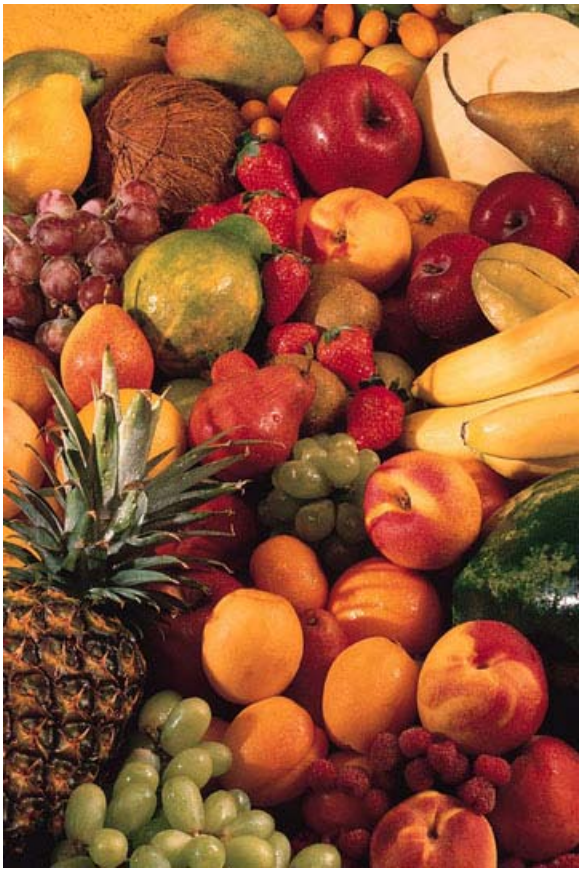
The Facts about Common Nutrients

March is National Nutrition Month (NNM) 2007, and in the spirit of this month, the following information is designed to provide readers with an overview of some of the more commonly consumed nutrients, and the guidelines, suggestions, and pitfalls associated with each. Personal Trainers can play a large role in assisting in the proper dissemination of quality information, which does not often effectively reach most consumers. The constant bombardment of fad diets, misleading supplement advertising, and media messages "lost in translation", further contribute to the confusion of establishing healthy eating and lifestyle behaviors. Focusing on balance, variety, and moderation still holds the same merit in today's nutritional goals as it did four decades ago.



Fats

For most people the word fat has a negative connotation. Linked with disease and anti-vanity association many people look at lipids as the enemy. The reality; fat is a key energy-yielding nutrient and an essential component of the diet. It serves numerous physiological roles including insulation and protection of the organs, thermoregulation, nutrient transporter, key energy reservoir and a component of cell membranes. Dietary fats are either consumed as saturated or unsaturated fatty acids. The term saturated fat refers to the chemical composition, in which every carbon molecule is bonded to four other molecules (most often hydrogen). Due to this chemical makeup, saturated fats are solid at room temperature.

Unsaturated fats are divided into two classes: monounsaturated and polyunsaturated fats. Mono-unsaturated fats contain one carbon atom that has an empty bonding site; essentially one carbon is missing its hydrogen attachment. Mono-unsaturated fat, is considered heart healthy compared to saturated fat sources due to the benign affect it has on blood lipid profiles. Polyunsaturated fats that are considered particularly important for health are omega-3 and omega-6 fatty acids. The numbers 3 and 6, refer to the carbons at which the unsaturated bond exists. Omega-6 fatty acids play important roles in body function including cell membrane formation. Omega-3, particularly in the forms EPA and DHA, have been linked with proper function of the brain and eyes, and hormone-like products that affect the heart and immune system. Researchers have identified the importance of omega-3 fatty acids as essential for normal growth and development and these fats may play an important role in the prevention of heart disease, hypertension, arthritis, and cancer. Polyunsaturated fats from fish oils (mostly omega-3) may delay cancer development, slow tumor growth rates, and reduce the size and number of tumors.

Saturated fats have a negative effect on the blood lipid profile by elevating blood cholesterol levels, specifically raising LDL. High consumption of saturated fats is directly linked with increased risk for heart disease, which

explains why most recommendations have been lowered to no more than 7% of the diet. Replacing saturated fats with unsaturated sources can yield positive effects on blood lipid profiles and reduce risk for CAD. Trans-fatty acids carry similar risks to saturated fats. Recent media coverage has identified these lipids as particularly deleterious to blood lipid profiles. Trans fats raise LDL levels, and often lower HDL. Trans-fats should be avoided in the diet if possible. Although labels are now required to identify trans-fat, the classic "partially-hydrogenated vegetable oil" in the ingredients suggests trans-fats in the food.

Common Sources

-Saturated fats: coconut oil, palm kernel oil, butter, red meat
-Monounsaturated fats: olive oil, canola oil, nuts
-Polyunsaturated fats: safflower oil, vegetable oil, sunflower oil, cold water fish
-Trans-fats: margarine, fast foods, chips, baked goods

Antioxidants

In the production of energy via oxidative means, oxygen can react with body compounds to form free-radicals. Free radicals are highly reactive due to the instability associated with unpaired electrons. They damage cell membranes disrupting intra/extracellular transport, alter cellular protein functions and damage DNA. Oxidative stress is associated with nearly two hundred identified diseases. Due to the fact that a percentage of daily oxygen is converted to free-radicals, the more consumed per day the higher the free-radical production. Routine exercise, particularly high-intensity, causes notable increases in free-radical activity. Additionally, radiation, pollution, smoking, and other environmental factors can promote free radical formation in the body. Antioxidants include Vitamins C, E, and A. Additionally, selenium works with vitamin E and contributes to manage oxidative stress via the internal enzyme-selenium complex.

Vitamin A

Vitamin A is a versatile vitamin, with roles in gene expression, vision, maintenance of the body linings and skin, immune defenses, growth of bones, and normal development of cells. It is of critical importance for reproduction as well. Vitamin A's major function is in protecting all epithelial cells: the skin, linings of the lungs, intestines, urinary tract, and bladder by participating in protein synthesis and cell differentiation. Vitamin A exerts considerable influence on the body through its regulation of the activities of the genes. Genes direct the synthesis of proteins, including enzymes which perform the metabolic work of the tissues.

Sources: fortified milk, carrots, sweet potato, spinach, beef liver, mango, apricots

Vitamin E

Vitamin E is one of the body's primary defenders of oxidation. Vitamin E will protect the lipids and other vulnerable components of the cell from being oxidized. Vitamin E exerts an especially important antioxidant effect in the lungs, where the cells are constantly exposed to oxygen. The white blood cells that defend the body against disease also depend on vitamin E, and it may play other roles in immunity. Vitamin E is also crucial for normal nerve development and offers protection from heart disease by protecting LDL from oxidation. The oxidation of LDL encourages development of atherosclerosis.

Sources: soybeans, wheat germ, margarine, salad dressings, fruits, and vegetables

Vitamin C

The best understood action of vitamin C is its role in collagen formation, the single most important protein of connective tissue. Vitamin C's antioxidant role is in regenerating oxidized substances such as iron and copper to their original, active form, while also removing the damaging agent. In the intestines, Vitamin C protects iron from oxidation and promotes absorption. It also helps to protect and recycle vitamin E to its active form. Vitamin C is involved with amino acid metabolism as well. Some of these amino acids may need to be converted into hormones of great importance in body functioning, among them norepinephrine and thyroxine. Disease prevention related to Vitamin C supplementation is being extensively studied.

Sources: citrus fruits, broccoli, sweet red pepper, strawberries, grapefruit, orange juice, brussels sprouts, green pepper

Selenium

Selenium is an essential trace mineral that functions as an antioxidant. In conjunction with Vitamin E, selenium assists a group of enzymes that work to prevent the formation of free radicals and prevent oxidative harm to cells and tissues. When fighting off foreign invaders, cells of the immune system generate oxidizing compounds. The selenium-dependent enzymes reduce these compounds to harmless by-products which can safely be metabolized by body tissues. Selenium also plays a role in activating thyroid hormone, the hormone that regulates the body's rate of metabolism. Low blood selenium correlates with the development of some forms of cancer, especially prostate cancer in men.

Sources: shellfish, meats, whole grains, and vegetables

Folate

The B Vitamin folate is active in cell division. During mitosis, genetic material from the parent cell must be passed on to the daughter cells. Folate helps to synthesize the new DNA which needs to be passed on. Folate is also critical to the normal metabolism of several amino acids. Because immature red and white blood cells and the cells of the digestive tract divide most rapidly, they are most vulnerable to deficiency. Deficiencies of folate can lead to anemia and B12 malabsorption, diminished immunity, and abnormal digestive function. Research suggests that a diet deficient in folate may also increase risk for cardiovascular disease and cancer of the colon and increase a woman's risk for cervical cancer. Folate deficiency is associated with a group of devastating birth defects known as neural tube defects. Neural tube defects range from slight problems in the spine to mental retardation, severely diminished brain size, and death shortly after birth. It is important that females of child-bearing years should consume adequate daily intakes. Of all the vitamins, folate seems to be the most sensitive to interactions with alcohol and other drugs. Alcohol-addicted individuals are at risk of folate deficiency because alcohol impairs folate's absorption and increases its excretion. Many medications, including aspirin, oral contraceptives, and anticonvulsants impair folate levels. Smoking can also negatively affect folate levels.

Sources: fortified cereals, enriched pasta, breads, and rice.

Calcium

Calcium is the most abundant mineral in the body. The majority of the body's calcium is stored in the bones, where it is used for bone structuring and remodeling. Bone calcium serves as a bank that can release calcium to the body fluids if even the slightest drop in blood calcium is detected. The calcium not stored in the bone helps regulate muscle contractions, transmit nerve impulses, clot blood, and secrete hormones, digestive enzymes, and neurotransmitters. Calcium also helps regulate the transport of ions across cell membranes. To protect against bone loss, higher calcium intakes early in life are recommended; 1200 mg per day up to the age of 24. A person with insufficient calcium intake will be at risk for the development of osteopenia; the precursor for

osteoporosis. Calcium may also help reduce the risk of hypertension. Calcium supplementation has been shown to reduce blood pressure. Some researchers speculate that calcium's effect on blood pressure is related to its action on the smooth muscle surrounding blood vessels.

Sources: milk, cheddar cheese, almonds, sardines, broccoli, pork and beans

Magnesium

More than half of the magnesium in the body is found in bone. The rest is found in muscles, heart, liver, and other soft tissues, with approximately only 1% circulating in the body fluids. Magnesium is critical to the operation of hundreds of enzymes as well as its direct effect on the metabolism of potassium, calcium, and vitamin D. Magnesium acts in all cells of the soft tissues, where it forms part of the protein-synthesizing machinery and is necessary for the release of energy. Magnesium helps relax muscles after contraction and promotes resistance to tooth decay by holding calcium in tooth enamel. Deficiency of magnesium causes tetany, an extreme and prolonged muscle contraction similar to the reaction seen when calcium levels within the sarcoplasmic reticulum are low. Many people do not meet their full dietary need for magnesium.

Sources: oysters, dried figs, black-eyed peas, spinach, baked potato, sunflower seeds

Sodium

Sodium is the principal electrolyte in the extracellular fluid and the primary regulator of the extracellular volume. When the blood concentration of sodium rises, as when salted foods are ingested, thirst encourages humans to drink water until the appropriate sodium-to-water ratio is restored. Sodium also helps maintain acid-base balance and is essential to muscle contraction and nerve transmission. Individuals with a high consumption of salt in the diet have a higher risk of hypertension, cardiovascular disease, and cerebral hemorrhage, a hypertension-related stroke. The relationship between salt intakes and blood pressure is direct—the more salt a person eats, the greater the affect on blood pressure may rise. A high sodium diet has also been associated with calcium depletion and an associated decrease in bone density. Dietary advice to prevent osteoporosis might suggest both eating more calcium-rich foods and restricting foods high in sodium. In the INTERSALT study, a large international epidemiological study of 10,000 people living in 32 countries, a 1-teaspoon difference in salt consumption was associated with a 2.2mmHg difference in systolic blood pressure. The same study showed that consuming 1 teaspoon less of salt per day was associated with a 9 mmHg attenuation in the rise of systolic blood pressure between the ages of 25-55. In clinical trials with hypertensive patients, lowering salt consumption by ½ teaspoon a day reduces systolic blood pressure by about 5 mmHg and diastolic blood pressure by 2.5 mmHg.

Sources: Many processed foods tend to contain plenty of sodium including meats, cheeses, and condiments like ketchup

Potassium

Potassium is the principal positively charged ion inside the body's cells. It plays a major role in maintaining fluid-electrolyte balance and cell integrity, and it is critical to maintaining a healthy heartbeat. Potassium also assists in carbohydrate and protein metabolism. Dehydration leads to a loss in potassium from inside the cells. This condition is particularly dangerous because when the cells of the brain lose potassium, the person loses the ability to notice the need for water. Eating foods high in potassium helps to counter some of the effects of high salt consumption on blood pressure. Potassium increases the amount of sodium excreted from the body into the urine and promotes other favorable changes such as relaxation of the arteries. Thus, a diet high in potassium and low in sodium can decrease an individual's risk for the development of high blood pressure.

Sources: orange juice, banana, lima beans, salmon, baked potato, honeydew melon, avocado

Iron

Iron is found in every living cell. In the human body it is the component of hemoglobin and myoglobin. Iron aids in the management of

carbon and hydrogen released during energy metabolism to form carbon dioxide and water. Iron helps enzymes in many of the energy pathways involving oxygen, as well as serves in the process of cell, protein, hormones, and neurotransmitters formation. Iron-deficiency is rather common, and may manifest into anemia when the degree of deficiency becomes significant. Iron-deficiency compromises exercise capacity. Heme-iron has the greatest absorption rate therefore animal products are recommended in the dietary consumption of iron. Generally less than 30% of iron is absorbed in the heme form, which drops further when consumed as non-heme sources. Additionally, meat, fish, and poultry contain a factor that encourages non-heme absorption. Vitamin C also contributes to a three-fold increase in non-heme iron absorption. Menstruation places females at particular risk for iron-deficiency.

Sources: spinach, enriched cereal, steak, tofu, navy beans