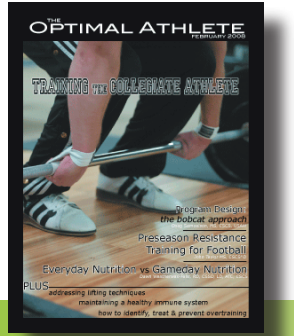

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maintainging a healthy immune system through nutrition

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With the start of winter comes the inevitable exposure to sickness and while everyone is susceptible, collegiate athletes in particular tend to be more so. The reason for this susceptibility stems from a weakened immune that results from stress, sleep deprivation and most importantly the physical demands placed on an athlete's body. Also contributing to an athlete's susceptibility are environmental factors that, among other things, include poor nutritional habits and the regular occupance of public buildings.

Luckily, the human body has an innate mechanism specifically the Thymus gland and its production of T-cells, that works as a combat force against bacteria, viruses and other foreign substances. The other component of immunity is a reserve of antioxidants, functioning as the body's systems of defense against internal cell damage from free radicals. Free radicals are unstable byproducts of the body's cells use of oxygen to produce energy and the increase in free radicals generated during strenuous exercise may degrade the immune system. Because antioxidants are available in the form of food, they have become a nutrition icon, particularly amongst athletes. . On hearing about these metabolic busy bodies, athletes are often times curious as to whether they need to include antioxidants as dietary supplements to boost immunity.

Oxidative Stress and Antioxidants

Free radical formation is enhanced by oxidants, the toxic byproducts of metabolism and exercise, as well as, cigarette smoke, pollution, and even sunlight exposure (radiation). Oxidative stress occurs when the number of free radicals produced exceeds the body's defenses against them. This is especially harmful because their ***radical*** movement within cells damages and eventually kills the cells they inhibit.

Antioxidants are micronutrients, available in both food and in supplemental form (vitamins and minerals), that neutralize oxidants and thus reduce free radical formation. Moreover, research suggests a strong correlation between most cancers and a high volume of free radicals that have not been neutralized by antioxidants. Consequentially, diets low in antioxidants increase the risk of developing cancer and conversely diets high in antioxidants may be substantially protective. Antioxidant nutrients include many vitamins and minerals, such as Vitamin C, Vitamin E, Selenium and beta-carotene. Best sources of Vitamin C include citrus fruit, strawberries, bok choy, green and red peppers, brussel sprouts and broccoli. Best sources of vitamin E include safflower, corn and canola oils, wheat germ, soybeans and sunflower seeds. Best sources of beta-carotene are all fruits and vegetables that have an orange color, such as sweet potato or yams, carrots, mangos, and apricots as well as spinach, fortified milk and beef liver. Best sources of selenium are seafood, organ meats, other animal meats, and grains and vegetables as long as the soil they were grown in is rich in nutrients.

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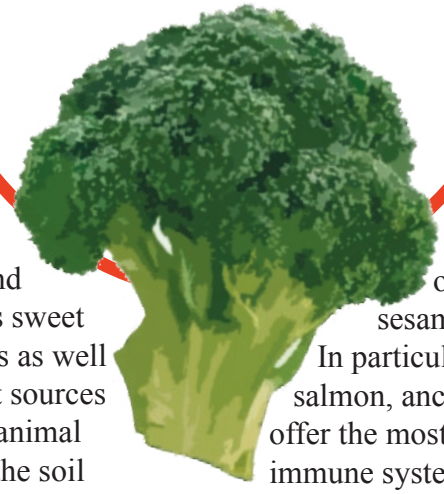

Fat and Immunity

In addition to the cancer risks, free radicals and oxidative stress also increases the risk of cardiovascular disease, atherosclerosis (hardening of the arteries) and general decrease in good health (greater vulnerability to colds and flu). Unfortunately preventative measures go beyond simply taking antioxidants. Cancer and heart disease have a positive relationship to higher fat diets and particularly fat from saturated fat or trans fatty acids. Preventative measures against colds and flu requires that some fat be able to absorb some antioxidants, and other fat-soluble vitamins (vitamins A, E, D, and K). Ideally, fat, an established necessity, should account for less than 30 percent of total calories and less than 7 percent of total calories should come from saturated fats.

Good fats include Omega-3 fatty acids, normally found in fish oils, positively affect immune function. Eicosapentanoic acid (EPA) and docosahexanoic acid (DHA) both decrease an inflammation response by increasing the production of T-cells, and DHA reduces the incidence of natural cell death. The intake of Alpha-lipoic acids leads to regeneration of antioxidants like vitamins C and E enhancing the overall antioxidant effect. Foods high in Omega 3s as well as DHA, EPA and Alpha-lipoic acid include nuts and seeds (walnuts, soybeans), leafy green vegetables, grains, vegetable oil (corn, safflower, cottonseed, sesame, sunflower and flaxseed oil). In particular, fatty fishes such as mackerel, salmon, anchovy, herring, sardines and tuna offer the most available EPA and DHA to the immune system.

Protein and Immunity

Glutamine and arginine are amino acids (protein building blocks) that play a role in strengthening the immune system. Glutamine is a major component of the intestinal wall of the gastrointestinal tract and its presence prevents infectious organisms from migrating from the gastrointestinal tract into the bloodstream.

Arginine contributes to the production of nitric oxide which functions in killing many infectious microorganisms. Glutamine and Arginine are both non-essential amino acids, meaning the body produces them naturally, however an increase in complete proteins, such as egg whites, lean beef, chicken, and turkey can also help enhance immunity, as long as the fat is kept low.

Micronutrients and Immunity

A slight deficiency in any one nutrient can weaken immunity. Getting essential nutrients from food rather than from supplemental form is recommended because the bioavailability of micronutrients in food is greater, meaning vitamins and minerals are more absorbable. In fact many supplemental forms of nutrients have less than 40% absorption. Unfortunately though, the "typical" American diet is considered deficient in a variety of nutrients including calcium, iron, vitamin A, and vitamin C. In addition, the recommended daily allowance (RDA) from the American Dietetic Association for many nutrients can potentially be below what is optimal for an efficient immune system in an active person. In this case, vitamin and mineral supplements may aid in immunity boost by protecting against micronutrient deficiencies.

To combat the risk of deficiency, ensure your diet includes:

- Iron - Iron exists in two forms—heme and nonheme. Heme iron is bioavailable from animal tissue. Nonheme iron comes from animal tissues as well as plant tissues and various fortified breads and cereals. The body absorbs heme iron much more efficiently than nonheme iron thus animal sources such as chicken, lean beef and liver are the best sources of iron. Spinach is also a great source of bioavailable iron.

- Calcium - Calcium is most absorbable from dairy products such as milk and cheese, and other sources include broccoli, black-eyed peas and sardines. Be aware though that although antacids contain calcium as one of the main ingredients, they are not a reliable form of calcium. Antacids decrease the absorption of some other vitamins and minerals. The amount of antacids required to produce an appropriate amount of absorbable calcium would negatively reduce the absorption of iron, Vitamin C and vitamin D to possible deficiency levels.

- Vitamin A - Beta carotene is the precursor for vitamin A, so again, foods rich in the orange color are especially effective for a strong immune system.

Summary of Recommendations for Enhance Immunity

- Limit saturated and high fat sources. Replace the red meats (higher in fat) with servings of fish, particularly oily fish such as salmon, tuna and mackerel. These fishes are all high in omega-3 fatty acids, which as noted, has natural anti-inflammatory properties enhancing immunity.

- Cook with olive oil, being rich in mono-saturated fats, versus other oils, which have unfavorable types of fats for the immune system. Avoid excessive use of margarine. Though most margarines are unsaturated in their fat content, they are artificially prepared and are thus higher in trans fats.

- Eat more fruits and vegetables. Green leafy vegetables in particular are very rich in antioxidants (eg. Broccoli, spinach, kale). Add more servings of other fruits and vegetables to your diet, as they are rich sources of antioxidants (Vitamin C, Vitamin A, Vitamin E, etc)

From these recommendations, you will notice that the immune system can be boosted and supplementation can be simultaneously avoided. As an added benefit, this nutritious energy will not only decrease the risk of cancer, but will also decrease risk for heart disease, especially if adequate fiber is simultaneously consumed (recommendation is to get 25 – 35 g of fiber per day).

Maintaining a good nutritional status and adequate micronutrient stores in the body are essential for mounting an effective immune response to opportunistic infections. With sound eating habits and proper

nutritional planning, supplements become less necessary and never should be used in lieu of eating properly. In addition, by reducing exposure to environmental factors that promote the production of free radicals you can further ensure that you are doing everything possible to lessen the effect of free radicals.

Ilana Katz, MS, RD, LD *currently serves as sports nutrition consultant to multiple athletic centers and coaching facilities in metro Atlanta, GA. Ilana received her Master's degree in Nutrition from Georgia State University, is a Registered / Licensed Dietitian, and is also certified by the National Council Certified Personal Trainers (NCCPT). Ilana has authored several publications and has been recruited by multiple top collegiate athletic programs for her knowledge and expertise in the field of sports nutrition.*