widespread deficiencies. The symptoms of such deficiency are so wide ranging that they just cannot be named individually. This is a very powerful antioxidant and scavenges harmful free-radicals.

Selenium can be a very toxic mineral, and even as little as 1,000 mcg (1 mg) per day can result in serious poisoning. This is why it was previously considered toxic and why you must not take in too much.

The most dramatic benefit of having healthy selenium levels is cancer protection, especially for such cancers as colon, prostate and breast. A comparison of 27 different countries showed that the higher the selenium intake the lower the cancer rates generally. Another major benefit is cardiovascular health. A third advantage is protection against diabetes and insulin resistance.

Some countries, like New Zealand and Finland, have selenium poor soils and get an average daily intake of less than 30 mcg. Research in Finland compared 12,000 people, and the ones with the lowest serum selenium levels had *six times the cancer rate* of those with the highest levels. Other Finnish research showed those with the lowest selenium levels had *seven times the CHD conditions* as those with the highest levels.

Chapter 16: Germanium

Number 32 on the Periodic Table and was discovered in 1886. It has an atomic weight of 72.6 and is a heavy metal. Many scientists now generally recognize that germanium is a necessary ultratrace element for both plant and animal life. It will soon be firmly established as necessary for human health. No RDA has been established for it. A reasonable dose would be 100 mcg a day, which would certainly supply enough, yet not be excessive. Germanium sesquioxide is safe and non-toxic, but germanium dioxide is toxic. Very irresponsible promoters were, and still are, selling germanium supplements with 100 mg (milligrams) of germanium - this is ONE THOUSAND TIMES more than you need - a three year supply per day! On the other hand, you find equally unscrupulous promoters selling germanium with only a few biologically useless micrograms per dose. You will not find this in vitamin and mineral supplements in meaningful doses.

Unfortunately, there is not a lot of research being done on germanium. We do know that it is contained in the soil, is taken up in plants, and is vital to animals and humans. What little human and animal research that exists is very recent, within the last 10 years, but is very promising. Most of this has taken place in China. We need more human studies where blood germanium is measured in people with various diseases, and then the levels compared to healthy controls. Anti-tumor and anti-cancer effects were found in laboratory animals. Chinese hepatitis patients at Potou People's Hospital were given germanium supplements, with good results. We will find out just how important germanium is, in the near future. We are already finding out how germanium helps keep our immune system strong. Research in both animals and humans is showing germanium deficiency exists in various cancers.

In 1988 a very impressive review was published in the journal *Medical Hypothesis*, complete with 72 references. This was very convincing as to the benefits for the potential in enhanced immunity, oxygen enrichment of cells, free radical antioxidant scavenging, arthritis, osteoporosis, and anti-viral properties.

We need more such work done for this very promising and important element. Meanwhile take 100 mcg in your supplement.

Chapter 17: Strontium

Strontium is number 38 on the Periodic Table and was discovered back in 1790. It has an atomic weight of 87.6 and is a heavy element. There is no doubt that strontium is an absolutely essential trace (it is not an ultratrace) mineral for mammals based on the current research. Since vegetables and fruits vary so radically in content, the only foods that have consistent strontium levels are seafoods. It is very difficult to find a supplement containing any meaningful amount, surprisingly. Either an amino acid chelate or aspartate is a good choice. There is no RDA. A reasonable estimate for a human adult dose would be 1,000 mcg (1 mg) daily based on what is found in soils and various common foods. This would provide the needed amount without toxicity.

Toxicity from strontium is almost unknown, since it is so hard to find in any quantity in soils or foods. (This has nothing at all to do with radioactive strontium-90.)

There is quite a bit of research on the value of strontium in soils, plants, animals, and recently even actual human studies. Yet, you do not see farmers adding it to their soil, or giving it to their livestock, doctors using it in their practices, or pharmaceutical corporations employing it. Even vitamin companies rarely add it to their formulations.

One of the most important functions found for strontium is in bone, teeth and cartilage metabolism. Arthritis, osteoporosis, dental caries (cavities), are epidemic in Western societies. We know that calcium cannot be absorbed without magnesium, boron and vitamin D. Now, we see strontium is another important factor in this. Instead of treating these conditions with toxic drugs, we should be using minerals and other natural supplements like glucosamine. Improved bone metabolism is only one of many benefits we are finding for having healthy strontium levels. Various diseases and conditions are being found to be due, in part, to lack of strontium. Recent research, for example, found cytoprotective effects on the liver, which would help prevent cancer, cirrhosis and other liver diseases. Other research, both animal and human, have found low strontium indicated in various other types of cancer. Make sure a strontium supplement is an integral part of your healing program.

Chapter 18: Nickel

Nickel is number 28 on the Periodic Table and was discovered back in 1751. It has an atomic weight of 58.7 and is a heavy metal. It is well-accepted that nickel is an essential ultra-trace nutrient in plants, animals, and humans. It is vital for plant growth, especially the common foods we eat. The fact it is found in significant amounts in mammalian blood logically shows it is needed in human nutrition. A reasonable dose would be 100 mcg based on analysis of what is contained in diets of various cultures. Germans, Austrians and Indians, for example, were found to be eating about 80 to 130 mcg daily. Many people may not need a supplement, but taking 100 mcg is good insurance, since it varies so radically in different areas of the world. You will almost never find meaningful amounts of nickel in vitamin/mineral supplements, despite this fact. Surprisingly, there is very extensive research on nickel in soils, plants and even some in animals, but hardly any in humans. At the University of Munich, the U.S. Department of Agriculture, and at Technische University, rats on a nickel-deficient diet developed health problems, especially with the liver, thyroid, as well as folic acid and iron metabolism. We need more research on humans to see what benefits there are, and what effects deficiencies cause. The few studies we have are far more concerned with toxicity than benefits. The University of Arkansas published an impressive review, with a full 109 references, on the need for dietary nickel and its effect on immunity. Nickel from manufacturing can build up in a few industrial areas and pollute local waters and soils. This excess nickel can then accumulate in plants. It is ironic this can happen, when some of the world is deficient in it.

The few human studies have shown some very promising things about nickel. Chinese children with very high IQ's were much higher in serum nickel than normal children. Infertile women were shown to be very low in nickel, compared with fertile women of the same age. Nickel blood levels in diabetics have been shown to be lower than those of healthy controls. Pregnant women with low nickel levels suffered hypertension more often. Fertility is involved with nickel and other ultra-trace elements, and these serum elements vary in women during their monthly cycle.

Chapter 19: Tin

Tin is number 50 on the Periodic Table and was discovered thousands of years ago. It has an atomic weight of 118.7 and is the second heaviest essential mineral after iodine. Based on studies of plant and dietary contents, 100 mcg of this ultra-trace mineral would be a reasonable daily intake. U.S. law limits this to 30 mcg however. There is a fair amount of research on tin, but most of it is on industry pollution, rather than benefits for plants and animals. The few human studies are mostly concerned with dietary intake. There is no doubt this is essential, yet so little is known about it. We need more human research on this. It is almost impossible to find meaningful amounts of tin in any vitamin/mineral supplement. By the way, “tin cans” is a misnomer. Cans for food are not made of tin nor lined with tin, so they are not a dietary source from leaching.

A complete search of the internationally published clinical research did reveal a few very important studies demonstrating the importance of tin in animal nutrition. The problem is that tin is such a very heavy metal, and so prevalent from industrial manufacturing, that some areas are polluted and people get excessive tin in their blood, which is then slowly excreted. Most of the research, therefore, is concerned with toxicity and pollution, rather than dietary necessity and benefits.

A series of anti-tumor drugs, called “organotin compounds” are based on the tin molecule and have shown good promise. The best of these studies was a review done at the University of Shizuoka, with an impressive 166 references. Tin is known to be involved in a wide variety of mammalian biological processes. The immune function, for example, generally depends on having sufficient tin. At Kyoto University in Japan it was clearly established that tin is essential in the diets of laboratory animals. At the University of Aberdeen, rare human research was done where serum tin levels were measured relative to heart and artery health. It was found that low tin levels correlated with high LDL and n-6 fatty acid levels, both of which are predictors of CHD, in general. At the University of Medical Science (China), researchers did more human research, this time on peptic ulcers and gastritis, and found low tin levels in the patients generally.

Chapter 20: Cobalt

Cobalt is number 27 on the Periodic Table and was discovered back in 1735. It is a heavy element with an atomic weight of 58.9. It is definitely an essential ultratrace mineral for the simple reason that *vitamin B-12 is based on the cobalt molecule*. This is the most important use for cobalt, but only one of many. We are said to synthesize our own vitamin B-12, but this would be impossible without sufficient dietary cobalt. The RDA for vitamin B-12 is only 6 mcg. A reasonable estimate is that 10 mcg of cobalt would be enough for all our needs, based on what is found in common foods grown in rich soils. Cobalt cannot be stored in the body, and therefore cannot accumulate. It is non-toxic and you would need over 100 times your daily dose to get any possible side effects. There are a few areas in the world where cobalt from industry builds up in soil and crops, but this is rare.

The research on cobalt is very extensive, yet the world has simply not taken advantage of this information. Soils often need cobalt supplementation for better crop yields, as plants need it for optimum growth. Farm animals need it in their feed to develop and reproduce, and farmers should give them mineral supplements with cobalt. Yet it is basically impossible to find any vitamin/mineral supplement anywhere, that contains cobalt- except one. For decades science has known it to be essential in human nutrition, yet it is “unknown” in the supplement industry. It is so easy and so inexpensive to make sure our soils, our crops, our livestock, and real people get cobalt. Why limit the use of cobalt to the synthesis of vitamin B-12? A Chinese study found similar amounts of cobalt and copper in human blood thus proving this is essential to our very lives.

Why not just take B-12 supplements instead of cobalt supplements? B-12 is only 4% cobalt, and we need it for many other processes. B-12 is absorbed very, very poorly when taken orally. Injections are expensive, invasive, and unpleasant. Methyl cobalamin 1 mg is the best choice.

Progressive pharmaceutical and vitamin companies will have to start adding this to their vitamin/mineral formulations for complete nutrition. We are going to find more benefits for cobalt supplementation as the research continues.

Chapter 21: Cesium

Cesium is a very heavy metal which is number 55 on the Periodic Table with an atomic weight of 132.91. It was discovered in 1860, and is the least abundant of the five natural alkali metals. Only recently have progressive scientists realized that cesium is a vital ultratrace mineral. There is no RDA.

Cesium is an important mineral in human breast milk for example. Analyses of the blood serum in infants, children and adults consistently show significant levels of cesium. Analyses of the soils around the world generally show relevant levels of cesium. The common foods in various cultures also contain significant amounts of cesium. Studies in Denmark for example showed meaningful levels in onions, peas, cabbage and Brussels sprouts. This leaves little doubt as to the essentialness of it.

There is a good deal of research every year on the value of cesium in human nutrition. Soon we will have more studies showing the deficiencies of ultratrace elements in various diseases, conditions and illnesses. Of course these ultratrace elements just aren't as important as major trace elements, such as magnesium and boron, but they are nevertheless very vital. We must remember that all minerals work together harmoniously in concert as a team. The major minerals need the trace elements as well as the ultratrace elements for complete metabolism and good health. Because the effects of ultratrace element deficiencies are more subtle, it is therefore more difficult to show deficiency in various illnesses. A daily supplement of 100 mcg would be reasonable and safe. The chloride form is inexpensive and absorbable. There are proponents who tell you to take much larger doses of cesium chloride to cure cancer and other diseases, or to "alkalinize" the body. This would, of course, be toxic and contraindicated, and unbalance the mineral homeostasis. Again, cesium is an ultratrace mineral that works along with the major, trace and other ultratrace minerals.

You are going to see more research on this very important element and finally supplement companies will routinely include it in their mineral formulations. There is already more than enough evidence to include this in agricultural, livestock, veterinary and human nutrition.

Chapter 22: Rubidium

Rubidium is number 37 on the Periodic Table, with an atomic weight of 85.47, and therefore a heavy metal. It is one of the five natural alkali metals, and was discovered in 1861. This is very abundant in the earth's crust generally. The name comes from the Latin "rubidius" (dark red).

This is not an ultratrace element as is commonly assumed, but is a normal trace element. It is far too abundant in our soils, in our common food, and in our very blood to be seen as a mere ultratrace element. Modern scientists now realize it is necessary in plant, animal, and human nutrition. There is no RDA, but no deficiencies have been shown in human studies. It is simply amazing that rubidium is so overlooked and is not understood to be the important trace (not ultra-trace) element it is.

Scientists in Belgium found that rubidium levels in the human brain, but not in the blood, fall as we age. Chinese research found 2.25 mcg/ml of rubidium in human blood compared to 1.18 mcg of copper and 6.40 mcg of zinc which shows this to be of equal importance biologically. Rubidium is needed for producing S.O.D. (superoxide dismutase) a major antioxidant. Rubidium has shown anti-depressive effects, but only in megadoses as with lithium. Rubidium has been shown to be important in reproductive health. 5-HT (5-hydroxy tryptophan) levels are enhanced with supplementation. Laboratory animals fed rubidium deficient diets show multiple health problems. Science has shown both human and animal studies of how vital rubidium is to human health as there is no other source than in our food. Rubidium is never found as an industrial contaminant such as with cadmium, lead and mercury.

Red meat contains little rubidium, but poultry and fish contain significant quantities. Fruits and vegetables often contain high levels of 5-60 mg (not mcg) per kg. This is simply not deficient in people who eat sufficient fresh (or frozen or canned) fruits and vegetables. A sensible, but very optional, dose would be about 500 to 1,000 mcg (1 mg) based on the analyses of human blood as well as various dietary intakes around the world. The best information we have comes from *Rubidium In the Food Chain* from Schiller University in Germany.

Chapter 23: Gallium

Gallium is a basic metal with the atomic number 32 and atomic weight of 69.73. It was discovered in 1875. It has low toxicity and is a very overlooked nutrient. Gallium is a necessary ultratrace element. It is a liquid metal at room temperature. One of the best sources of information is the book *Advances in Micronutrient Research* 1996 (p. 19-44) published by Scientific Publishers (ed. By Hemantaranjan).

100 mcg of salts such as gallium nitrate are safe, effective doses. The human blood studies show a significant amount of gallium in our blood. Soil and common food studies verify this. When you find an ultratrace element in good concentrations in human and animal blood, soils, and common plant and animal foods this verifies it is necessary for our health. Gallium is found in all our organs, especially the spleen, liver, kidneys, brain, adrenals, and thyroid.

The earth's crust has an amazing 10 mg per kg of gallium! This is huge. Soils vary from 0.5 to as high as 200 mg per kg. In plants you find 0.01 to 0.20 mg per kg. Seafood has 0.15 mg per kg. Seaweed has 0.05 mg per kg. Tomatoes grown with gallium added to the showed dramaticall enhanced yields. Three separate studies in Denmark showed significant gallium in vegetables. One study found significant gallium in cabbage and sprouts. Another one found good amounts in onions. A third found generous amounts in peas.

An Italian study found significant amounts of gallium in the cerebrospinal fluid of 350 people. They also found the same situation in their lymph nodes. A 1966 study found 28 pcg in human blood, 42 pcg excreted in urine, and 68 pcg excreted in feces.

A Japanese study (*Food Additives and Contaminants* 13, 1996) looked at the common foods in their national diet. They analysed these for 28 elements. They found the average person was only takikng in about 12 micrograms of gallium. This study was one of many to show how deficient mineral intake is even in the Japanese people. They have one of the healthiest diets In the world.

When are the supplement corporations going to add these vital ultratrace elements to their formulas?

Chapter 24: Minerals We Might Need

It is interesting that there are only 13 vitamins, and that there is an established RDA for every one of them. We understand vitamins very well. You can get a complete vitamin supplement inexpensively at any drug store. Vitamins alone, however, have little value without *all* the corresponding elements that also occur with them in our foods. There are 116 known elements and 91 natural elements. If we take out the six noble gases, as well as carbon, hydrogen, oxygen, nitrogen, sulfur, phosphorous, sodium, potassium, and the halogens (chlorine, fluorine, astatine and bromine), *that leaves us with 73 possible supplemental ones we may be deficient in.* We still just don't understand minerals very well, especially the ultratrace elements. The ultratrace ones are only be needed in tiny, microgram amounts.

If you do a sophisticated analysis of sea water, you will find most every known element, even if only in the smallest of detectable picogram (billionths of a gram) amounts. If you do the same sophisticated analysis of the various farming soils around the world you will also find most every mineral, even if only in about the same barely analyzable amounts. You will also find an amazing variety of minerals if you analyze the common foods we eat, in the various countries of the world. Finally, and most importantly, if you analyze human blood you will still find most every known mineral contained in it.

When you analyze actual human blood you will find such varied elements as aluminum(!), antimony, arsenic(!), barium, beryllium, bismuth, bromine, cadmium(!), cerium, dysprosium, erbium, europium, gadolinium, gold, hafnium, holmium, indium, iridium, lanthanum, lead(!), lutecium, mercury(!), niobium, neodymium, osmium, palladium, praseodymium, platinum, radium(!), rhenium, rhodium, ruthenium, scandium, samarium, silver, tantalum, tellurium, terbium, thulium, thallium(!), titanium, tungsten, uranium(!), yttrium, ytterbium, and zirconium.

These elements are the very same ones, in rather similar amounts, you will find in seawater. This proves the sea is the "mother of all life," and that our blood is a microcosm of the oceans. This is the reason sea vegetables are the best source of food minerals, with fish and seafood the second best source. (The

problem with eating seaweeds is the extreme amount of iodine contained in nearly all varieties.)

Even though such elements as arsenic, cadmium, aluminum (the third most abundant element on earth), lead, mercury, thallium, uranium and radium are considered toxic, are they necessary for life in very, very low amounts? Is this “toxicity” really due to industrial pollution, modern technology, and other such avenues? Or are these natural elements just as necessary as any other, only in barely detectable picogram amounts?

Which of these elements are necessary for plant life? For animal life? Which of these are actually necessary for us humans? Which ones are needed in nutrition, and which are poisons? Aluminum is the third most abundant element on earth and excessive aluminum intake is poisoning us. Titanium is the ninth most abundant element on earth, yet currently we have little evidence of how essential it may be. We simply don’t know all we should at this point. Just because elements exist in the oceans, in our soils, in plants, and even in our blood, does not necessarily mean they are essential for life. Some of these surely are toxic to us. Some of them are essential, but we haven’t yet discovered all of those which are.

With the great advances in analytical technology we can now accurately detect minerals in our soils, the foods we eat, and our bodies. For the last decade, researchers around the world have been researching which ultratrace elements may be essential. Which of these is the most promising?

Barium has a lot of research in plant and animal metabolism, thus providing evidence as being essential, especially since we take in about 1,000 mcg a day. This is not an ultratrace element as it is commonly considered, but rather a regular trace element. **Europium** has been shown to extend lifespan in test animals, and more research will be forthcoming. **Indium** is claimed to be beneficial on Internet promotions, but so far there is little to validate it. Evidence is lacking here. **Lanthanum**, surprisingly, has considerable research and, soon, may well be shown to be essential. One study found 37 pg/ml in human blood which equates well with those with more evidence behind them. Lanthanum has been shown to increase crop yields along with other rare earth elements. **Lithium** is definitely essential, but there doesn’t seem to be a deficiency of it in our diets. The “therapy” of

giving people with bipolar disorders 1,000 times the needed amount is patently insane and causes far more problems than it cures. **Titanium** has a surprising amount of research available and will soon be recognized as a necessary element. **Praseodymium** has studies indicating benefits in animals and humans, and one study found 7 pg/ml in human blood. **Samarium** also shows potential as a nutrient in plant and crop studies. One analysis found 3 pg/ml in human blood. **Thulium** (not to be confused with thallium) has a scarcity of research, yet a few soil and plant studies indicate it may be a necessary element. There is very little of it in our blood however. **Yttrium** may also turn out to be essential, although there just isn't enough known about it so far. **Cerium** was found in very large amounts in human blood (170 pg/ml) in a Japanese study. This is a very large amount and probably very meaningful. **Neodymium** was found in very significant amounts (20 pg/ml) in the same study and has potential in both animal and human health. **Erbium** was found similarly to be 5 pg/ml which indicates this may also be essential. **Dysprosium** was found in 5 pg/ml amounts and has promise as well. **Tungsten** may well be another necessary ultratrace element.

Human blood studies have shown almost no meaningful amounts of such elements as lutetium, terbium, rhodium, zirconium, samarium, technitium, rhenium, tantalum, hafnium, niobium, holmium, ytterbium, and tantalum in our soils, our food or in our blood. This would tentatively indicate these have little if any value in mammalian nutrition.

Only future research will answer these questions. Until then if we just take as many of the 21 elements discussed in this book and eat a variety of whole, unrefined, organically grown foods as much as possible we'll be doing as much as we can to have the best of health and be free from health problems. Google "mineral supplements" and you'll find the only supplement on earth with most all of these elements in the amounts you need.

Just a Few of the References

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