

Vitamins & Minerals

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OVERVIEW

"If you eat a balanced diet - you don't need supplements." This has been the advice of most health professionals for decades. It's time for change.

Substantial evidence shows that intakes greater than the Recommended Dietary Allowances (RDA's) of specific vitamins and minerals reduce the risk of particular diseases. In addition, a generous intake of the right vitamins and minerals may help you feel and look your best no matter what your age. You may be able to significantly reduce the risk of chronic, crippling diseases that steal your energy, enjoyment and enthusiasm for life. However, they are not magic bullets, nor will supplements neutralize the impact of a high-fat, low fiber diet of overly processed foods. Don't rely on supplements as a nutritional shortcut - you won't come out a winner.

Numerous studies report that particular nutrients have antioxidant effects that protect against heart disease, certain cancers and cataracts. They're called antioxidants because

they prevent damage from a process known as oxidation. If not controlled, oxidation results in damage to cells. Niacin used alone and in combination with other medications lowers blood cholesterol. Calcium in amounts higher than traditionally recommended can slow the development of osteoporosis and may lower blood pressure in some people.

Despite these dramatic findings, there's little official acknowledgment that supplements have value except for use by a small number of groups including:

- newborns routinely given a single dose of vitamin K to prevent abnormal bleeding.
- pregnant and breast-feeding women's increased needs for most nutrients.
- women with heavy menstrual periods who may need iron supplementation.
- those on very low calorie diets who simply don't eat enough to get essential nutrients.
- vegans (vegetarians who eat no animal products) who often don't eat enough foods rich in calcium, iron, zinc and vitamin B-12.

- people with chronic illnesses that affect how they absorb nutrients.

Supplement use by anyone else is often regarded as unscientific and at best a waste of money. Eating nutrient rich foods is clearly the preferred way to consume vitamins and minerals. But anyone eating less than 1,500 calories a day simply can't eat enough food to meet even the minimum standards for some nutrients. Even those with healthy diets may not eat the right combination of foods to meet minimum intake standards and may not be close to preventive amounts.

Vitamin and mineral knowledge is in its infancy. Less than one hundred years ago the first vitamin, vitamin A, was discovered. Initially, research focused on finding the smallest amount of a nutrient that would prevent common deficiency diseases like scurvy (vitamin C deficiency) and beriberi (thiamin deficiency). Then, as more nutrients were identified, how they interacted became important. Today, we're on the threshold of a whole new era identifying more unique categories of nutrients and learning how they optimize health and thwart disease.

Vitamins are chemical compounds containing carbon, which is necessary for growth, health, metabolism and physical well-being. They're found in plants and foods. Some vitamins are essential parts of enzymes - the molecules that help complete chemical reactions. Other vitamins form parts of hormones - substances that promote and protect overall health and reproduction.

Plants make almost all of their own vitamins. Animals can create their own vitamins too. For example, cats and dogs manufacture vitamin C. Humans must obtain vitamins from foods, produce them in their skin or make them with intestinal bacteria. For example, vitamin D can be synthesized by skin when exposed to sunlight; vitamin K and biotin are made from bacteria in the colon; and niacin is converted from the amino acid tryptophan. There are facts we know about vitamins and minerals:

- Vitamins and minerals don't provide calories or energy.
- All necessary vitamins and minerals can be found in food.
- All vitamins are "organic" since they contain the

Deplorable Diets

The US Committee on Dietary Allowances estimates that many Americans consume 30 percent or more of their calories from foods that provide few, if any, vitamins or minerals. A 1998 study of the dietary sources of nutrients in US adults reports similar results:

Food Category	Percent of Total Calories
cakes, cookies, quickbreads and doughnuts	5.5
soft drinks/sodas	4.1
salad dressings/mayonnaise	3.1
margarine	3.0
sugars/syrups/jams	2.8
alcoholic beverages	2.5
potato chips/corn chips/popcorn	2.1
oils	1.0
fruit drinks (not juice)	1.0

Source: Journal of the American Dietetic Association, 1998.

Nutrient Measures and Conversions

5 grams = 1 teaspoon

14 grams = 1/2 ounce = 1 tablespoon = 3 teaspoons

28 grams = 2 tablespoons = 1 ounce

10,000 micrograms = 1,000 milligrams = 1 gram

1 IU of vitamin A = .3 mcg retinol = .6 mcg beta-carotene

1 mg alpha-tocopherol acetate = 1 IU

element carbon.

- All minerals are inorganic since they do not contain carbon.
- Not consuming a particular vitamin or mineral may result over time in a deficiency disease.

It's not surprising if vitamins and minerals seem a little foreign. Unlike most common things we measure, nutrients are tallied using the metric system of grams, milligrams and micrograms. These are very tiny measurements - one gram is about the weight of a small paper clip. In fact, your total vitamin and mineral needs for a day would barely add up to 1/8 teaspoon. To make it even more complex, some nutrients are measured in more than one way. For example vitamin A is counted in retinol equivalents (REs), international units (IUs) and beta carotene equivalencies.

ALPHABET SOUP OF STANDARDS

To confuse matters more there are a variety of scientific standards, none of them adequate, to help sort out how much of a particular nutrient is desirable.

Sometimes government and other standards complement each other, often they conflict. Policy makers and health organizations need to review and update their recommendations on supplement use to reduce confusion.

Recommended Dietary Allowances (RDAs) were once the gold standard of nutrient recommendations. The RDAs are supposed to tell you how much of each nutrient you need. But even its creators admit that the numbers are not as meaningful as you might hope. The RDAs were designed by the National Academy of Sciences in 1941 for the War Department. They were

used as a guide to feeding US soldiers, and the basic concepts haven't changed much in the last 50 years. If you ate close to 100% of the RDAs for the nutrients listed, chances were good you had a balanced diet that is, if you were a healthy person to start with. If you consume the RDA for vitamin C (60 mg), for instance, you will have a very low risk of scurvy.

Adequate Intakes (AIs) are the "best guesses" of the experts when not enough science is available to make a formal RDA. Based on a combination of research and observation, they offer a range of intakes that should keep most people healthy.

Daily Values (DVs) and %DVs were invented when the food label was redesigned in 1992. Many people are understandably confused by these new standards. If you are healthy and fit and eat exactly 2,000 calories a day, then the DVs are tailored with you in mind. Since most of us don't eat a 2,000 calorie diet you may need more or less than 100% of the DVs.

The new standards are Dietary Reference Intakes

(DRIs) and are promoted as a major leap forward in nutrition science. It's no longer feasible to have a single reference number for each nutrient. DRIs take a broader perspective examining each nutrient's role in decreasing your risk of developing chronic diseases. It also sets an upper level of intake to protect you from the risk of toxicity. The new goal is more than protection against deficiency but to lower your risk of major chronic diseases. It is expected that by the year 2000, DRIs will be developed for all nutrients.

Tolerable Upper Intake Levels (ULs) are the maximum amount of a nutrient that won't hurt you. That is, if you are a healthy person to begin with. ULs are not intended to be a recommended level of intake but a marker for reasonable safety for those who want to "push the envelope." For most nutrients, this number refers to total intake from food, fortified food, and nutritional supplements.

MORE IS NOT ALWAYS BETTER

A megadose of a nutrient is typically any amount greater than ten times your RDA. At this level, nutrients act differently in your body.

Megadoses of some nutrients have significant drug-like effects. The most frequent side effects from taking too many supplemental nutrients are vague. They include common symptoms such as headache, weakness, fatigue, nausea and vomiting. Often these are the same early symptoms of many other illnesses including vitamin deficiency. If you notice any early warning signs be sure to tell your health care provider you are taking supplements. It's a good idea to compile a list of all the supplements you're taking and share this with your doctor at every visit.

Fortified foods have nutrients added to them during processing. Federal law requires manufacturers to add specific nutrients to certain foods. For example, milk processors add vitamins A and D. Food companies can choose to selectively add almost any nutrient to increase the appeal of a food. For instance, orange juice and rice both come in calcium fortified versions. Getting nutrients from fortified foods is similar to taking a supplement. There is no guarantee that the form of the nutrient added contains all the known and unknown benefits of eating a real food source.

FAT SOLUBLE NUTRIENTS - VITAMINS A, D, E AND K

Fat-soluble vitamins include vitamins A, D, E and K. They are unique because they are found and stored in fatty tissue. You must eat some fat so these nutrients can be absorbed from foods. Because these vitamins are held in fatty tissue you don't need to replenish them every day - you can "save them up" over time. However, fat-soluble vitamins have a much greater potential for being toxic, since storage in body fat is almost unlimited.

It's almost impossible to overdose on fat-soluble vitamins from food sources - unless you have a hankering for polar bear liver! Arctic explorers sought-out polar bear and seal liver to help extend their marginal food rations. Unfortunately, arctic animals like polar bears and seals store vitamin A in amounts that are toxic and often fatal to humans.

Vitamin A

Why you need it: Vitamin A is critical for normal growth and healthy development. It's especially key in stimulating night and color vision. That's because vitamin A helps

Toxic Talk

Both one-time overdoses or prolonged over-consumption can cause health impairments. Toxic doses of vitamins and minerals rarely result from eating too much food. Over-supplementation is the culprit. There are three types of vitamin/mineral toxicity:

- Acute or sudden toxicity occurs from one very big dose or from several huge doses over a few days. You get sick right away.
- Chronic toxicity develops after weeks or months of habitually taking extreme levels of a nutrient. For example, mega-doses (amounts 10 times or more greater than the RDA) of vitamin B-6 can cause nerve disorders and skin rashes. Permanent damage may occur with some forms of chronic toxicity. Most people who develop toxic reactions to supplements don't have a clue it's their vitamin or mineral intake that's causing the problem. What commonly happens is you go through an expensive and exhaustive series of tests. Finally, you remember to tell your doctor that you take supplements. If you're lucky, your symptoms go away shortly after you stop them.
- Teratogenic toxicity refers to harmful changes in a baby's development that occur during pregnancy. Pregnant women risk miscarriage or severe birth defects if they take large amounts of certain supplements such as vitamin A.

maintain the protective layers of the skin including the eyes. It's crucial for vitamin A to combine with a special protein in your eye that improves night vision. Recent research suggests that optimal intakes of vitamin A may strengthen the immune system and fend off certain cancers. Vitamin A helps protect body surfaces designed to keep infection and disease out. These special surfaces include

your skin and the moist lining of your mouth, throat and digestive tract. Vitamin A's influence on immunity may be one of the ways it helps prevent the initiation or growth of cancer cells.

Recommended intake for optimal health: 5,000 IU/ day of vitamin A

Best natural food sources: carrot, cantaloupe, kale, mango, peppers, squash, sweet potato and turnip greens.

Fortified foods: low-fat and skim milk, margarine and ready-to-eat cereals.

Minimum toxic dose: 6,500 IU/ day of vitamin A or 15 - 30 mg.

Vitamin D

Why you need it: Vitamin D is essential for helping calcium get into your bones. Without proper levels of vitamin D you can't absorb enough calcium no matter how much you take in. This nutrient also helps maintain proper heart function.

Recommended intake for optimal health: 400-600 IU or 10-15 mcg/day of vitamin D. Diabetics and people who are exposed to high levels of toxic chemicals at work or air pollution where they live may need these higher optimal amounts.

Best natural food sources: tuna, salmon, sardines

Fortified foods: milk, margarine

Minimum toxic dose: 1,000 IU (25 mcg)/ day of vitamin D or more may cause constipation; headaches; nausea; high blood pressure; seizures; growth retardation; calcium deposits in the heart, blood vessels and kidneys.

VITAMIN E

If all the hype about vitamin E were true you could live well past 100 and have

the sex drive and youthful appearance of a teenager. Vitamin E is no fountain of youth, but it does provide significant health benefits. Working as an antioxidant, vitamin E protects various tissues from destruction by free radicals. Optimal intakes of vitamin E have also been linked to reduction of heart disease and cancer.

Unfortunately, vitamin E is one nutrient that is difficult to obtain in optimal amounts from moderate calorie foods. It takes almost a pound of vegetables such as spinach, sweet potatoes or peas to provide just 20 - 30 IU of vitamin E. Oils, nuts and seeds are more concentrated sources of vitamin E, but they also contribute hefty amounts of fat grams and calories. Antacids decrease vitamin E absorption. If you habitually take antacids, you will need supplemental vitamin E.

Vitamin E is the only nutrient where the "natural" form is preferable over synthetic versions. Ignore the product label and read the ingredient list. Look for d-alpha-tocopherol. If you see dl-alpha-tocopherol, it's the synthetic version. The extra "l" makes all the difference. For more information on vitamin E and heart disease, [click here](#).

Why you need it: Vitamin E protects vitamin A and essential fatty acids from oxidation and prevents breakdown of body tissues. Vitamin E may also decrease heart attack risk and improve immunity.

Recommended intake for optimal health: 50 to 400 IU/day of vitamin E from foods or the natural form of the vitamin.

Best natural food sources: almonds, hazelnuts (filberts), peanut butter, shrimp, sunflower seeds, wheat germ.

Fortified foods: ready-to-eat cereals.

Minimum toxic dose: 800 to 1,000 IU/day of vitamin E or more may cause breast tenderness, depression, diarrhea, double vision, fatigue, intestinal cramping, mood swings, and weak muscles. High doses can also interfere with the effectiveness of anticoagulant (blood-thinning) medicines that are prescribed to prevent blood clotting. Continued high intakes deplete vitamin A stores.

Selected Studies

- A study of 87,000 nurses found that women who took vitamin E supplements of 100 IU a day for at least two years had a 31 percent reduced risk of non-fatal heart attacks and deaths from coronary heart disease. (New England Journal of Medicine, 1993)

Women, especially those at risk for heart disease, should take supplemental vitamin E.

- A study of 39,000 male health professionals found that men who used vitamin E supplements of at least 100 IU a day had a reduced risk of non-fatal heart attacks and deaths from coronary heart disease. (New England Journal of Medicine, 1993.)

Men with a family history of heart disease should take supplemental vitamin E.

- A study of 2,002 people at Cambridge University found that men with existing heart disease who took a supplement of 400-800 IUs of vitamin E daily for a year and a half reduced their risk of non-fatal heart attacks by 77 percent. (The Lancet, 1996) The levels of vitamin E in this study are much higher than others. Try to eat foods rich in vitamin E instead of only relying on supplements.

- Data from a 1986 study of 34,000 postmenopausal women from Iowa examined by the University of Minnesota found that women who ate diets high in Vitamin E had a 62 percent reduction of risk for heart disease. Vitamin E supplements didn't seem to lower the risk, possibly because few women in the original study done in 1986 took them. (New England Journal of Medicine, 1996) It's tough to get optimal amounts of vitamin E just from foods. This study helps support the food first principle. Women who had "pretty good" vitamin E intakes from foods fared better than those who did not.

Vitamin K

You don't hear much about vitamin K, but it is important. Most notably it helps your blood to clot and helps form bone tissue. Extra amounts of vitamin K are frequently needed by those on long-term antibiotic therapy and anyone who does not metabolize fat normally. If you've ever had a baby you might remember that almost all newborns are given an injection of vitamin K shortly before they leave the hospital. That's because newborns have not yet developed normal, healthy bacteria in their digestive tract that help produce one of the three forms of vitamin K, K-2 (menaquinone). The other two types of this nutrient are vitamin K-1 (phylloquinone) found in foods it is also made by bacteria in your gut. The third type K-3 (menadione) is a synthetic form of vitamin K found in the liver and is the most active form of the three. Most Americans consume about three to five times more than the RDA of vitamin K. That makes deficiency quite rare.

Why you need it: Vitamin K controls blood clotting; maintains bone; helps heal bone fractures.

Recommended intake for optimal health: 65 - 200 mcg/day of vitamin K

Best natural food sources: asparagus, broccoli, brussel sprouts, cabbage, collard greens, endive, green apples, kale, red leaf lettuce, Swiss chard, watercress.

Fortified foods: no food is fortified at 25% of the RDA

Minimum toxic dose: Not known. May cause impaired liver function in those with advanced liver disease; jaundice, brain damage in infants. Large intakes of vitamin K can interact with the prescription drug warfarin (Coumadin.)

WATER SOLUBLE VITAMINS - VITAMINS B AND C

The eight B vitamins plus vitamin C make up the water-soluble nutrients. Unlike fat-soluble nutrients, these can't go into long term storage. B's and C get used up or washed-out of the body quickly via urine and sweat. Because they are so fragile, it's easy to lose water-soluble nutrients before you even open your mouth to put them in. That's because exposure to light, air or heat during storage, processing or cooking diminishes availability. It's important to carefully handle and prepare foods that contain B and C vitamins so you don't end up washing them down the drain or pouring them out with the cooking water.

Thiamin - Vitamin B1

Why you need it: Vitamin B1 helps the body release energy from carbohydrate foods during metabolism; helps nervous system functioning; keeps mucous membranes healthy.

Recommended intake for optimal health: 1.5 mg/day of thiamin

Best natural food sources: ham; pork, pompano fish; sunflower seeds.

Fortified foods: bread, pasta, rice, ready-to-eat cereals, regular or quick-cooking hot cereals.

Minimum toxic dose: 300 mg/day of thiamin or more may cause drowsiness, hypersensitive reaction resembling anaphylactic shock.

Riboflavin - Vitamin B2

Why you need it: Vitamin B2 helps the release of energy from protein, carbohydrate and fat during metabolism. Promotes normal growth and helps convert the amino acid tryptophan to niacin.

Recommended intake for optimal health: 1.8 mg/day of riboflavin

Best natural food sources: lowfat or nonfat milk and yogurt, buttermilk (note: the lower the fat content, the higher the riboflavin content of dairy products)

Fortified foods: bread, pasta, ready-to-eat cereals.

Minimum toxic dose: 1 gm of riboflavin or more may cause dark urine, nausea, vomiting.

Niacin - B-3

Dementia (loss or decrease in mental function), diarrhea and dermatitis are the three Ds of niacin (NYE-a-sin) deficiency, also known as pellagra. When corn became a staple food in the early 1700s in Europe, pellagra reached epidemic proportions. Reliance on corn foods in the southeastern US in the early 1900s sparked our own pellagra epidemic. That's because the niacin in corn is bound to a protein molecule that prevents absorption. In 1941 the federal grain enrichment program was developed as a response to the devastation caused by pellagra. Today, many corn-based products like tortillas are soaked in lime water which releases the niacin and makes it useable.

Niacin can be formed in the body from tryptophan, an essential amino acid. Tryptophan is found in meat, poultry, fish, and eggs. During the depression years, these foods were scarce. Today, our higher standard of living and the increased

availability of protein-rich foods has all but eliminated pellagra.

Niacin can lower blood cholesterol in certain people, when taken in very high amounts. Remember that megadoses of a vitamin change the way that these nutrients work in your body. Niacin in megadose amounts acts like many cholesterol-lowering drugs. A common side effect from niacin therapy is skin flushing. Time-released niacin supplements were developed to help reduce this effect, but these slow absorbing formulas have been found to be more toxic to the liver. If you have liver disease, gout, peptic ulcers or a high intake of alcohol, regular and time-release niacin supplements are not recommended.

Why you need it: helps the release of energy from protein, carbohydrate and fat during metabolism; maintains normal function of skin, nerves and digestive system.

Recommended intake for optimal health: 14 mg/ day of niacin

Best natural food sources: chicken; lamb; pork; veal; mackerel; mullet; salmon; swordfish.

Fortified foods: breads; pasta; cereal

Minimum toxic dose: Amounts as low as 50 mg/

day of niacin can produce flushing if taken on an empty stomach. Five hundred milligrams or more may cause high blood sugar; itching; irregular heart rhythm; nausea; ulcers. Blurred vision, eye and eyelid swelling and loss of eyebrows and eyelashes are also common side effects of too much niacin.

Pyridoxine - Vitamin B6

Why you need it: Vitamin B6 helps use protein to build body tissue; aids in metabolism of fat; maintains chemical balance of body fluids; regulates water excretion; aids in the reduction of elevated homocysteine levels when taken along with folic acid and vitamin B12. The higher your protein intake, the higher your need is for vitamin B6. For more information about elevated homocysteine levels and vitamin B6, visit our Holistic Heart Library or [click here](#).

Recommended intake for optimal health: 1.3 mg/ day of pyridoxine. For individuals with elevated homocysteine levels, 100 mg/day is recommended.

Best natural food sources: bananas, plantain, chicken

Fortified foods: ready-to-eat cereals, oatmeal

Cobalamin Vitamin B-12

Cobalamin (ko-BALL-ah-men) can sometimes be a true miracle cure. Picture an elderly woman admitted to the hospital with symptoms of senility. She is frail, but was able to care for herself, carry on intelligent conversations and answer common questions. Gradually her mental abilities faded to the point that Alzheimer's or senility were considered. After ruling out these and other serious problems, a simple injection of vitamin B12 leads to sudden, dramatic improvements. She's up, walking the halls of her hospital wing, smiling and is "back to normal."

Getting enough vitamin B-12 can be a problem for many older adults because aging bodies don't secrete enough stomach acid necessary for absorption of the vitamin. A B-12 deficiency can cause serious neurologic problems. Low levels may also increase susceptibility to heart attack and stroke. Folic acid and B-12 work together. If there is too much folic acid a deficiency of B-12 can be hidden from routine blood analyses.

Why you need it: Vitamin B-12 is essential to help fight certain cancers, cardiovascular disease, depression, and mental function.

Vitamin B-12 works with folate to make red blood cells. It also serves in every body cell as a vital part of many body chemicals, and helps the body use fatty acids and some amino acids.

Vitamin B-12 taken along with vitamin B-6 and folic acid can also reduce elevated homocysteine levels. For more information about vitamin B6 and elevated homocysteine levels, visit our Holistic Heart Library or [click here](#).

Recommended intake for optimal health: 2.5 - 3 mcg in most people. However, in people with elevated homocysteine levels, 1000 mcg/day is the recommended dose.

Best natural food sources: meat, fish, poultry, eggs, milk

Fortified foods: cereals, breads

Minimum toxic level: None known.

Folic Acid

Folate (FOE-late), folic (FOLL-ick) acid, folacin (FOE-la-cin) - whatever you choose to call it - has earned the honor of contributing the most striking public health improvement of any vitamin this decade. Optimal amounts of folic acid during conception and early fetal development drastically reduce the chances of having a baby born with a devastating neural tube defect (NTD)

like spina bifida. Before the link with folate was discovered, about 2,500 babies were born with NTDs in the United States each year. When more women start consuming the new recommended folate levels those numbers are expected to drop by half.

Now folate may shine in the spotlight again. Evidence is mounting that optimal levels of folate (along with B-6 and B-12) help reduce heart disease by controlling the amount of the amino acid homocysteine (ho-mo-SIS-teen.) Normally, homocysteine is converted into other amino acids. If this conversion does not take place fast enough, bloodstream levels of homocysteine become too high. Recent studies show that high levels of homocysteine can damage artery walls, which propels the build-up of atherosclerotic plaque. For more information on folic acid and elevated homocysteine levels, visit our Holistic Heart Library or [click here](#).

Unfortunately, as many as 88% of all American fall short when it comes to meeting the DV for this nutrient. Many foods are good sources of folic acid, but you need to eat at least five to nine servings of fruits and

vegetables a day to even come close. In fact, folic acid deficiency is the most common vitamin deficiency in the world. Since January 1998, all US manufacturers of enriched products including white flour, white bread, white rice, regular pasta and hot cereals were required to add folic acid. This fortification adds about 100 extra mg of folic acid to your daily total. If you typically choose whole wheat bread, whole wheat pasta or brown rice check the ingredient label to see if folic acid has been added. Fortification is optional for whole grain products.

Why you need it: helps to form red blood cells; forms the genetic material (DNA and RNA) within each cell; functions as part of co-enzymes in amino acid formation. Considering the strong evidence that folic acid helps prevent birth defects -- not to mention heart disease and possibly cancer -- the US Public Health Service advises every woman of childbearing age to consume 0.4 mg each day. Most multivitamins supply that amount of folic acid, which is also available as a separate supplement.
Recommended intake for optimal health: 400-600 mcg from a synthetic

supplement, plus food sources; the higher level for any woman who might get pregnant and all pregnant women during their first trimester.

Who needs more: older people with reduced stomach acid have less absorption. Individuals with elevated homocysteine levels should take 800 mcg/day of folic

acid along with a multivitamin, vitamins B6 and B12.

Best natural food sources: spinach (cooked); black-eyed peas; kidney beans, pinto beans, lentils, oatmeal, asparagus, orange juice.

Fortified foods: bread, pasta, rice, ready-to-eat hot and cold cereals.

Selected Studies

- A meta-analysis of 12 randomized controlled trials that assessed the effects of folic acid supplements on blood homocysteine concentrations found that dietary folic acid reduced blood homocysteine concentrations by 25% in the range of 0.5-5 mg folic acid daily. Vitamin B-12 supplementation of 0.5 mg daily produced an additional 7% reduction in blood homocysteine. (British Medical Journal 1998)
- A study of 75 men and women showed that folic acid intakes of 500-665 mcg per day increased red cell folic acid levels and decreased harmful homocysteine blood levels, thereby reducing the risk of heart disease. (New England Journal of Medicine, April 1998.)
- A three-month study showed that women who increased their intake of foods rich in folic acid had significantly less red-cell folate levels compared to women who received supplements. Women who either took supplements or ate folate-fortified foods were the only ones who improved their folate status. (Lancet, 1996) It may be unreasonable to expect women of child-bearing age to get the recommended amount of folate from foods alone. If you might get pregnant, you should be taking folate supplements.
- Two studies - one of 5,000 Canadians and one of 80,000 US nurses found those who reported eating diets high in folate had a lower risk of heart disease over the following 15 years. (Journal of the American Medical Association, 1996 and 1998.)

Biotin

Why you need it: helps the release of energy from protein, carbohydrate and fat during metabolism. It also helps strengthen hair and nails.

Recommended intake for optimal health: 25-35 mcg/day of biotin.

Best natural food sources: eggs, liver, yeast breads.

Fortified foods: ready-to-eat hot and cold cereals.

Minimum toxic dose: None known.

Pantothenic Acid

Pantothenic (pan-toe-THIN-ick) acid gets around, but it's not a popular nutrient. The proof is on the food label. Scan the nutrition facts panel of your favorite fortified foods and you won't find pantothenic acid listed along with the other B vitamins routinely added. That's because pantothenic acid deficiency is so rare we don't even know what it might look like. Pantos, another Greek root word, means everywhere. Almost every food you eat contains some pantothenic acid. But that's just half the story. If you rely on heavily processed, nutrient-fortified foods to provide your vitamin and mineral needs, you can end up with sub-optimal nutrient levels.

The pantothenic acid that occurs naturally in foods is significantly destroyed during food processing. If you don't eat a wide variety of unprocessed foods you will fall short on pantothenic acid at the same time your intake of other nutrients looks good. For example, some women who eat a minimal amount of calories trying to control their weight often choose highly processed-fortified foods that appear to be "nutritious" (like breakfast cereals and fruit-granola bars.) They often have a salad or small meal and then add in fat free chips or cookies and diet soft drinks. It's startling to see their nutrient intakes showing well over 100% of the RDA for popular vitamins and minerals. In contrast they consume just 50 - 75% of the RDA for nutrients like pantothenic acid that are supposed to be so easy to get.

Why you need it: helps release of energy from protein, carbohydrate and fat during metabolism; maintains blood sugar levels; aids in the forming of red blood cells, hormones and substances needed for nerve transmission.

Recommended intake for optimal health: 5 - 10 mg/day of pantothenic acid; athletes, those who perform vigorous manual work and pregnant women need the higher

amounts.

Best natural food

sources: almost all natural foods contain some pantothenic acid.

Fortified foods: whole grain cereals.

Vitamin C

Millions of people religiously swallow supplements of vitamin C (sometimes referred to as ascorbic acid) hoping to cure everything from the common cold to cancer. There's lots of fiction surrounding vitamin C, here are the facts. Vitamin C:

- prevents scurvy, a disease reported to have caused the deaths of one-half to two-thirds of all sailors on extended sea voyages during the 16th to 18th centuries. Scurvy is still a common affliction in undeveloped countries with deficient food supplies.
- stimulates antibodies that help fight infection and illness.
- helps stop the production of cancer-causing nitrosamines in the stomach.
- helps improve your ability to use folic acid and iron.
- helps to rid the body of toxic levels of stored lead.
- by working as an antioxidant, prevents free radical damage that leads to cancer and promotes tumor

growth.

- is harmful to tooth enamel when chewable forms are taken daily.
- is needed in higher than normal amounts by smokers, and people who take oral contraceptives, anti-coagulants, aspirin products, sulfa drugs or tetracycline.
- in large amounts can cause false negative tests for diabetes (urine) and colon cancer (fecal occult blood.)

With all due respect to Nobel prize-winning scientist and vitamin C advocate Dr. Linus Pauling, over thirty years of research shows no clear evidence that large intakes of vitamin C can prevent or cure colds. What it can do is prevent scurvy, which usually first shows up as cracked and bleeding gums. British sailors were nicknamed limeys because of the limes, lemons and other citrus fruits that were provided to prevent scurvy during long seas voyages.

Vitamin C is a puzzling nutrient. Only humans, monkeys, guinea pigs, a few birds and some fish need vitamin C from foods. Every other living thing makes their own C from the sugar glucose. The same amount of vitamin C that prevents scurvy (10 mg) is not the

same amount as that which can produce optimal health. Your body becomes saturated with vitamin C at intakes between 100 and 200 milligrams. If you take too much vitamin C, it stays in your small intestine and attracts water, which will eventually cause diarrhea.

Why you need it: forms collagen (connective tissue); maintains capillaries, bone and teeth; aids wound healing; increases iron absorption. As an antioxidant, prevents cell damage and can help stop the production of cancer-causing nitrosamines in the stomach. For more information about vitamin C and its potential role in the prevention of heart disease, visit our Holistic Heart Library or click here.

Recommended intake for optimal health: 200 mg/ day of vitamin C.

Best natural food sources: cantaloupe, grapefruit, grapefruit juice, honeydew, kiwi, mango, oranges, orange juice, papaya, pineapple juice, raspberries, strawberries, tangelo, tangerine, watermelon, asparagus, broccoli, brussel sprouts, cabbage, cauliflower, kale, kohlrabi; mustard greens; peppers; plantain; potato (with skin); rutabagas; snow peas; sweet potato; tomato; tomato juice or sauce.

Fortified foods: some juice

and juice drinks, ready-to-eat cereals.

Link up to http://www.ama-assn.org/insight/spec_con/patient/pat048.htm for the American Medical Association's reference page on vitamin C.

CHOOSING THE RIGHT VITAMINS

So, just how much of what do you need? Before you dash to the nearest supplement counter, take stock of what you are already adding to your foods in terms of extra vitamins and minerals. You may be swallowing a supplement without realizing it. Some foods are required by law to be enriched or fortified with additional nutrients. Milk and other dairy products have added vitamins A and D. One eight-ounce glass of milk provides 100 IUs of vitamin D and 500 IUs of vitamin A. Many grains like bread, rice, and pasta have added B vitamins, iron and folate.

Food companies also voluntarily add nutrients to foods to increase their marketing appeal. Several leading cereal companies spray on between 25 and 100 percent of the DV of selected nutrients. Compare cereal nutrition facts labels the next time you are in the

grocery store and you'll notice the randomness of how nutrients are added to foods. Eating a serving of cereal poured from one of these packages is like taking a supplement, but only if you drink the milk in the bottom of the bowl, since that's where most of the added water soluble vitamins end up. Keep in mind there are more than 40 known nutrients and only a few of these are added to any one food. The helter-skelter way nutrients are pumped into food can skew well-intentioned food choices. You might gobble up plenty of the popular nutrients that are cheap or in vogue and still be deficient in those that are too expensive or unpopular with food manufacturers.

As long as a "food" meets the minimum requirements for certain nutrients it can replace a real fruit, vegetable or grain according to current USDA school lunch standards. Fortified candy and doctored-up sugary beverages are standing in for more nutritious foods in lunchrooms across the country. No matter what the guidelines say, vitamin-laced gummy candies are not the nutritional equivalent of a serving of fruit. Orange juice is far superior to an orange drink fortified with

added vitamin C. Fortified beverages usually lack essentials including folic acid, vitamin A, potassium, phosphorus, and even a little fiber found in 100% juice.

Advertising campaigns encourage on-the-go yuppies, baby boomers and their aging parents to get a "boost" from a can of fortified imitation milk-like beverage such as Ensure or Slim Fast. Although there are a wide variety of fortified candy and granola bars, milkshakes, puddings, soups and cookies marketed as total meal replacements, they don't provide fiber or other important nutrients. A diet of vitamin-mineral fortified food fragments doesn't compare with the health benefits and emotional satisfaction from eating a variety of fresh, wholesome and delicious foods. Special nutritional supplements do have a place for individuals with severe health problems like cancer or cystic fibrosis, but they can't stand in for more healthful meals and snacks.

It's critical to keep in perspective that nutrient requirements are interrelated. You need appropriate amounts of all nutrients to optimize your health. Meeting your nutrient needs by relying on the selected supplements

included in fortified foods almost ensures you will not be eating well. Variety in food selection is what promotes optimal nutrition. A daily multiple vitamin-mineral product that provides 100% of the RDA is a good place to start. Choose one with as many essential nutrients as possible. Some "one-a-day" type brands have fewer than 10 nutrients - others more than two dozen.

If you have a specific lifestyle or health-related condition, your need for a particular nutrient or group of nutrients may be increased. For example:

- Most women and girls don't eat enough calories to be able to meet their iron needs.
- Cigarette smokers need double the usual amount of vitamin C.
- Women on oral contraceptives have an increased need for B vitamins and vitamin C .
- Prolonged use of antibiotics can alter intestinal bacteria that normally helps to manufacture B vitamins and vitamin K.
- The elderly tend to absorb less vitamin B-12, vitamin D and vitamin C.
- Individuals with broken bones, recovering from surgery or body burns need

increased amounts of most nutrients, especially vitamin C and calcium if movement is confined.

- Heavy alcohol users frequently have elevated nutrient losses associated with diarrhea and increased urine output and require both vitamin and mineral supplementation.
- Many medications can cause a deficiency of particular vitamins and minerals. Always ask your doctor or pharmacists for drug-nutrient interactions when you begin a new prescription or over-the-counter medication.

The bottom line: Carefully selected supplements may benefit most people. A multiple vitamin/mineral supplement is a good start. If you don't drink milk you might need additional calcium. Research is confirming that vitamin E, in amounts higher than you can get from foods, offers protective benefits. But don't misinterpret the message. Popping a pill doesn't mean you can forget about selecting a variety of wholesome foods. While this book reviews the optimal amounts of vitamins and minerals, it does not suggest that supplementation is the preferred way to get them. Evidence that supplements help prevent or fight disease pales next to data that

shows the positive effects of eating food sources, especially fruits and vegetables. Eat the most healthful way you can, and then determine what might need improvement based on your individual circumstances. Remember, vitamin and mineral supplements are not magic pills; nor will they neutralize a high-fat, low fiber diet of processed foods. Don't rely on vitamin supplements as a nutritional shortcut. People of different ages, genders, and health status have different nutritional needs.

MINERALS - HARDWARE FOR YOUR HEART?

Minerals are inorganic chemicals; that is, they are not attached to a carbon atom. They aid many biochemical functions necessary for growth, development, and overall health. Like vitamins, many minerals are a part of enzymes. Minerals are the catalysts that help enzymes to operate. Different minerals are critical to enzyme systems either because they are a part of the enzyme itself or because they help the enzyme to work properly. We need more than 100 milligrams (mg) of minerals daily. An adult male stores about 5 pounds of minerals throughout his body. There are several classifications for

dietary minerals depending on the function they serve and how much you need. They are:

- major minerals--minerals of which you need more than 250 mg per day. Calcium is a major mineral, needed in amounts ranging from 800-1,500 mg per day.
- electrolytes--minerals that dissolve in water.
- trace elements---minerals you need in very tiny amounts, less than 20 mg per day. Iron is a trace element: most people require just 10 to 18 mg daily.
- heavy metals-toxic minerals that even in minute amounts can cause harm. They include aluminum, arsenic, cadmium, lead, and mercury.

Zinc, copper, iron, and other minerals are deposited in earth and rock. They find their way into foods because plant roots absorb minerals from dirt and water. Red meat is the best food source of minerals because animals will consume vast amounts of plants over their lifetime. The minerals from plants are concentrated in the animal's tissues. Whole grains are the best non-meat mineral source, followed by fruits and vegetables.

Vitamin Needs for Special Situations

Nutrient	Highest Federal Standard (RDA or DV)	Optimal Intake	Individuals with Special Needs Note: Pregnant and breastfeeding women, alcoholics, and drug abusers have increased needs for most nutrients.
Vitamin A	1,000 RE	5,000 IU	Diabetics and people who are exposed to toxic chemicals at work or heavy air pollution where they live.
Vitamin D	5-15 mcg	10-15 mcg	Sun-avoiders, people over 70, some vegetarians, and people with kidney failure.
Vitamin E	8-10 mg	50-200 IU	Those over 55 and people with hyperthyroiditis.
Vitamin K	60-80 mcg	65-200 mg	People on very low calorie diets.
Vitamin C	60 mg	200-500 mg	Women on oral contraceptives and smokers.
Thiamin	1-1.5 mg	Not known	People over 70, heavy coffee and tea drinkers, and those on very low calorie diets.
Riboflavin	1.2-1.7 mg	Not known	People who eat lots of processed foods, very active adults, those with low calcium intakes and individuals with low thyroid disorders.
Niacin	13-19 mg	Not known	People over 55, diabetics, very active individuals, and those with hyperthyroid disorders.
Vitamin B-6	1.4-2 mg	Not known	Women on oral contraceptives.
Folate	200 mcg	400-600 mcg	People over 70, women on oral contraceptives, all women who could potentially become pregnant, and people with sickle cell anemia.
Vitamin B-12	2 mcg	Not known	Vegans.
Biotin	100 mcg	Not known	Those on antibiotics, smokers and women on oral contraceptives.
Pantothenic Acid	7 mg	5-12 mg	People over 55, those on very low calorie diets and smokers.

ELECTROLYTES

Chloride

You may not know much about chloride alone, but it's part of a famous couple known as table salt (sodium chloride.) Adults typically need a minimum of 750 mg of chloride a day. Part of that goes to form hydrochloric acid - better known as stomach acid. This caustic compound is what helps you break down food so individual nutrients can be absorbed and used by the body.

Chloride is an electrolyte that helps maintain the balance of water between body cells and surrounding fluids. It is the negative ion that helps to neutralize the positively charged sodium and potassium ions. Chloride ions located mainly outside cell walls help monitor and regulate the flow of fluid inside and outside cell walls. Chloride ions also aid in the digestion of food by combining with hydrogen to make hydrochloric acid, which helps nutrient absorption. Transmission of nerve impulses to the brain and regulation of electrical impulses that travel across nerves are aided by chloride.

Recommended intake for optimal health: 750 mg

(the amount found in 1/4 teaspoon of table salt), more if you exercise.

Best natural food sources:

table salt, salted foods

Fortified foods: none

If you get too little:

Alkalosis, or too little chloride, is rare. Can occur with excessive sweat loss or with prolonged diarrhea or vomiting.

Symptoms include muscle weakness, loss of appetite and lethargy.

If you take too much: Too much chloride is rare and only likely if you are consuming huge amount of salt or salt substitutes that contain potassium chloride.

Overdose may cause weakness, confusion, increased blood pressure, or coma.

MAGNESIUM

A special region in Greece, Magnesia, was frequently visited in ancient times because of the magical powers within a salty, white powder. Ever heard of "Milk of Magnesia?" Magnesium works as antacid in small doses and as a laxative in large amounts. This multi-purpose mineral is also what early photographers used to create light flashes before the days of flash bulbs or electronic flashes.

Magnesium is the trigger that activates over 300 enzymes. Enzymes regulate many body functions, including energy production and muscle

contractions. Magnesium works as a signal for muscles to contract and relax. And when the muscles that line major blood vessels contract, it impacts your blood pressure. Magnesium helps just about every other chemical in your body do its job.

Since the 1960's, researchers have known that people who live in areas where the water is "hard" often have lower rates of heart disease and stroke. ("Hard" water contains more calcium, magnesium, and other minerals than "soft" water.) But the amount of magnesium in hard water is typically no more than 3 to 20 mg per liter--less than ten percent of what people get from a day's intake of food.

Why you need it: builds bones; forms proteins; helps release energy stored in muscles; regulates body temperature.

Recommended intake for optimal health: 300-500 mg/ day of magnesium

Best natural food

sources: no food provides at least 25 percent of the RDA in one serving. Foods that provide 10-24 percent of the RDA include whole grains; broccoli; spinach; skin-on potatoes; dry beans; dry peas; lentils; nuts; nut

Selected Studies

- A study of 16 healthy people who were placed on magnesium-deficient diets became less insulin sensitive. Their insulin became less effective at getting sugar from their blood into their cells. A high percentage of type 2 diabetics have a deficiency of magnesium inside their cells. (Hypertension, 1993) Insulin sensitivity is one of the first steps that can lead to diabetes. But no one knows which came first--the diabetes or the magnesium deficiency. And it's not clear whether magnesium supplements can help diabetes.
- The Atherosclerosis Risk in Communities Study (ARIC) has been following about 14,000 middle-aged people for up to seven years. They found that men and women with the lowest levels of magnesium in their blood at the start of study were twice as likely to be diagnosed later with diabetes as those with the highest levels of magnesium. (Diabetes, 1997.) Magnesium and insulin need each other. Without magnesium, your pancreas won't secrete enough insulin- or the insulin it secretes won't be efficient enough--to control your blood sugar. And without insulin, magnesium doesn't get transported from your blood into your cells, where it does most of its work.

butters; pumpkin seeds; nonfat yogurt; halibut.

Fortified foods: none

Minimum toxic dose: Not known, but too much from supplements may cause nausea; vomiting; low blood pressure; muscle weakness; irregular heartbeat.

Potassium

It takes a minimum of 2,000 milligrams of potassium a day to aid digestion and make protein. Potassium is so important to protein that lots of it is stored in your muscles. Often leg cramps are linked to a potassium deficiency. Potassium also affects blood pressure by relaxing the artery walls. Relaxed walls allow blood to flow through smoothly and that helps keep your blood pressure low.

Why you need it: potassium helps muscles to contract; maintains fluid and electrolyte balance; helps send nerve impulses; releases energy from protein, carbohydrates, and fat metabolism.

Recommended intake for optimal health: 2,000 to 5,000 mg/day

Best natural food sources: 100 percent bran cereal, apricots (dried), bananas, orange juice, peaches (dried), pomegranate, prunes, prune juice, avocado, chard, plantains, potatoes, pumpkin, spinach, squash, tomatoes (cooked), tomato juice, pork, veal, carp, catfish, cod, flounder, mullet, black beans, kidney beans, lima beans, soybeans, lentils, dry peas (cooked), milk, yogurt.

Fortified foods: none

If you get too little: There are dozens of symptoms of potassium deficiency ranging from fatigue, muscle cramping, weakness, bloating, loss of appetite, drowsiness, numbness and tingling and increased thirst to heart beat irregularities, and eventually coma or death. Chronic potassium

deficiency is thought to play a significant role in increasing the risk of high blood pressure.

Minimum toxic dose: A healthy person can't get a toxic amount of potassium from foods. People with advanced kidney disease, adrenal hormone dysfunction, major infections or suffering shock after an injury can have too much potassium leak out of their cells and into the blood at abnormally high levels.

Symptoms of potassium overload include nausea, vomiting, diarrhea and abdominal cramps. Large amounts from supplements (over 18,000 mg) may cause increased heart rate, low blood pressure, convulsions, paralysis of limbs, and cardiac arrest.

Sodium

Do you reach for the salt-shaker as soon as your plate is served? You don't need that extra sodium, but will it harm you? The answer to that question is still being debated.

Sodium is the main positively charged ion in your blood and other body fluids. About 1/3 of the sodium in your body is enmeshed in the mineralized crystals found in your bones and teeth. If you ate only unprocessed foods

and added no table salt you'd still get enough sodium to meet normal needs. Just 400-500 milligrams of sodium is enough to keep your body fluids and blood pressure in balance. Of course, if you are extremely active, have a fever or prolonged diarrhea or are vomiting you need extra sodium. That's why soup, broth and saltine crackers are frequently recommended during illness.

Sodium is the nutrient most frequently associated as a villain in blood pressure. High blood pressure, or hypertension, affects about 50 million Americans--one in four adults. It's the leading cause of stroke and contributes to heart attack, heart failure, and kidney failure. Some Americans, including those over 70 and African Americans, have a particularly high risk from high blood pressure. Current research shows some individuals have much greater blood pressure responses to salt than others. About half those individuals who have high blood pressure are "salt sensitive." But only 10% of the total American population falls into this category. Since there is no harm in moderately cutting back on dietary sodium - reduction is widely recommended. There's also a theory that high levels of sodium

over time may cause rising blood pressure as you age. So if your blood pressure is normal now, cutting back to a reasonable amount of sodium may help keep it that way.

Figuring out what a "reasonable" amount of sodium is has turned out to be a major public health debate. Many public and private organizations say Americans should consume no more than 2,400 mg of sodium a day. That equals about 6 grams or 1-1/2 teaspoons of salt (sodium chloride). The most recent US Dietary Guidelines for Americans and the 1996 Dietary Guidelines for Healthy American Adults, from the American Heart Association both suggest a limit of 2,400 mg.

Perhaps those individuals have never been on a sodium restricted diet. Not too long ago 2,200 milligrams of sodium was considered a significant dietary restriction. Hospitalized patients were given individualized counseling from registered dietitians on how to follow such a plan before they could be discharged. A more reasonable estimate of moderate sodium for healthy adults with normal blood pressure is probably

in the range of 3,000 to 5,000 mg per day.

It's hard to eat less than 5,000 milligrams of sodium if you rely on processed convenience foods and/or often eat meals away from home. Do you have high blood pressure? Are you at risk for high blood pressure because it runs in your family? If your answer is yes to either of these questions, it's worthwhile to consider ways to eat less sodium. However, if you have more pressing areas to work on - maintaining a healthy weight, changing your fat intake - don't make lowering sodium your primary focus.

Salt is an acquired taste. The more you eat, the more you want. Savvy salt sleuths know that you can't tell the sodium content of a food by the way it tastes. Salt that is added to foods after cooking provides a huge amount of flavor. That's because the salt is placed right on your taste buds when it goes into your mouth. Salt or sodium-based seasonings that are cooked into food or added as preservatives don't have the same dramatic effect. The bottom line: If you need to add salt, do it at the table - not in cooking. Look at these shocking comparisons:

Where's the McSalt?		
McDonald's	mg of sodium	Fascinating Facts
French Fries, regular size	135	Yes, these fries were salted after frying.
Milkshake, small chocolate or vanilla	250	The sodium in your shake is from added preservatives.
Hamburger, regular	580	The condiments - ketchup and pickle supply most of the sodium
Quarter Pounder	820	More condiments and more bread mean more sodium.
Bacon, Egg and Cheese Biscuit	1310	Yes, it's the highest sodium item on the menu.

Source: Adapted from McDonald's Corporation, 1998.

Link up to <http://www.nhlbi.nih.gov/nhlbi> the National Heart Lung and Blood Institute site for the latest information and research on blood pressure.

Why you need it: The best-known function of sodium is to help regulate blood pressure. It also aids in muscle contraction. Sodium, along with potassium and chloride help regulate fluid balance and keep your blood pH normal. The electrical current that helps send nerve impulses through your body is stimulated by the positive charge

of sodium molecules. **Recommended intake:** Figuring out what a "reasonable" amount of sodium is has turned out to be a major public health debate. Many public and private organizations including the US Dietary Guideline and the American Heart Association say Americans should consume no more than 2,400 mg of sodium a day. A more reasonable estimate of moderate sodium for healthy adults with normal blood pressure is probably in the range of 4,000 to 5,000 mg per day.

Best natural food sources:

None - though all foods contain some sodium

Fortified foods: Most processed foods have moderate to high amounts of added sodium.

Selected Studies

The Trials of Hypertension Prevention, Phase II (TOHP II) study, found that short-term sodium reduction and weight loss made a difference in improving blood pressure. Each change lowered blood pressure in those who were overweight and had slightly elevated blood pressures. However, the study group did not fully maintain their weight loss and sodium reduction over 3 to 4 years and the effects on blood pressure reduction were lessened. (Annals of Epidemiology, March, 1995.) It's long-term lifestyle changes that improve overall health and can reduce blood pressure and weight.

TRACE ELEMENTS**Iron**

Just as iron helps form the skeleton of a skyscraper, it helps support your strength and vitality. For many people, especially women, it's hard to get enough iron. It's almost impossible for pregnant or breast-feeding women to meet their increased iron requirements. That's one of the reasons why prenatal supplements are so important. Before birth, a baby has just nine months to store up enough iron to last until it's time to start solid foods. Breast milk is naturally low in iron. New moms also need to replace iron stores that were depleted during pregnancy and to make up for the additional blood lost during delivery and recovery from the birthing process. Women with heavy menstrual blood losses may need the same high levels of iron (30 mg/day) as pregnant women.

Iron is the most abundant element on earth, yet is needed in only minute amounts for humans. Iron is found in both animal and plant foods. Animal foods contain heme sources of iron and plant foods have non-heme iron. About 20 to 30 percent of the heme iron is absorbed compared to

only 2 to 5 percent of non-heme iron. Iron must be in ferrous form to be absorbed and it's the hydrochloric acid in your stomach that processes this conversion.

Why you need it: Carries oxygen throughout the body both in blood and muscle tissue.

Recommended intake for optimal health: 10 -30 mg. Lower levels are for children, men and postmenopausal women. Higher levels for women with heavy periods or those pregnant or breast-feeding. Don't take any iron-containing supplement with a glass of tea or coffee. The tannins in these beverages - especially tea - grab onto the iron and block its absorption.

Best natural food sources: Beef, Bran, Clams, Oysters, Soybeans (cooked), Spinach (cooked)

Fortified foods: Bread, Pasta, White rice, Some ready-to-eat cereals, Farina, Oatmeal

If you get too little: Iron deficiency anemia is probably the most common nutritional deficiency in the United States. Symptoms of anemia include fatigue, inability to concentrate, pale skin tone, cracks in the corners of the mouth, eye inflammation, mouth ulcers, hair loss and thin or brittle fingernails. Pregnant women with iron deficiency are more prone to

infection after delivery, premature delivery and low birthweight babies.

If you take too much: As little as 30 mg of iron or more may cause constipation, stomach upset, abdominal pain or bloody diarrhea. Long term high intakes may lead to deterioration of the gut lining and liver damage. In children a toxic dose of just 3 gms (the amount in 10 prenatal vitamins) can be severe enough to cause convulsions, coma, or death.

Copper

Why you need it: copper helps form hemoglobin; keeps bones, blood vessels, and nerves healthy.

Recommended intake for optimal health: 2-3 mg daily

Best natural food sources: Barley, Crab, Lobster, Oysters

Fortified foods: None

If you get too little: Infants and children on very limited diets are at high risk for copper deficiency. Symptoms in children include failure to thrive, pale skin tone, diarrhea, lack of pigment in hair and obviously dilated veins. Adult deficiency symptoms are water retention, irritability, poor hair texture and color and a loss of the sense of taste.

If you take too much:

Minimum toxic dose: 20 mg or more may

cause anemia; muscle aches; nausea; vomiting; liver damage; coma.

Wilson's disease, an inherited disorder, causes excess copper accumulation in body tissues. Treatment requires a low copper diet and medication to bind copper before it can be absorbed.

Fluoride

The biggest source of fluoride is usually the local water supply. Half of all US water supplies are fluoridated. Those that aren't are homes that rely on well water or non-municipal water sources. Most bottled water does not contain fluoride. Low doses of fluoride are beneficial to the dental health of adults as well as children. If you don't know if your water is fluoridated call your local water department to find out. A typical amount added is .7 - 1.2 mg per liter of water. The American Academy of Pediatrics recommends that all breast-fed infants and babies using reconstituted formula in households where the water is not fluoridated start supplements at six months.

Why you need it: Bones and teeth - hardens tooth enamel and protects teeth from decay; strengthens bone.

Recommended intake for optimal health: 1.5 - 4 mg per day

Best natural food sources:

Not widely found in foods and varies with soil content where foods are grown

Fortified foods: Some municipal drinking water (check with your local water supplier)

If you get too little: Do you have a mouthful of gleaming silver fillings proving you grew up without benefit of fluoridated water? For over 60 years, the dental benefits of fluoride have been known. If you drank fluoridated water as a child you have 50 to 70% fewer cavities than your peers who didn't have fluoride.

If you take too much:

Minimum toxic dose: 10 mg or more may cause stomach cramps; vomiting; diarrhea; tremors. Long-term high doses cause mottled teeth; brittle bones; increased frequency of broken bones. Toothpaste with fluoride should be spit out and not swallowed; only use a pea-size amount for children.

Iodine

"When it rains, it pours" claims the Morton Salt motto. With the case of iodine it's ironically true. Iodized salt is the most significant source of iodine in the United States - a nutrient once scarce in many parts of the country. Adding

iodine to table salt began in 1924 in Michigan to help prevent the spread of goiter that was common in the Great Lakes region. The practice soon spread across the country.

Why you need it: Iodine helps your body form thyroid hormones, which are vital to physical growth and development. Thyroid hormones control metabolism, improve mental functioning and give you healthier hair, skin, nails and teeth.

Recommend intake for

optimal health: 150 mg

Best natural food sources:

Saltwater fish, Seafood

Fortified foods: Iodized table salt

If you get too little: The average person only needs a teaspoon of iodine over the course of an entire lifetime. Deficiency of iodine is a world health problem, but is relatively rare in industrialized countries with fortification programs. Severe iodine deficiency in the diet of a pregnant woman increases the risk of miscarriage and stillbirth. If the baby survives birth, it is likely to suffer irreversible mental retardation. Mildly iodine-deficient children have trouble concentrating and have learning disabilities. Iodine deficiency in adults leads to a variety of illnesses including hypothyroidism, goiter

and cretinism.

If you take too much:

Minimum toxic dose: 2 mg or more may cause acne, confusion, irregular heart-beat, goiter (swollen neck or throat) and bloody or tarry stools.

Selenium

In 1979, researchers first described an association between selenium deficiency and heart-muscle disease. Often called cardiomyopathy, selenium deficiency causes enlargement of the heart and heart failure. It primarily targets women in their childbearing years and children.

It's interesting to note that a selenium deficiency during pregnancy can have irreversible effects on your baby's development and growth. The most dramatic effect of selenium deficiency during fetal growth is detrimental effects on the immune system.

Why you need it:

Selenium is a powerful antioxidant that protects red blood cells and cell membranes from free radical damage. It also works with and helps vitamin E with other antioxidant functions. May help protect against some of the damaging effects of ultraviolet light.

Recommended intake

for optimal health: 200 mcg

Best natural food sources:

Salmon and Haddock.

Accurate levels of selenium in cultivated plant foods are not available as selenium content varies with the soil levels of this mineral.

Fortified foods: None

If you take too much:

Minimum toxic dose: 700 mcg or more from inorganic sodium selenite may cause hair loss; fingernail loss; fatigue; nausea; nerve damage.

Manganese

Manganese isn't a glamorous nutrient, but it is shrouded in mystery. We don't know much about manganese because few scientists are interested in studying it. The first reported deficiency of manganese was not noted until 1972.

Why you need it:

Manganese is a vital part of many enzymes; promotes normal growth and development.

Recommended intake for

optimal health: 2.5 - 5.0 mg

Best natural food sources:

whole grains; pineapple; strawberries; lentils; kale; tea.

Fortified foods: none

Minimum toxic dose: Not known, but large doses may cause depression; delusions; hallucinations; impotence; insomnia. Large amounts of manganese may interfere with iron absorption.

Molybdenum

If you haven't heard of molybdenum, don't worry. It's the least known of all essential minerals. It's also among one of the scarcest minerals found in the earth's crust.

Why you need it: promotes normal growth and development; aids in enzyme conversion of uric acid; helps iron metabolism.

Recommended intake for optimal health: 75-250 mcg

Best natural food sources: dark leafy green vegetables, legumes, milk

Fortified foods: breads and cold cereals

Minimum toxic dose: 1 mg or more may cause excessive loss of copper in urine; 10 to 15 mg may cause gout-like symptoms.

Zinc

Your body has about the same amount of zinc as a 4" galvanized nail. Getting and maintaining the right amount of zinc is similar to walking a tightrope. It's a fine line between too much and not enough - with hazards for any missteps. Loading up with zinc for more than a week can weaken your immune system, lower your HDL (good) cholesterol and trigger a copper deficiency.

Unlike other trace minerals, zinc is not stored in the body

but acts as a functioning nutrient. Zinc is a party animal - it likes to circulate around and doesn't take time to rest.

Zinc helps put zip into your immune system. Even a mild zinc deficiency can increase your risk of infection. Stomach acid is important for the absorption of zinc. Medications or health problems that decrease available stomach acid may limit absorption of zinc. Tumor cells demand zinc for growth and when the supply is plentiful they thrive. If you have cancer, zinc supplements are usually not recommended. Since zinc is such a circulator, you lose it when your skin rubs off or you comb out that "flaky white stuff." If you substantially increase your calcium intake, you may need more zinc. Vegetarians sometimes have a hard time getting enough zinc. That's because soy foods and whole grains are high in substances that are natural inhibitors of zinc absorption. Zinc found in animal foods, especially red meat, seafood and eggs, is absorbed up to four times more effectively than zinc found in plant foods.

Why you need it: Teamed up with copper this mineral helps protect against the

damage caused by free radicals. Zinc helps wounds heal. Zinc plays a role in over 200 enzymatic reactions in your body. It is critical for the manufacture and stabilization of genetic material. Zinc levels of a pregnant woman are linked to the proper formation of the brain, eyes, heart, bones, lungs, soft palate, lips, kidneys and sex organs of the developing baby. Zinc is needed to help oil glands function and helps skin wounds heal by controlling inflammation and speeding re-growth of tissue. Finally, zinc maintains normal taste and smell sensations.

Recommended intake for optimal health: 15 - 20 mg, people who take extra calcium supplements need the higher levels, don't take extra zinc without a doctor's supervision.

Best natural food sources: Beef, Lamb, Oysters, Pork, Veal

Fortified foods: Most fortified ready-to-eat cereals, hot and cold

Minimum toxic dose: 30 mg or more may cause drowsiness; nausea; vomiting; diarrhea; impaired coordination; restlessness; weaken the immune system; lower HDL (good) cholesterol; decrease copper and iron levels.

Mineral Needs for Special Situations

Nutrient	Highest Federal Standard (RDA or DV)	Optimal Intake	Individuals with Special Needs Note: Pregnant and breastfeeding women, alcoholics, and drug abusers have increased needs for most nutrients.
Calcium	1,000 - 1,200 mg	1,000 - 1,500 mg	Milk avoiders, those on very low calorie diets and people over 55 - especially postmenopausal women.
Phosphorus	700-1,200 mg	800-1200 mg	People with kidney disease or problems of the digestive tract.
Magnesium	310-420 mg	350 - 500 mg	People over 70, very active individuals, diabetics and those on very low calorie diets.
Iron	15 mg	10-30 mg	Women with heavy menstrual blood losses and those on very low calorie diets.
Zinc	15 mg	15-25 mg	People over 70, some vegetarians, very active adults and diabetics.
Iodine	150 mcg	Not known	Not known.
Copper	1.5 -3 mg	2-3 mg	Premature babies and people who take large amounts of vitamin C or zinc from supplements.
Manganese	2-5 mg	Not known	Those on very low calorie diets.
Fluoride	3.2-3.8 mg	2-4 mg	People who don't have fluoridated water - especially children 6 months to 16 years.
Chromium	50-200 mcg	50-200 mg	Those over 70 and people on very low calorie diets.
Molybdenum	75-250 mcg	Not known	
Selenium	70 mcg	100-200 mg	Women in their childbearing years and children.

MINERAL INTERACTIONS

If you take too much of one vitamin or mineral, it can decrease your ability to absorb other nutrients. Here are some of the most common interactions:

If you take too much:	You might become deficient in:
Calcium	Magnesium, Iron and Zinc
Copper	Zinc
Iron	Phosphorus and Zinc
Manganese	Iron
Molybdenum	Copper and Zinc
Phosphorus	Calcium
Zinc	Copper

FINAL ADVICE

There are a variety of ways to optimize your intake of important nutrients. They include:

1. Don't use supplements as an excuse for bad nutrition. Eat a wide variety of fruits, vegetables and grains every day. Choose skim or low fat milk and dairy products for adequate calcium. Eat lean red meat and seafood at least several times a week for their high minerals content. Supplement to fill in the gaps.

2. Take vitamin E and or calcium supplements daily. It's almost impossible to get optimal amounts of vitamin E from foods. If you can't

or won't drink milk or eat other calcium-rich foods, a calcium supplement is worth considering.

3. Take a multivitamin and mineral supplement daily. If you are making smart food choices, the extra amounts in a multi will push you toward the optimal amounts of most nutrients.

4. Take a multivitamin and mineral supplement and vitamin E and calcium if you need them.

REFERENCE

Busch F. The New Nutrition: From Antioxidants to Zucchini. John Wiley & Sons. New York, NY. 2000