



# The Role of MICRONUTRIENTS In SPORTS MEDICINE

## INDIVIDUALIZED NUTRITION for the ATHLETE

From a nutritional standpoint, the athlete's focus should include both macronutrients – protein for muscle rebuilding, carbohydrates for energy renewal, fats for nerve function – as well as the critically important micronutrients – which are the vitamins, minerals, antioxidants and amino acids your body needs to function optimally every day and over a lifetime.

We are all biochemically unique, and several factors affect our personal micronutrient needs – age, lifestyle, intensity of physical training, prescription drug usage, past and present illnesses or injuries, absorption rate, genetics and more. The “normal” amount of each micronutrient varies from athlete to athlete, and even in the same athlete depending on circumstances in his or her life.

SpectraCell's micronutrient testing measures 33 vitamins and minerals in your body, but goes even further – it measures functional, long-term levels within the cell, which means SpectraCell's micronutrient testing evaluates how well your body actually utilizes each nutrient.

## DEMAND, SYNERGY and BALANCE of MICRONUTRIENTS

The athlete's need for micronutrients may fluctuate wildly depending on the intensity and duration of training. Even with a superb diet, deficiencies often exist. For example, higher levels of folate and vitamin B12 are needed to repair damaged cells as well as to synthesize new ones, especially red blood cells. Mineral depletion is common after strenuous activity.

Plus, micronutrients work synergistically – the status of one affects the function of another. Vitamin C replenishes the antioxidant glutathione. Vitamin A is better absorbed in the presence of oleic acid. Vitamin D and calcium only protect bones when both are present.

And although athletes may have higher requirements for some nutrients, a “more is better” approach can be dangerous when applied indiscriminately. Too much zinc ingestion can induce a copper deficiency, for example. Over-supplementation with antioxidants can actually have a pro-oxidant (harmful) effect. Nutrients need to be balanced. Targeted supplementation and personalized nutrition is key.

## MUSCLE RECOVERY and FATIGUE

The speed in which major muscles recover after an intense workout is largely dependent on the body's nutritional reserve. Supplementation with vitamin C can reduce post-exercise muscle soreness and decreases levels of an enzyme (creatinase) associated with damaged muscle. Supplementation with the amino acid carnitine yields similar results: less muscle soreness and fewer biochemical indications of tissue damage after physical exertion.

In addition to repairing muscle tissue post-workout, micronutrients also delay muscle fatigue during workouts. Supplementation with the amino acids asparagine and carnitine increase the capacity for muscles to utilize free fatty acids and spare glycogen, thus improving endurance. In one animal study, time to exhaustion was increased by 40% in the supplemented group.

Nutrients benefit more than skeletal muscle. A study on female runners demonstrated that folic acid improves vascular function. Clinically, this meant that folic acid improved the smooth muscle function of their arteries leading to better blood flow during training.

## CELLULAR ENERGY PRODUCTION

Inside every muscle cell there is a “cellular powerhouse” known to biologists as a mitochondrion, whose primary function is to generate energy. Although smaller than a cell, the mitochondria need copious amounts of micronutrients to power the muscles, nerves and heart. Lacking even a single micronutrient can compromise the efficiency with which the mitochondria fuel muscles. For the athlete, this means decreased endurance or strength.

Powerful nutrients like carnitine, lipoic acid and coenzyme Q10 are critical cofactors specific to mitochondrial function. Many B vitamins – biotin, B1, B2, B3, and B6 – directly impact energy pathways in the mitochondria. Vitamin E protects ATP (adenosine triphosphate), which is the energy “currency” of our bodies, while vitamin A maintains cellular equilibrium when energy production ramps up.

