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A Nutritional Primer – III

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Macronutrients – carbohydrates, proteins, fats and water – are part of our everyday life. So are the micronutrients – those things which are essential but which are needed in very small amounts. Today, we're going to discuss those micronutrients.

Vitamins

Vitamins are defined as a group of organic substances, present in minute amounts in natural foodstuffs that are essential to normal metabolism. Insufficient amounts of vitamins may cause deficiencies. There are thirteen vitamins needed by humans. All of them except D and K, must come from food sources. Vitamins D and K can both be synthesized in the body. There are two different kinds of vitamins: fat-soluble and water soluble. Fat-soluble vitamins are A, D, K, and E and are stored for a relatively long time in the body's fat and liver tissues. Water-soluble vitamins stay in the body for relatively short periods of time and therefore must be replenished frequently.

Vitamins, Storage, and Cooking

Vitamins are affected by temperature changes when being stored, handled and cooked. Fruit left out on a window sill in sunlight will speed up the ripening process and will continue until it is spoiled (i.e. avocados, bananas). You will also see damage to produce when left uncovered in the refrigerator, as well as when you don't store them at the proper temperature. The optimal temperature for vegetables is 34 degrees F. They keep much longer when stored at that temperature. They also will keep their optimum vitamin and mineral content as well when handled properly.

Fat-soluble Vitamins

Vitamin A

One of the most important functions of vitamin A is that it promotes good vision, particularly in dim light.. Retinol, a form of vitamin A, is an essential part of the retina,

rhodopsin. Vitamin A also helps maintain healthy skin, teeth, mucous membranes, and skeletal and soft tissue. The recommended daily allowances (RDA) for Vitamin A is 1000 micrograms for men, and 800 micrograms for women. A deficiency in vitamin A increases your susceptibility to infectious diseases and causes vision problems as well. Vitamin A can also be toxic at high doses, which has caused abnormal fetal development in pregnant women.

Sources: cod & halibut fish oils, liver, kidney, and other organ meats, milk, cream, and cheese. These sources are also high in fat and cholesterol (except for skim milk). Vegetables sources are fat and cholesterol free (see beta carotene).

Beta Carotene

Beta carotene has been proven to be a very potent substance with antioxidant properties that may protect against cancer. Beta carotene is the vegetable source of vitamin A and is non-toxic in large amounts. The worst that large amounts could do is turn your skin orange or yellow, if you eat for example, a pound or two of carrots a day. Beta carotene is a carotenoid and contains the potent antioxidant properties of vitamin A that is believed to help fight cancer. Some clinical studies are also relating beta carotene with a decreased risk of heart disease.

Sources: Carrots, sweet potatoes, pumpkin and other winter squashes, cantaloupe, pink grapefruit, spinach, apricots, broccoli, and most dark green leafy vegetables. The darker the green or yellow-orange color, the more beta carotene the fruit or vegetable contains.

Vitamin D

Vitamin D is synthesized by sunlight in our skin and is sometimes called the sunshine vitamin because deficiencies are so rare in sunny climates. Vitamin D, also known as calciferol, promotes the absorption of calcium which is necessary for the normal development of bones and teeth. It also helps with maintaining proper blood levels of calcium and phosphorus. Vitamin D is sometimes classified as a hormone, as well as a nutrient, because it is synthesized in the body. Large doses of vitamin D are toxic and can cause significant calcium reabsorption from the bones, as well as deposition in soft tissues, like the heart and lungs. A deficiency in vitamin D is called rickets and causes bone and teeth deformations in children. Deficiencies are rare in the U.S. due to the fortification of milk and because vitamin D is a fat-soluble vitamin. The RDA for vitamin D is 5 micrograms, but being in the sun for 15 minutes, three days a week, will produce enough for the body as well.

Sources: Fortified milk (U.S.), butter, margarine, cheese, cream, fish, oysters, and fortified cereals.

Vitamin E

Vitamin E, also known as tocopherol, is an antioxidant which protects tissue against the damage of oxidation by eliminating free radicals. It also helps in the formation of red blood cells and utilization of vitamin K. Vitamin E is also a fat-soluble vitamin, and rarely do you see deficiencies. A deficiency in vitamin E causes neuropathy, which is a disorder of the nervous system, and muscle disorders. The RDA for vitamin E is 10 mg for men and 8 mg for women. There have been no discoveries of toxicities with megadosing vitamin E, and yet, no potential benefits recorded either. Although there are some claims that vitamin E helps prevent scarring or helps with healing, there were headaches reported as side effects while megadosing.

Sources: Vegetable oils (soybean, cotton seed, sunflower, corn) and products made from them such as margarine; wheat germ, corn, nuts, seeds, olives, asparagus, spinach, and other dark green leafy vegetables.

Vitamin K

Vitamin K is critical to our blood clotting system which gives our body the ability to heal. Intestinal bacteria manufacture 80% of the vitamin K we need. The other 20% comes from our diet and deficiencies of the vitamin are virtually unheard of. They mainly stem from an inability to absorb the vitamin efficiently. Taking antibiotics also eliminates the bacterial flora in the intestines and infants who don't have an abundance of intestinal bacteria are also at risk. With deficiencies, you would see a slower coagulation time with blood clotting. The RDA for vitamin K is 80 micrograms for an adult.

Sources: Cabbage, cauliflower, spinach, and other leafy vegetables, cereals, soybean and other vegetable oils.

Water-soluble Vitamins

Thiamin (vitamin B1)

Thiamin is part of the B-complex vitamins and is essential in metabolism. It helps convert carbohydrates to energy. As well, it is necessary for healthy brain and nerve cells and proper heart functions. Thiamin deficiency, also called Beriberi, is a disease that is rare in the U.S. but mild deficiency symptoms are common. Mild symptoms are weakness and fatigue, nerve damage and even heart failure. The RDA for thiamin is 1 mg day.

Sources: Whole grains, lean meats, fish, peas, dried beans and soybeans, peanuts, fortified breads, pasta and cereals. Milk and other dairy products, as well as fruit and vegetables when consumed in quantity.

Riboflavin (vitamin B2)

Riboflavin is also essential in releasing energy from carbohydrates. It is also essential for the growth and production of red blood cells and regulation of some hormones. Skin will become dry and flaky and your eyes will be extremely sensitive to light with a deficiency in riboflavin, although extremely rare. There are no toxic effects because absorption of the vitamin in the intestines is difficult. The RDA for Riboflavin is 1.7 mg per day for men and 1.3 mg per day for women.

Sources: Milk and other dairy sources, lean meats, eggs, nuts, green leafy vegetables, and legumes. Bread and cereals are often fortified as well.

Niacin (vitamin B3)

Niacin, like the other B-complex vitamins, is crucial in the transformation of food into energy. In addition, niacin also helps with the normal functioning of skin, nerves and the digestive system. The body's able to transform niacin from tryptophan (amino acid) or acquire it from food sources. Megadosing niacin, falsely believed to boost strength and energy, causes rashes, liver damage, ulcers, and other side effects. Under medical supervision it is sometimes prescribed to lower cholesterol levels, like a drug, not a supplement. Deficiencies in niacin, called pellagra, cause inflammation of the skin, digestive problems, and mental impairment. The RDA for niacin is 19 mg NE (NE = niacin equivalent = 1 mg niacin = 60 mg dietary tryptophan) for men and 15 mg NE for women.

Sources: Nuts, dairy products, lean meats, poultry, fish and eggs. As well as legumes and fortified breads and cereals.

Vitamin B6

Vitamin B6, also known as pyroxidine, is important for protein and protein component chemical reactions. The higher your protein intake the more B6 is required to use it. It also helps maintain normal brain function, aids in the formation of red blood cells and builds antibodies for the immune system. Megadoses causes numbness and other nervous problems and deficiencies are rare. The RDA for B6 is 2 mg for men and 1.6 mg for women.

Sources: Meats, fish, nuts, beans and other legumes, bananas, eggs, whole grains, and fortified cereals and breads.

Vitamin B12

Vitamin B12 is important, like all the B-complex vitamins, for metabolism. It also helps make red blood cells and maintain nervous system functions. It is also needed to activate the folate coenzyme. It is synthesized by bacteria, fungi, and algae, but yeast, higher plants, and animals cannot manufacture it. Vitamin B12 is supplied to humans primarily

by animal products which have accumulated it from bacterial synthesis. Vegetarians who do not eat eggs or dairy may need supplements of B12. A deficiency in B12 is called pernicious anemia, which is related with fatigue. This deficiency however, is not related to intake, but probable with an inability to absorb the vitamin. It is corrected with vitamin B12 shots. There are also no health benefits for taking large amounts of vitamin B12 and no reports of toxicities with large dosages. The RDA for vitamin B12 is 2 micrograms for both men and women.

Sources: Mainly animal products, especially liver and other organ meats, clams, and oysters. Milk products, seafood, and eggs are other good sources.

Pantothenic acid

These two B-complex vitamins have never had requirements established because there were no deficiencies reported. Pantothenic acid, or vitamin B5, is essential for metabolizing food and in synthesizing various body chemicals, like hormones and cholesterol. Megadoses cause no toxic effects except possible diarrhea. The estimated safe and adequate intake for pantothenic acid is 4 to 7 mg (No RDA established because there are no reported deficiencies).

Sources: Widespread in foods. Meats, whole-grain cereals, and legumes. Milk, fruit and vegetables contain a modest amount.

Biotin

Biotin is responsible for metabolism of proteins and carbohydrates, and the construction and oxidation of fatty acids and amino acids. Deficiency is rare and limited to a few people with inborn metabolic disorders that interfere with the ability to absorb the nutrient. There are no reported toxicity's for an intake up to 10 mg. The estimated safe and adequate intake for biotin is 30 to 100 micrograms.

Sources: Liver, egg whites, soybeans, and yeast. Cereals, legumes, and nuts contain moderate amounts. Most fruits and vegetables and meats have little biotin, with the exception of cauliflower and mushrooms.

Folacin

Folacin, also known as folate or folic acid, is important to the synthesis of DNA which controls cell function, heredity and tissue growth. It also works in combination with B12 to make red blood cells. There's not a big problem with getting enough folacin because it is so plentiful in foods, but pregnant women should be careful to consume enough because folacin is critical to the growth and development of fetus. Folacin is not toxic except with 100 times the RDA. The RDA of folacin is 200 micrograms for men and 180 micrograms for women. Pregnant women and women of child bearing age should consume 400 micrograms per day.

Sources: Dark green leafy vegetables, broccoli, citrus fruits and juices, beans and other legumes, wheat bran and other whole grains, pork, poultry, and shellfish.

Vitamin C

Vitamin C, also known as ascorbic acid, plays many roles in the body. It acts as an antioxidant to protect cells, helps promote healthy gums and teeth, aids in iron absorption, forms collagen, and helps with metabolism of certain amino acids from hormones. An adequate intake also helps prevent cataracts and a low intake is associated with cancer of the stomach and esophagus. There are no studies proving the myth that large doses of vitamin C helps cure a cold, but megadoses can cause diarrhea. The RDA for vitamin C is 60 mg and up to 100 mg for smokers.

Sources: Citrus fruits, strawberries, tomatoes, broccoli, turnip greens and other greens, sweet potatoes, white potatoes, and cantaloupe. Most other fruits and vegetables contain some vitamin C; Small amounts are found in meats, fish, and milk.

Next week, we'll begin discussing how to reorganize your life for good health.

Remember, it is your life and it is your health; it is also your responsibility.