

## Nutrient Crib Sheet

(C) R.G. Smith (rob<at>retina.anatomy.upenn.edu) Please distribute freely. February, 2025

Background on Nutrients. We are often given the advice to eat a variety of different foods that complement each other, because these are supposed to provide all the nutrients we need. However, recent studies and books point out that our diet does not contain enough of some critical nutrients. This is important information, and the stakes are very high -- in our society today there is an epidemic of diseases caused by nutrient deficiencies. By eating right, we can prevent common causes of heart disease and greatly reduce cancer and viral/bacterial infections.

The traditional meaning of "vitamin" is a chemical required in tiny amounts in the diet, so one might imagine that we only need small quantities of vitamins and that they can be readily obtained from an ordinary well-balanced diet. However, our requirement for vitamin C (ascorbate) is not tiny -- we need several grams/day, more when sick. And it is virtually impossible to get enough vitamin D from food. Further, one might also imagine that our normal diet gives us enough magnesium. However, our requirement for magnesium is several hundred mg/day, but we don't get that much from our food.

Individuality of nutrient needs. As individuals we differ in our nutritional requirements because of differences in genetics, biochemistry, and daily life. Therefore, our needs for essential nutrients differ widely. Most of us are commonly malnourished in one way or another. These nutritional deficiencies are the cause of much illness and suffering, but are easy to correct, because for most of the essential nutrients the body can absorb and beneficially use a much higher amount than the minimum we need. For several nutrients including vitamins C & D and magnesium, to get enough we need to take special care, which usually means taking additional supplements. Further, as we age, we have a much worse problem -- as we get older we tend to eat fewer raw fruits and vegetables, and our aging digestive system has difficulty absorbing nutrition. Thus, older people tend to need a higher level of nutrients in their food to stay healthy.

Universality of nutrient benefits. A question often posed about nutritional supplements is, do they really provide big benefits? The answer is that a deficiency of these nutrients has been documented to have detrimental effects throughout the body on many aspects of our health. But these deficiencies aren't obvious because they have so many symptoms. The information listed below explains the importance of these nutrients and how to get enough of them. Doses shown are recommended for adults. Those with smaller or larger body weight may need to vary their dose, and those with special needs should see a nutrition-aware doctor.

### Vitamin C (ascorbate, ascorbic acid)

To stay healthy: 3-10 grams/day. (For adults, 15-50 mg/pound/day; for children, half their age in grams/day.) Vitamin C is an anti-oxidant that helps to preserve the body's health, and is also essential for the synthesis of collagen, the most common protein in the body. Therefore vitamin C can prevent hemorrhagic stroke and reverse atherosclerosis, and can also prevent allergy and asthma. It is essential for most of the body's biochemical and protective processes, to hold the body together in growth and healing, and to strengthen the immune system. However, vitamin C deficiency is common in humans eating processed foods. To stay healthy, take 1-3 grams of vitamin C with water 1/2 hour before each meal. Capsules of 1000 mg (1 gm) are convenient, but vitamin C powder dissolved in juice can be absorbed more quickly. At a dose too high, vitamin C is a mild laxative, and can cause bloating and gas, so if you notice this, reduce intake by 20-50% and take smaller doses spread throughout the day. Some people tolerate buffered ascorbate (sodium, calcium, or magnesium ascorbate) better for it is

non-acid. Some people may prefer taking timed-release vitamin C before you go to bed at night.

When sick, 3-15 grams/hr. (15-100 mg/pound/hr) Vitamin C at a sufficiently high dose can prevent viral infections and neutralize bacterial toxins that spread with an acute deficiency. At first sign of symptoms (fever, headache, scratchy throat), many nutritionists recommend 1-3 gms every 20 minutes with water until symptoms are relieved. The body absorbs more vitamin C when under stress so when you're sick you can take more than normal. If you're already sick, take as much as you can tolerate for faster recovery. Continue taking vitamin C at a high dose until the symptoms of the cold/flu are gone. For other illness or any other type of physical and mental stress, vitamin C helps the body to recover. Vitamin C is relatively safe because it is non-toxic and non-immunogenic. See Hickey & Saul (2008) book below.

### Vitamin D (D3: cholecalciferol)

To stay healthy: 5000-10,000 IU/day (25-50 IU/pound/day). Vitamin D is important for the entire body. It is produced by skin exposure to direct sunlight. Vitamin D is required for calcium utilization, immune function, reducing inflammation, and prevention of disease in many body functions. Vitamin D is a powerful hormone -- it interacts with receptors on many cell types throughout the body, and is known to prevent cancer, autoimmune diseases, diabetes, asthma, flu, and osteomalacia and osteoporosis. It is not toxic at a 5-fold normal dose. Although sun exposure gives us vitamin D, it also increases the likelihood of skin cancer, so taking supplements is recommended instead. Those with a higher fraction of body fat need more vitamin D to give an adequate blood level. A standard blood test for vitamin D levels is widely available and advisable. See Khalsa (2009) book below.

Daily dose: Summer. For people throughout most of the lower 48 states with light skin, a 20 minute daily exposure to direct midday summer sun (11-3 PM), on the face, lower arms and legs is sufficient. For people with dark skin, a daily exposure of the face, lower arms and legs up to 2 hours in the summer midday sun may be required. To minimize the sunburn risk, the best advice for those with light skin is to expose your back, arms, and legs to sunlight for 2-4 minutes, or for dark skin, for 10-20 minutes. Direct sun exposure is essential because the UVB that creates vitamin D is not transmitted through clouds, glass windows or sunblock.

Daily dose: Winter. We get almost no vitamin D from the sun when it is less than 45 degrees above the horizon (in North America, April-September: sunrise-10 AM, 4 PM-sunset; October - March: all day). Therefore in the winter supplements are necessary. Some dairy products are fortified with vitamin D, but they don't provide enough. Milk provides 100 IU/cup, requiring 5 quarts to get a 2000 IU daily dose. A person of 200 lbs may need 7000-10,000 IU/day in supplements when sun exposure is inadequate. To see the full benefit of vitamin D supplements in a blood test usually takes 6 months to a year, so the test should be done regularly.

### Vitamin E (d-alpha, beta, delta, gamma tocopherols and tocotrienols)

To stay healthy, 200-800 IU/day. (2-4 IU/lb/day) Vitamin E is a powerful fat-soluble anti-oxidant that helps the body prevent damage to cell membranes and fats caused by inflammation and environmental toxins such as smoke. Vitamin E enhances immune function and is helpful in preventing cardiovascular disease and eye diseases such as glaucoma and macular degeneration. It is thought to be helpful in preventing cancer, diabetes, arthritis, and asthma. Up to 40% of us have low blood levels of vitamin E, and 90% of us don't get even the minimum 15 IU/day. Good sources are wheat germ, vegetable oils such as palm oil, and nuts such as almonds and peanuts. Although a well-balanced diet can provide the recommended minimum, it's difficult to get enough to provide all the benefits, so supplements are helpful. The best form to take in a supplement is

"mixed tocopherols". Vitamin E tends to dilate blood vessels and it helps the body to gradually break down blood clots and prevents blood clots from forming. Therefore, when taking vitamin E, to lessen the chance of strokes it is important to take a sufficient level of vitamin C. Vitamin E is effective in helping the skin heal from burns (e.g. apply cold as first aid, later apply vitamin E), and can be applied directly from a gel-cap. Doses of 100-200 IU/day are recommended by nutritionists for people over 50 to provide health benefits, and doses of 400 IU/day up to 800 IU or higher are used to combat stress and help prevent heart disease, especially in older people. See web references below.

### Magnesium

To stay healthy: a total of 300-600 mg/day. (2.5-4.5 mg/pound/day for adults, more for teenagers' growth). Magnesium is an important nutrient for healthy arteries, muscles, brain and bones, and is involved in hundreds of enzyme reactions. In fact, magnesium is essential for all organs, and its deficiency has many symptoms -- high blood pressure and cholesterol, fatigue, irritability, insomnia, muscle cramps, and eye twitching are common ones. Most of us don't get enough magnesium in our typical daily diet. A blood test for magnesium usually does not indicate the deficit. Further, as we age, our absorption of magnesium tends to lessen, so our need is greater. Many of us get only 200-300 mg/day, not enough for our body's needs, so we have a deficit. See Dean (2017) book below.

To recover from deficit, take 200-600 mg/day in divided doses. It may be necessary to supplement with a lot of magnesium at first to relieve the deficit for several weeks, then take a lower level (100-200 mg/day) to maintain a sufficient body level. However before taking magnesium supplements make sure your kidney function is OK.

Sources of magnesium: (see List of Nutrients in Foods below) seeds (sunflower, pumpkin), nuts, legumes, tomatoes, chocolate, dark green leafy vegetables, whole grains, wheat germ. A craving for chocolate and nuts may be related to their high level of magnesium. Note that any processed flour including enriched flour has lost almost all of its magnesium -- so any white or "wheat" bread, cake, and most pastas have virtually none. Because most of us don't get enough magnesium in our diet, we must take supplements: magnesium chloride is best absorbed, but chelate, citrate, and malate are also helpful.

### Calcium

To stay healthy: a total of 500-1000 mg/day. (3-6 mg/pound/day for adults, more for teenagers' growth). Calcium is an important nutrient for arteries, muscles, the digestive system, brain, blood cells, and bones. It is essential for all organs, and its deficiency causes a wide variety of symptoms including osteomalacia and osteoporosis. However, it is thought best not to take calcium supplements because it is easy to get excessive levels in the blood. When you eat a lot of protein, the body excretes calcium. This can deplete the body and bones of calcium, but the effect is countered by an adequate supply of magnesium. Some studies suggest it is best to get calcium from the diet rather than supplements.

To recover from deficit, eat foods containing calcium instead of taking supplements. It is important to balance the amount of calcium with a proportionate amount of magnesium, and also to take enough vitamin D which facilitates the absorption, regulation, and utilization of calcium. Most of us have had a magnesium deficit throughout our lives, and as we get older many of us have a calcium deficit. See Dean (2017) book below.

Sources of calcium: (see List of Nutrients in Foods below) dairy products, dark green leafy vegetables, sardines and canned salmon (with bone), rhubarb, molasses, peas and beans, supplements: calcium is

often combined with magnesium in a 2:1 ratio -- calcium carbonate is the most common form, but is not well absorbed, so other forms (calcium lactate/malate/citrate/aspartate/orotate) are better.

### Vitamin B-3 (niacin, niacinamide)

To stay healthy: 20-1000 mg/day. Vitamin B-3 (niacin) is required for the metabolism of food, for the skin, digestive system, and the brain. It is required at higher doses than other B vitamins, and should be taken together with a separate multivitamin supplement that provides the entire B vitamin complex. Niacin is widely used to increase HDL and reduce LDL cholesterol, and to help relax and get to sleep. Good sources are brewer's yeast, fish, meat, legumes, nuts, seeds, and green leafy vegetables. Niacin taken alone can cause a warm flush on the skin for a few minutes which is harmless. Niacinamide generally does not cause a flush but it also does not reduce cholesterol. Those with diabetes, liver problems, or who drink alcohol or are pregnant should check with their doctor when using niacin. See Saul (2012) book below.

### Vitamin B-12 (cobalamins, cyanocobalamin, methylcobalamin)

To stay healthy: 20-100 mcg/day (a millionth of an ounce). Vitamin B-12 is required for the metabolism of every cell in the body. A deficiency of vitamin B-12 can cause a variety of symptoms, including fatigue, tremor, numbness or tingling in extremities, and with a more serious deficiency cognitive impairment, and permanent brain damage. Deficiency is common, and 50% or more adults over the age of 60 are deficient. When taken along with vitamins B-6, and B-9 (folate), vitamin B-12 has been shown to reduce brain atrophy in older people. Vitamin B-12 is found in meat, fish, poultry, dairy products, and eggs, and excellent sources are shellfish, liver, sardines, and salmon. Although the recommended amount of vitamin B-12 is 6 mcg/day, taking a supplement tablet of 100-1000 mcg is safe and may be necessary for some people.

### Iron

To stay healthy: 1-10 mg/day. Iron is necessary for most cells throughout the body, and thus is essential for health. A deficiency of iron causes anemia and a lack of energy, which can be insidious because it often has few other specific symptoms. But unlike most other nutrients, there is no known mechanism for active elimination of iron from the body, so it is easy and fairly common to get too much. Excess iron consumption is thought to be a risk factor for bacterial infections and many diseases of aging (see weblinks and Saul (2012) book below). Women may lose 60 mg/month of iron during menstrual periods, which must be made up from the diet on a regular basis. But the menstrual loss is eliminated during pregnancy, which is equivalent to ~500 mg over the gestational period for a fetus, and thus in many cases not much additional iron is needed during pregnancy. Normal term breast-fed babies don't need supplemental iron in their diet for the first 9-12 months. See your doctor for advice if you or your baby have special needs (see web links and Saul (2012) book below).

Sources of iron. The most absorbable form of iron is found in liver, red meat and turkey. Other good sources of iron include chocolate, beans and lentils, tomato sauce, and spinach. Daily multi-vitamin tablets for women contain ~20 mg of iron, and many other multi-vitamin tablets contain ~10mg (the RDA for men), and tablets without iron are also available and recommended for men. Many people, especially those who eat a lot of meat, get enough iron in their diet, and therefore should not take iron-containing supplements. Those with special problems should check with their doctor for advice. Many nutritionists and doctors recommend iron intake on the low side to combat infections and other consequences of iron overload. Blood tests for iron are readily available and recommended. See weblinks and Saul (2012) book below.

## Micro nutrients & minerals

To stay healthy: eat a varied diet, focused on moderate portions of meat, fowl, or fish, dark green leafy and colorful vegetables, whole-grain foods, legumes, and fruits, take a mega multivitamin tablet, and use sea salt because it contains micro-minerals. Many other nutrients and minerals are necessary at low doses. Zinc (20 mg/d) and selenium (100 mcg/d) help to prevent viral infections. Wheat germ is a good source of vitamin E. Omega-3 and omega-6 fatty acids are essential and can be obtained in oily fish (salmon, anchovies, sardines), and flaxseed meal, flax oil, lecithin, walnuts, and wheat germ. See lists of minerals and nutrients below. Avoid white or "wheat" bread and regular pasta, white rice, and processed foods containing sugar or fructose. If you are getting enough vitamin C and E, fat does not cause cardiovascular disease and satisfies the appetite better than carbs. And take supplements for vitamin Bs, C, D, E, magnesium, and zinc.

## Nutrition References

Information about essential nutrients and minerals

<http://www.orthomolecular.org> (Excellent site for description of nutrient therapy for health. Wealth of info.)

<http://www.orthomolecular.org/resources/omns/v05n10.shtml> (Discussion of ascorbate forms and acidity)

<http://orthomolecular.org/resources/omns/v16n26.shtml> (Further discussion of forms and functions of vitamins C and E)

<http://lpi.oregonstate.edu/infocenter/vitamins.html> (Linus Pauling Institute, very good overall description of the use of nutrients for health.)

<http://www.nlm.nih.gov/medlineplus/ency/article/002404.htm> (official NIH description, but many experts say that the doses are 50-100x too low.)

<http://lpi.oregonstate.edu/infocenter/vitamins/vitaminC> (Description of vit C at the Linus Pauling Inst. Very conservative doses, many nutritionists recommend much higher doses.)

<http://lpi.oregonstate.edu/infocenter/vitamins/vitaminE> (Description of vit E at the Linus Pauling Inst.)

List of nutrients in foods: <https://nutritiondata.self.com>

Nut grower's guide: nutrient content of nuts.

<http://www.publish.csiro.au/samples/Nut%20Growers%20GuideSample.pdf>

Vitamin C: The Real Story, the Remarkable and Controversial Healing Factor, by Steve Hickey and Andrew W. Saul (Paperback - Nov 15, 2008) ISBN-13: 9781591202233 (Best overall book I've seen on vitamin C and the effects of its deficiency. Explains how a vitamin C deficiency can cause atherosclerosis and how to determine the correct dose of vitamin C to prevent viral infections.)

The Vitamin D Revolution: How the Power of This Amazing Vitamin Can Change Your Life, by Dr. Soram Khalsa M.D. (Paperback - Mar 1, 2009) ISBN-13: 9781401924706 (Best overall book I've seen on vitamin D and the effects of its deficiency. It is essential in preventing inflammation, cancer, and in activating the immune response. Explains how to get vitamin D from the sun, and why we can't get vitamin D from the sun in the winter, so we must use supplements, 2000 IU/day or more for adults.)

The Magnesium Miracle by Carolyn Dean (Paperback - 2017) ISBN-13: 978-0399594441 (Best overall book I've seen on magnesium and the effects of its deficiency. Explains symptoms and effects.) Ballantine Books, 2nd Ed.

Doctor Yourself: Natural Healing That Works, 2nd Edition, by Andrew Saul, PhD. (Paperback, 2012) ISBN-13: 9781591203100 (Highly recommended. Comprehensive guide to practical use of vitamins and nutrients to solve even difficult health problems. Some people may not want to consider the approaches but they work and are often safer than drugs. The associated web site is kept up to date with the latest information. <http://www.doctoryourself.com>)

See this crib sheet at: [http://retina.anatomy.upenn.edu/~rob/nutrient\\_crib\\_sheet.html](http://retina.anatomy.upenn.edu/~rob/nutrient_crib_sheet.html)