

Vitamins

by Brian Goldman, MD, the doc in the pool

I am asked fairly often about vitamins. The question I am most confronted with is “Which vitamin is the best one for me?” This question demonstrates how invasive the supplement industry has become. We are not questioning whether supplementation is useful, valid, beneficial, healthful, harmful, etc. We have already swallowed the fact that supplements are good and “now I wanna know which will help me the most”. That is marketing for you. In spite of a huge body of literature available to the avid researcher (I know all master swimmers love reading the medical literature) that shows absolutely no known benefit (and in many cases actual harm) we continue to ask the same paraphrased question. How can that be? We are smart cookies. We are health-conscious and go out of our way to exercise regularly and shop for healthy food choices. Still, the plaintive “Which vitamin is best for me?” comes floating in our minds and to our lips.

I will tell you why. It is because we want to believe. We want very much to find a solution for wellness in a bottle. If a little of a good thing can be found in a plant, why not concentrate it and put it in a capsule. If it can be branded and marketed it becomes even more powerful, desirable, possible. The seductiveness of a youth-generating infusion of chemicals is just too much. Who could not resist? The problem is that no such thing exists. In the following article I will present a basic overview of vitamins with a special emphasis on antioxidant vitamins.

Vitamins

Vitamins are *micronutrients* (as opposed to fat, carbohydrates and protein which are macronutrients). Vitamins are organic (made from carbon) substances required by the body in minute amounts. They have no common chemical structure and do not supply energy.

There are 13 vitamins. Vitamins A, D, E and K are fat-soluble. Vitamins C, and B complex are water-soluble. B complex vitamins include thiamine, riboflavin, pyridoxine, niacin, pantothenic acid, biotin, folic acid and cobalamin.

The only vitamin that can be made in the body is Vitamin D. All the others must be found in our diet.

Fat-soluble vitamins: A-D-E-K

These vitamins are found in dietary lipids or fat. Once eaten, they dissolve and remain in the body’s fatty tissue. It takes years of a deficient diet to develop a fat-soluble vitamin deficiency. Excess intake can lead to organ injury.

Water-soluble vitamins: C, B complex

Water-soluble vitamins are dispersed in body fluids without tissue storage. Any excess intake leads to urinary excretion. Water-soluble vitamins remain available for use for months or years even for an individual who may eat a vitamin-deficient diet.

Vitamins’ roles in the body

Vitamins offer no useful energy for the body. They serve as essential links and regulators in metabolic reactions that release energy from food. They control tissue synthesis and protect the integrity of the cell’s plasma membrane. Vitamins participate repeatedly in metabolic reactions without being broken down. (For this reason the vitamin needs of physically active persons do not exceed those of sedentary persons.)

What are common food sources for each vitamin?

Fat-Soluble:

A: Retinol, including carotene, which is a “provitamin” (a molecule that can be converted into a functional vitamin): green vegetables, milk, butter, cheese, and fortified margarine

D: eggs, dairy products, fortified milk and margarine

E (tocopherol): seeds, green leafy vegetables, margarines, and shortenings

K (phylloquinone): green leafy vegetables, small amounts in cereals, fruits and meats

Water-soluble:

B1 (thiamine): pork, organ meats, whole grains, nuts, legumes, milk, fruits, and vegetables

B2 (riboflavin): meats, eggs, milk products, whole grain and enriched cereal products, wheat germ, and leafy vegetables

Niacin (nicotinic acid): liver, lean meats, poultry, grains, legumes, and peanuts (niacin from tryptophan)

B6 (pyridoxine): meat, fish, poultry, vegetables, whole grains, seeds, and cereals

Pantothenic acid: meat, fish, poultry, milk, legumes, and whole grains

Folate: legumes, green vegetables, whole grains, meats, eggs, milk, and liver

B12 (cobalamin): meats, fish, eggs, and dairy (B12 cannot be found in plants).

Biotin: legumes, vegetables, meats, liver, egg yolks, and nuts

C: citrus fruits, tomatoes, salad greens, and green peppers

Antioxidant role of vitamins, or what are free radicals?

Oxygen metabolism in the body can generate *free radicals*. Free radicals are negatively charged particles. These are unstable, chemically reactive molecules or molecular fragments. They interact with other compounds to create new free radical molecules. These can damage DNA and cell membranes, which can lead to degenerative processes in the body like aging, atherosclerosis and cancer.

Antioxidants are the heroes in this process. They can scavenge the free radicals and chemically inactivate them, preventing cellular damage and other destructive internal processes.

Antioxidants are found naturally in our own bodies and in plant and animal tissues. Some dietary antioxidants include selenium, vitamins A, C, E and beta-carotene, a precursor of vitamin A.

Current recommendations for plant consumption to obtain adequate antioxidants vary. The National Cancer Institute recommends 5 or more servings per day of fruits and vegetables and 9 for men. The USDA recommends 2-4 servings of fruit and 3-5 of vegetables per day.

In human studies, adding supplements in the form of pills to our diet has not been shown to offer a cardiovascular or cancer prevention benefit. This would imply that the addition of antioxidant vitamin supplements does not provide additional health benefits beyond what we get in our diet.

With the athlete in mind, there is a concern that we may generate more free radicals during aerobic exercise. The current belief is that we master swimmers have a revved up production of the body's natural antioxidants to compensate for any increased production of free radicals. This could explain observations that exercise leads to a reduced incidence in coronary artery disease and cancer, two conditions that are associated with free radical damage.

When vitamin intake achieves recommended levels through the diet, supplementation does not improve exercise performance.

Knowing that a healthy diet can eliminate the need for antioxidant and vitamin supplementation is reassuring to the avid athlete. There really is no known need for vitamin supplementation. With that in mind I want to present two interesting facts:

Vitamin E supplementation may help athletes clear free radicals from their bodies faster. Can vitamin E supplementation offers athletes a competitive advantage? That has not been demonstrated.

Individuals who have prolonged periods of intense physical activity may benefit from supplementation with vitamins C, E and carbohydrates before, during and after an intense workout. In these circumstances individual may be at higher risk for upper respiratory tract infections such as colds. Colds are usually due to viruses and require no treatment, but having a cold can put a cramp in your style and hamper your workout routine.

When do vitamin deficiencies occur in athletes?

In vegetarians or in individuals with low energy intake (to maintain or reduce body weight)

Those who eliminate one or more food groups from the diet.

Those who consume large amounts of processed foods and simple sugars with low amounts of micronutrients.

How about excessive vitamin intake?

Excessive amounts of vitamins can lead to detrimental health consequences. For instance vitamin C excess can lead to kidney stones and gout. B6 excess can lead to liver disease and nerve damage. B2 can lead to visual impairment, etc.

What is the take home message?

Vitamins are essential micronutrients that perform specific functions in our body. We can only make one out of 13 of them, so we must obtain the rest from our diet. A diet that is nutritious and complete (i.e. contains all of the essential vitamins) is all that you need. You do not need to take a vitamin supplement. **Period.** Caveat: There are some rare exceptions, but most of us fit in the category of eat well and leave the vitamin bottle on the pharmacy shelf. If you are wondering if you might be one of the rare exceptions then by all means discuss this with your doctor or nutritionist.

That is all for now, folks. I hope that you have a healthy summer. I will be looking for you in the pool.