MultiV-Pro™ Research Packet

Rev. 1.0, January 2015

Corporate Philosophy

Our Mission

Integrate our passion for racing, knowledge of sports nutrition, integrity, and values to provide endurance athletes with the ultimate, scientifically validated, high-performance racing formulations.

Research Philosophy

Research is the most important value at First Endurance. We are driven by a desire to ensure our products are proven to enhance endurance performance and have scientific validation. At First Endurance, we refuse to reduce costs by using "pixie dust" amounts of ingredients just to dress up the label. Our formulations utilize the same levels (sometimes more) of the active ingredients that were used in the actual human scientific research. We assure effective products by using the same ingredients used in the human clinical studies. We are meticulous about research and go out of our way to make sure we have addressed each of our stringent requirements. All products that First Endurance develops are based on human scientific research.

Commitment to Quality

First Endurance uses only the finest ingredients and follows stringent quality control. Supplements can be easily ruined. Even if you buy the right ingredients, they can degrade quickly and lose their efficacy if they aren't handled under the most stringent controls. We are determined to ensure nothing goes wrong with any step of the way. All First Endurance products are manufactured under the highest manufacturing guidelines assuring potency and strict quality control. Not only do our manufacturing facilities not allow banned substances, we take additional steps to assure complete cleanliness.

Certificate of Analysis

A Certificate of Analysis (C of A) is a document that states every active and inactive substance used to manufacture a product. A C of A also shows that there are no additional ingredients added to any of the first Endurance formulations.

CERTIFICATE OF ANALYSIS

Product : E3 Lemon-Lime **Lot:** 4274AA

Formula Ingredients	Specification	Formulation Amount
Ascorbic Acid	Assay NLT 99% (dry basis)	Conforms
Calcium Carbonate	Assay NLT 99% (dry basis)	Conforms
Magnesium Oxide	Assay NLT 99% (dry basis)	Conforms
Sodium Chloride	39% Na+ 61% Cl-	Conforms
Di-Potassium Phosphate	Assay NLT 99% (dry basis)	Conforms
L-Glutamine	Assay NLT 99% (dry basis)	Conforms
Leucine	Assay NLT 99% (dry basis)	Conforms
Iso-Leucine	Assay NLT 99% (dry basis)	Conforms
Valine	Assay NLT 99% (dry basis)	Conforms
Net Formula Weight	29g	
Standard Plate Count	<1000cfu/g	Conforms
Coliform	<100cfu/g	Conforms
E. Coli	<10cfu/g	Conforms
Staph Aureus	<10cfu/g	Conforms
Salmonella	negative	Negative

This product lot number is certified as described above to be manufactured in accordance with the official formulation specification and based on input. Said specifications include the requirement that no additional ingredients can be added beyond those described above.

Certified by:

The raw material specifications for each ingredient are based on the certification of each supplier. Each supplier has been carefully selected and approved for the production of this product to ensure confidence with the Official Formulation and Production Specifications.

Quality Assurance **Date**

Safe and Legal

First Endurance is committed to developing the most advanced endurance supplements on the market. First Endurance has taken additional measures to assure that our products are safe legal and stimulant free. First Endurance supplements are legal to use in any sporting event governed by the World Anti-Doping Association (WADA), the US Anti-Doping Association (USADA) and by the UCI (Union Cycliste International). One or more of the aforementioned governing bodies govern all US Cycling, International Cycling, US Triathlon and International Triathlon and USTF.

Some commonalties among these governing bodies include banned substances which fall into one or more of the following categories as listed in Section I A-E of the UCI Prohibited Classes of substance and Prohibited Methods document. A) Stimulants B) Narcotics C) Anabolic agents D) Diuretics and E) Peptide hormones, mimetics and analogues. This document goes on to list banned substances within each of these classes. Regulations also ban 'Compounds chemically or pharmacologically related to the products mentioned'.

First Endurance products contain NO ingredients which are explicitly listed under the banned substance list, and none of the ingredients are related chemically or pharmacologically. First Endurance has also contacted the USADA and received verbal confirmation that our ingredients are not banned based on their regulations. Note: USADA, WADA and UCI do not offer any certification or written confirmation.

First Endurance manufactures its formulations to the highest GMP (Good Manufacturing Practice) standards available. In addition, a proprietary manufacturing method is used for added safety and assurance.

All ingredients used in First Endurance formulations come from audited suppliers who do not carry, broker or supply any banned substances. In addition our manufacturing facility does not allow banned substances in any products manufactured.

Part XIV Article 7 of the Anti-doping Examination Regulations contains the following warning:
riders must refrain from using any substance, foodstuff or drink of which they do not know the composition. It must be emphasized that the composition indicated on a product is not always complete. The product may contain prohibited substances not listed in the composition.

For a complete list of regulations and banned substances please use one of the following links:

UCI Banned Substance List
WADA
USADA

MultiV-Pro™ *Supplement Facts*

Use Directions: Take four (4) tablets with a meal. Or take two (2) tablets with an AM meal and two (2) tablets with a PM meal.

Supplement Facts
Serving Size: 4 Tablets
Servings per Container: 30

Supplement Facts	Amount Per Serving	%DV*
Vitamin A (100% as beta-carotene)	5,000 IU	100%
Vitamin D (as cholecalciferol)	500 IU	130%
Vitamin K2 (as menaquinone)	80mcg	100%
Vitamin E (as natural d-alpha tocopherol)	200 IU	675%
Vitamin K2 (as Menaquinone)	45mcg	60%
Vitamin B1 (as thiamin)	4 mg	270%
Vitamin B2 (as riboflavin)	5 mg	300%
Niacin (as niacinimide)	20 mg	100%
Vitamin B6 (as pyridoxine hydrochloride)	4 mg	250%
Folate (as folic acid)	400 mcg	50%
Vitamin B12 (as cyanocobalamin)	30 mcg	500%
Biotin	300 mcg	100%
Pantothenic Acid (as d-calcium pantothenate)	20mg	200%
Iodine (as Potassium Iodide)	150mcg	100%
Magnesium (as oxide and amino acid chelate)	250mg	60%
Zinc (as oxide and gluconate)	30mg	200%
Selenium (as amino acid chelate)	140mcg	200%
Copper (as gluconate)	2mg	100%
Manganese (as gluconate)	2mg	100%
Chromium (as amino acid chelate)	120mcg	100%
Molybdenum (as citrate)	75 mcg	100%
Iron (as Ferrochel® amino acid chelate)	27mg	150%
Beta-Glucan Immune blend (Wellmune 1,3-1,6 [from yeast], oat beta glucan *(Avena Sativa)*, Shiitake mushroom extract, *(Letinula Edodes)*)	300mg	*
Digestive Enzyme (Amylase, Hemicellulase, Cellulase Bromelain)	160mg	*
Prebiotic gut health (saccharomyces cerevisiae, fructo oligosaccharides)	200mg	*

Ginkgo Biloba Extract (min 24% Ginkgoflavone glycosides, 6% terpenoids)	120mg	*
Green Tea Extract (*Camillia Sinensis*, leaves) (decaffeinated)	200mg	*
Polyphenol Support Blend (citrus bioflavonoid extract 10:1, turmenric extract, grape seed extract, apple, raspberry, blueberry, purple grape, alpha lipoic acid)	550mg	*
*Daily Value Not Established **Percent Daily Values are based on a 2,000 calorie diet.		

Other Ingredients: Cellulose, dicalcium phosphate, croscarmallose, silica, vegetable stearate, magnesium stearate.

About MultiV-Pro™ – *Multi-Nutrient Endurance Vitamin*

MultiV-Pro™ is a comprehensive multivitamin that's designed to meet the unique requirements of professional endurance athletes, delivering the power of 4 products in one bottle.
(1) Provides clinically effective doses of vitamins, minerals and key endurance specific nutrients designed to enhance overall wellness.
(2) Features our exclusive beta glucan complex with Wellmune®, which has been clinically proven to reduce upper respiratory tract infection symptoms associated with hard training, improve recovery times, and offer unparalleled immune support.
(3) Utilizes a proprietary prebiotic/enzyme blend to enhance macro and micronutrient absorption.
(4) Includes a clinically effective dose of iron amino acid chelate to maximize aerobic capacity and ensure peak performance.

And it's not just about what's in the product, but also what is not. MultiV-Pro is the first multivitamin that is free of the antioxidant vitamins C and E, which have been shown to suppress endurance physiology gains.

Vitamin and Mineral Functions

Beta-Carotene (Vitamin-A): Vitamin A helps form and maintain healthy teeth, skeletal and soft tissue, mucous membranes, and skin. It is also known as retinol because it generates the pigments in the retina. Beta-carotene, which has antioxidant properties, is a precursor to Vitamin A. Antioxidants destroy free radicals, which are unstable substances that can react with and damage cells, tissues and organs. Free radicals are believed to be associated with many of the degenerative changes seen with aging.

Vitamin K2: Found in the forms K1 (phylloquinone) and K2 (menaquinone), this fat soluble nutrient is critical for normal blood coagulation and integrating calcium into bone. K2 is produced by bacteria and has the widest range of activity. K2 is the only form that protects against arterial calcification. It is also critical in the function of smooth muscle cells especially blood vessel elasticity.

Thiamine (vitamin B-1) helps the body cells convert carbohydrates into energy. It is also essential for the functioning of the heart, muscles, and nervous system.

Riboflavin (vitamin B-2) works with the other B vitamins. It is important for body growth and red blood cell production and helps in releasing energy from carbohydrates.1

Niacin assists in the functioning of the digestive system, skin, and nerves. It is also important for the conversion of food to energy.

Vitamin B-6 plays a role in the synthesis of antibodies by the immune system. Antibodies are needed to fight many diseases. Vitamin B-6 helps maintain normal nerve function and also acts in the formation of red blood cells. It is also required for the chemical reactions needed to digest proteins. The higher the protein intake, the more the need for vitamin B-6.

Folic acid works along with vitamin B-12 and vitamin C to help the body digest and utilize proteins and to synthesize new proteins when they are needed. It is necessary for the production of red blood cells and for the synthesis of DNA (which controls heredity and is used to guide the cell in its daily activities).

Folic acid also helps with tissue growth and cell function. In addition, it helps to increase appetite when needed and stimulates the formation of digestive acids.

Vitamin B-12, like the other B vitamins, is important for metabolism. It helps in the formation of red blood cells and in the maintenance of the central nervous system.

Biotin is essential for the metabolism of proteins and carbohydrates (like the other B vitamins), and in the

synthesis of hormones and cholesterol.

Pantothenic acid is essential for the metabolism of food. It is essential in the synthesis of hormones and cholesterol. Cholesterol is needed by the body for the proper functioning of its cells' membranes, particularly in the brain.

Iodine is essential for the normal metabolism of cells. It is a necessary nutrient for the production of thyroid hormones and normal thyroid function.

Magnesium in the body serves several important metabolic functions. It plays a role in the production and transport of energy. It is also important for the contraction and relaxation of muscles. Magnesium is involved in the synthesis of protein, and it assists in the functioning of certain enzymes in the body.

Zinc plays an important role in the proper functioning of the immune system in the body. It is required for the enzyme activities necessary for cell division, cell growth, and wound healing. It plays a role in the acuity of the senses of smell and taste. Zinc is also involved in the metabolism of carbohydrates.

Selenium has a variety of functions. The main one is its role as an antioxidant in the enzyme selenium-glutathione-peroxidase. This enzyme neutralizes hydrogen peroxide, which is produced by some cell processes and would otherwise damage cell membranes. Selenium also seems to stimulate antibody formation in response to vaccines. It also may provide protection from the toxic effects of heavy metals and other substances. Selenium may assist in the synthesis of protein, in growth and development, and in fertility, especially in men. It has been shown to improve the production of sperm and sperm motility.

Copper, along with iron, helps in the formation of red blood cells. It also helps in keeping the blood vessels, nerves, immune system, and bones healthy.

Chromium is important in the metabolism of fats and carbohydrates. Chromium stimulates fatty acid and cholesterol synthesis, which are important for brain function and other body processes. It is an activator of several enzymes, which are needed to drive numerous chemical reactions necessary to life. Chromium is also important in insulin metabolism.

Iron is part of hemoglobin in red blood cells and myoglobin in muscles. The role of both of these molecules is to carry oxygen. Iron also makes up part of many proteins and enzymes in the body.

Reference: United States National Library of Medicine http://www.nlm.nih.gov/

Iron- Ferrochel® - *Amino Acid Chelate (AAC) by Jeff Rocco MD*

***Protected by US Patent*# 5,516,925**

Iron is a critical mineral for performance in endurance athletes. The abridged story of iron is that it is necessary to create hemoglobin, which is the protein used by red blood cells to deliver oxygen and remove carbon dioxide from an athlete's exercising muscles. What follows is a discussion of iron deficiency anemia in the endurance athlete.

More hemoglobin = more oxygen delivery

This explains why many top performing athletes have sought to improve hemoglobin levels, employing techniques outside of the rules of WADA and many sport governing bodies. *(Note: Previously we have presented and discussed some of the basics of iron metabolism. For a review of that material please see Iron and Endurance Performance.)*. I recently experienced an iron deficiency diagnosis myself, as well as the benefits when the deficiency was corrected. As it turns out, many endurance athletes are iron deficient. In fact, about 90% of the patients I have evaluated for iron deficiency tested positive. To make matters worse, it seems that the higher performing athletes are more severely affected.

Symptoms of iron deficiency may be mistaken for over-training syndrome (OTS). *(Note: Previously, we have discussed OTS and material may be reviewed here: Cortisol and Overtraining)* The athlete may simply feel generalized fatigue and find no improvement (or decreasing) performance despite vigilance and

attention to recovery, nutrition, and training plans. Assuming that bleeding, such as from a colonic polyp or heavy menstruation, have been ruled out, the mechanism for anemia in endurance athletes is not entirely clear. Foot strike hemolysis can occur in runners when repeated foot falls cause mechanical breakdown of red blood cells. Recent studies, however, have shown that this effect may be clinically insignificant (1, 2). Foot strike hemolysis also fails to explain why cyclists exhibit iron deficiency anemia with alarming frequency. Oxidative stress and inflammation caused by high volume and high intensity exercise have recently been proposed to cause alterations in the red blood cell membrane and subsequent hemolysis (3, 4). The cause of athletic induced anemia may just be the increased levels of oxidative metabolism seen in endurance athletes compared to sedentary individuals.

Iron deficiency anemia is diagnosed with blood tests. The tests necessary to make the diagnosis include a complete blood count (CBC) with differential, and an iron panel which includes: serum iron, total iron binding capacity (TIBC), iron saturation, and Ferritin. The range of normal is quite wide and many times patients—especially athletes—may be told their levels are normal, when in fact they are low. Here's why: normal values can vary between laboratories, and normal is a range of values clustered around a mean value for that particular lab. In other words, there are a lot of results that are considered "normal" simply because they occur commonly. Many of the population tested have some sort of illness that may cause a low hematocrit. While the results for these patients might be considered normal, they are far from normal for a high performance athlete.

For example, consider hematocrit (the volume percentage of blood that is made up of red blood cells). The normal range for hematocrit is 40-49% for men and 35-46% for women. Doctors are used to treating patients with medical conditions that result in hematocrits in the anemic range. So, when a doctor sees an athlete in the 45-year-old age range who lives at 5000' above sea level with a hematocrit of 39%, that athlete might be told their hematocrit – and therefore their iron level – is within the normal range. However, if the doctor digs a bit deeper and orders an iron panel, more information is uncovered. Let's consider that same athlete with the following lab results:

Test	**Value**	**Normal**
Hemoglobin	13.2	13.3-16.7 g/dL
Hematocrit	39.7	40.0-49.6 %
Iron	68	65-175 mcg/dL
%Saturation	21.7	20-50%
TIBC	314	250-450 mcg/dL
Ferritin	153	5-244 ng/ml

You might look at those results and conclude that this hematocrit is normal and the iron panel is normal too. But it isn't – not for an otherwise healthy athlete who lives at 5000' above sea level. Living and training at altitude should stimulate red blood cell production to the high end of the normal range. The values for hemoglobin and hematocrit are at the low end of the range. An iron level of 68 is much closer to 65 than it is 175. If this athlete had been female, this same lab might have reported the low end of the range as 37mcg. Iron levels shouldn't be lower in women, but they commonly are due to menstruation and child bearing. A woman's iron stores can drop by as much as 25% with every child she bears. In the above example, the low % saturation and the normal TIBC tell us that this athlete's body has the capacity to deal with more iron.

But some may say this athlete must just need a better diet and some iron supplements. However, this athlete has already been on supplements for the past 3 years and is still low on iron. The point here is that it takes years to improve total body iron stores with oral supplements, and may not even be possible at all. The body has a difficult time absorbing enough iron to keep up with the depletion caused by high volumes of intense exercise. Intravenous (IV) therapy is required to make any real, meaningful change. After IV iron

treatment, this particular athlete's hematocrit increased from 39.7% to 45% in just 6 weeks. **That's a 13.3% improvement,** which translates into 13.3% more oxygen carrying capacity.

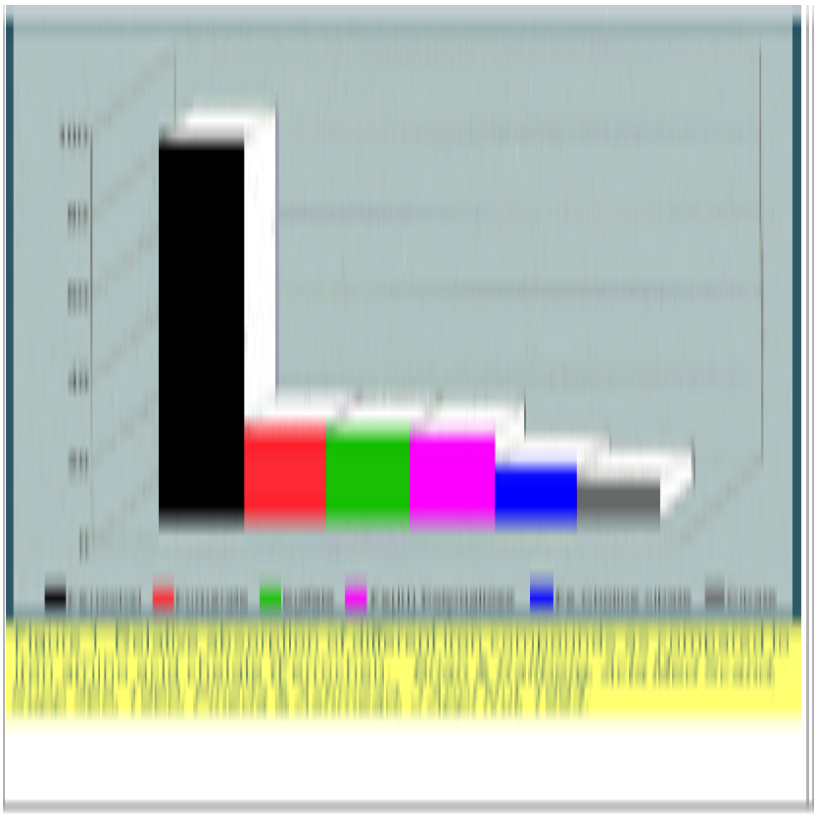
To treat iron deficiency anemia, I generally recommend a total of five IV infusions of iron with one week between each infusion. The week between infusions gives the body time to process the iron and bind it to proteins. Too much iron, given too quickly, can be toxic and cause liver damage. The infusions generally are delivered slowly over about half an hour. During the five-week infusion period, it is important for athletes to consume extra protein—up to 1g per pound of body weight—because the body needs both iron and protein to manufacture the red blood cells. Athletes can and should continue to train as usual during the infusion period. Many patients (athletes included) start to feel like they have more energy after only one or two treatments. Once IV therapy has been completed, additional IV therapy should not be needed for years. At that point iron levels can be maintained with an oral supplement. MultiV from First Endurance has a good dose of iron (18mg of elemental iron, chelated) for maintenance purposes. In my own personal experience, this approach to iron deficiency has helped me to not only to perform better, but to feel better too.

MultiV-Pro™ uses a unique form of iron called Ferrochel®. This iron source is organically bonded to amino acid chelates (AAC), forming a highly stable bio-available bond. Unlike iron as ferrous fumarate, iron AAC does not compete with the absorption of some minerals like calcium. In addition, there are no toxicity issues so it's also very safe.

Iron is a trace mineral required for red blood cell formation. In addition, iron plays a critical role in numerous body functions including enzyme systems, neurotransmission, collagen formation and immune system function. Of particular importance is the role iron plays in the formation of hemoglobin and myoglobin -- the proteins that carry oxygen in the blood and muscle tissue.

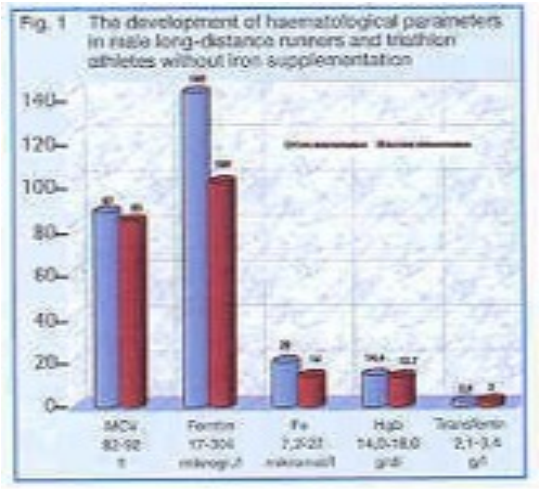
Iron balance is determined by losses and dietary intake. The body can lose iron via blood, urine, or sweat. Certain circumstances may make athletes more likely to experience iron loss. It has been shown that a significant percentage of runners experience small amounts of gastrointestinal bleeding after runs longer than 10 km. Another possible source is referred to as *foot-strike hemolysis*. In this situation a small number of red blood cells burst in the vessels of the feet, due to the pounding of running on a hard surface. Most of the iron in free hemoglobin can be reclaimed, but some is filtered out into the urine. If the exercise is unusually severe, damaged muscle cells will spill myoglobin into the blood where the kidneys will excrete it in the urine. Other studies have questioned this theory by illustrating the similar haematological levels found in swimmers.

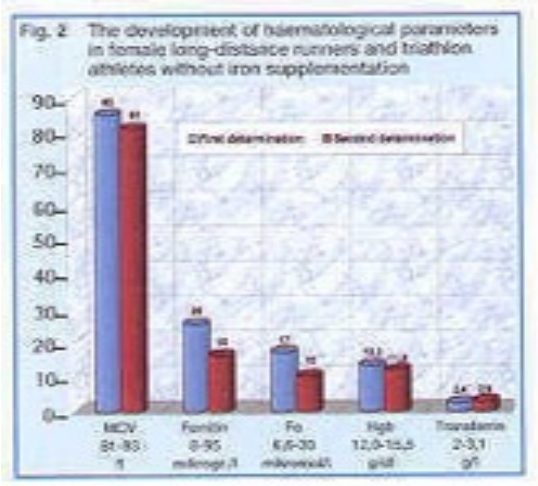
There are a variety of sources for dietary iron and several factors which influence how well dietary iron is absorbed. In general, dietary iron is absorbed poorly. Animal sources of iron are about 10 - 25% absorbed. Plant sources are only 2 - 5 % absorbed. Ascorbic acid (vitamin C) increases iron absorption. Healthy women have a dietary iron requirement of approximately 15 mg/day, and men, 10 mg/day, whereas endurance-trained individuals may have even higher requirements.



Iron deficiency can occur in almost anyone, but the greatest risk occurs in women who are vegetarians. Iron deficiency may begin to affect athletic performance based upon the degree of severity. If it is severe enough to affect the production of hemoglobin (i.e., anemia) then there is no question that performance will suffer. Controversy begins to creep in when one tries to define the earliest onset of iron deficiency. Since ferritin levels are the best measure of total body iron stores, many doctors and coaches will frequently measure this, and the complete blood count, in individuals at risk for iron deficiency. The goal is to try to identify athletes early on before deficiency becomes a problem.

An analysis of the research indicates that all endurance-trained athletes may have a need to supplement with iron. Endurance athletes who can frequently be mildly iron deficient may be limiting their performance potential. Literature has examined endurance performance of various athletes including runners, triathletes, cyclists and swimmers. The following graphs show the hematological consequence of endurance training on male and female athletes.





It is evident that, in the case of iron-deficiency, the body tries to compensate by increasing the absorption of iron. It is not clear however, whether one can maintain the new equilibrium.

The symptoms of iron-deficiency should be separated from those of anemia because they appear long before anemia is evident and so remain unrecognized. Many times the symptoms are regarded as a result of increased training. In the case of endurance sports, preventive iron supplementation is necessary because our organism cannot cope with the increased loss of iron.

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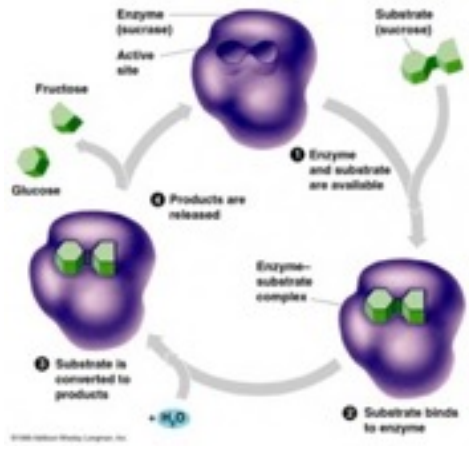
Enzyme Blend – *Amylase, Hemicellulase, Cellulase Bromelain by Kris Walker MD*

Protected by US Patent# 5,817, 350

Enzymes are substances that catalyze chemical reactions. Most are proteins. They work by lowering the activation energy for a chemical reaction, dramatically increasing the rate of the reaction. Enzymes are specific for certain substrates or molecules and catalyze only specific reactions. They are not consumed or changed by the reactions that they catalyze. They are affected by temperature, pH, and other molecules. Most enzymes work only at a certain pH and a certain temperature and are inactivated at other temperatures and pH levels. Other molecules also can inhibit or activate enzymes. Enzymes work by binding a substrate and forming an enzyme/substrate complex, which then reacts to form a new product than the original enzyme. Biological functions of enzymes include cell regulation, muscle contraction, signal transduction, and digestion.



Endurance athletes require energy, which they obtain from nutrients. However, food must be digested before the nutrients are available. Digestion of food relies on enzymes, and lack or deficiency of enzymes leads to poor digestion. This causes poor utilization of nutrients, gastric discomfort, gas, bloating, and diarrhea. Enzymes are available in raw food, but cooking food can destroy the natural enzymes present in food. Taking antacids also can inactivate proteases by raising the pH in the stomach. Proteases work in the stomach to digest protein and are active only at low pH levels of 1-2. Inadequate chewing may inhibit the release of natural enzymes from food and also limits the activity of amylase, an important digestive enzyme present in saliva.

Because digestive enzymes are so crucial to health and performance in athletes, supplementation may be useful. Enzymes can be obtained from plant and animal sources, as well as from certain microorganisms.

At least one study has shown that supplementation of digestive enzymes can improve digestibility and utilization of nutrients (The study was done on young pigs). Other studies showed improvement in protein utilization and nutritional status in nursing home and elderly patients with digestive enzyme supplementation.

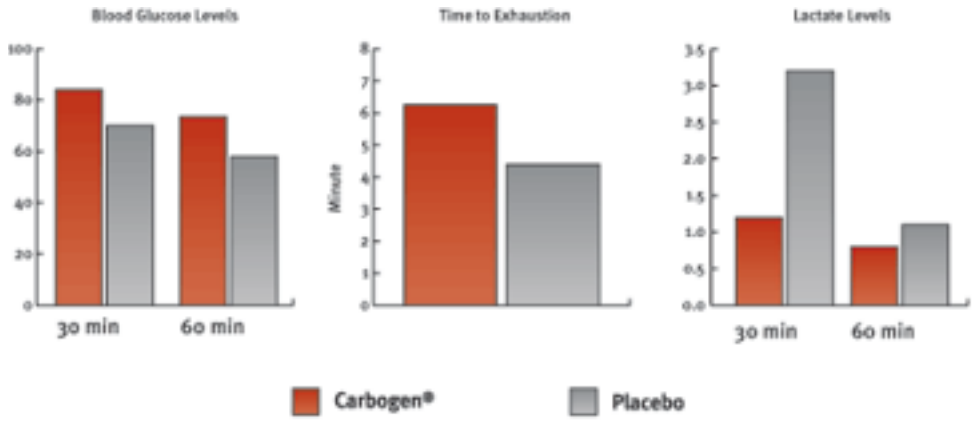
Digestive enzymes include amylases, which digest carbohydrates, proteases, which digest proteins, and lipases, which digest fats.

Digestion starts in the mouth, where amylase, which is found in saliva, starts to break down starch. It catalyzes the breakdown of long-chain carbohydrates into smaller products that are eventually converted into glucose. The pancreas also produces amylase. Lactase catalyzes the hydrolysis of the disaccharide lactose (milk sugar) into galactose and glucose. It is present along the brush border of the small intestine and is active at a pH of about 6. A deficiency of this enzyme causes lactose intolerance with gas, bloating, and diarrhea.

Proteases break down proteins and some examples of proteases are pepsin, trypsin, and chymotrypsin. Pepsin breaks down proteins in the stomach. It is secreted as pepsinogen, which is inactive until it is activated in the stomach by the low pH (1-2) and hydrochloric acid. Trypsin works in the small intestine where the pH is much higher (8).

Bromelain is a crude extract from pineapple that contains various proteases. It is prepared from cooled pineapple juice by centrifugation, ultrafiltration, and lyophilization. It is considered nontoxic and generally safe. A wide range of therapeutic benefits has been claimed for bromelain, including fibrinolytic, anti-edematous, anti-inflammatory, and anti-thrombotic activities. It has been used successfully as a digestive enzyme replacement following pancreatectomy. It works in a wide pH range, so it has activity in the stomach as well as in the small intestine. It can be used as a replacement for pepsin and trypsin in cases of deficiency.

A clinical trial was performed using a 160mg blend of Carbogen® (a mix of amylase, cellulase and hemicellulose), consumed with a meal replacement bar prior to exercise during a 60 minutes of high intensity cycling. Cyclists consumed a meal replacement bar and placebo, or meal replacement bar and 160mg enzyme blend. Blood glucose levels were consistently and significantly higher for the enzyme group vs. the placebo. Lactate values where also significantly lower in the enzyme group. Subjects on the enzyme group were able to sustain 100% VO2max significantly longer than those in the placebo group.



After an overnight 12-hr fast, five trained, male cyclists (mean VO2 max 70 ml/kg/min) performed two 60-min cycling bouts at 80% VO2 max followed by a sprint at 100% VO2 max. Subjects consumed a meal replacement bar plus either 160 mg Carbogen® or 160 mg placebo one hour prior to each cycling bout. Blood glucose and lactate were determined at: fasting, one hr-post feeding, at 30 and 60 minutes of exercise, and post-sprint. Glucose levels were consistently higher when Carbogen® was used, with the values after 60-min of exercise significantly higher than the placebo (Carbogen® 73.8±3.6 mg/dl vs. placebo 58.4± 11.9mg/dl, P<.05) *(Graph 1)*. Lactate values were also consistently lower with the values after 30 min of exercise significantly lower than the placebo (Carbogen® 1.2± .05 vs. placebo 3.3±0.23, P<.05) (G*raph 2)*. Subjects were able to maintain a 100% VO2 max workload significantly longer with Carbogen® vs. placebo (6.3±3.4 min vs.4.4± 2.9 min, p<0.001) *(Graph 3)*. Additionally, subjects reported

a lower rate of perceived exertion during the exercise trial with Carbogen® (mean RPE 12 ± 1.0) vs. placebo (mean RPE 13 ± 1.0).

MultiV-Pro™ from First Endurance contains 160mg of amylase, cellulose and hemicellulose.
An endurance athlete participates in rigorous training and relies on food as fuel. When hard training athletes consume higher amounts of calories, digestion can be compromised. Furthermore, the ability of enzymes to increase the rate at which nutrients are broken down can help increase blood glucose, leading to enhanced performance parameters. Supplementation of key or a broad spectrum of enzymes may benefit the ability of athletes to digest some carbohydrates, proteins, or fats.

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Ginkgo Biloba Extract (GBE) – *Improved Oxygen Use*

The primary active constituents of ginkgo biloba are ginkgo flavone glycosides and terpene lactones, which are standardized in high quality material. The flavone glycosides including quercetin are responsible for the antioxidant properties of ginkgo biloba extract. The terpene lactones—which include ginkgolides A, B and C, as well as bilobalide—possess neuroprotection, improvement of choline (a neurotransmitter) uptake in brain synapses, and inhibition of platelet activating factor (which reduces the tendency of the blood to clot). Laboratory and clinical studies have found a great deal of support for the majority of claims made for the therapeutic use of ginkgo biloba extract. Recently ginkgo has been studied for its ability to prevent acute mountain sickness (AMS) through nitric oxide metabolism and peripheral and cerebral blood flow. Ginkgo's ability to improve oxygen use and peripheral circulation is of particular importance to endurance athletes.

Improvement in Oxygen Use

In a 2004 study, ginkgo biloba showed an ability to prevent or lessen symptoms of AMS in humans. The mechanism of this effect is poorly understood. One hypothesis is that ginkgo alters nitric oxide (NO) metabolism, possibly by scavenging NO or altering nitric oxide synthase expression and thereby lessening the vasodilatory effects of NO. The study measured exhaled nasal NO output in humans ($n = 9$) during normoxia and then during acute normobaric hypoxia (goal oxyhemoglobin saturation 75% to 85%) before and after administration of a standardized extract of ginkgo biloba (120 mg twice daily for 5 days). Oxygen saturation, heart rate, and minute ventilation were similar before and after ginkgo biloba administration. Exhaled nasal NO output was increased during normoxia following ginkgo ($p < 0.02$) and reduced during normobaric hypoxia both before ($p < 0.02$) and following ($p < 0.003$) ginkgo. Exhaled nasal NO output during normobaric hypoxia was lowest following ginkgo ($p < 0.003$). Study representatives concluded that ginkgo biloba increases exhaled nasal NO output during normoxia and enhances reduced exhaled nasal NO output during normobaric hypoxia. Results suggest that ginkgo biloba may act to reduce AMS through an effect on NO metabolism.

Improvement in Blood Flow

Ginkgo biloba extract has also been advocated for the improvement of blood circulation. One study investigated the effect of the gingko biloba extract, or GBE, on skin blood flow in healthy volunteers and accompanying changes in urinary metabolites. Twenty-seven healthy middle-aged subjects participated in this randomized, double blind, placebo-controlled, crossover study. Subjects received 240 mg/d GBE or placebo for periods of 3 weeks. Skin blood flow was measured on the forefoot. These measurements were performed on 24-h urine samples collected at the end of the intervention periods. Following GBE treatment, overall mean skin blood flow was significantly reduced as compared with placebo. Remarkably, the change of skin blood flow after GBE intervention was proportionally related to blood flow after placebo treatment: subjects showed either an increased, decreased or unaltered skin blood flow. Analyses showed that urinary metabolic patterns differed depending on the change in baseline blood flow after treatment with GBE. The present findings substantiate that GBE has a multi-directional modulating action on blood flow in healthy subjects and support findings of a vasoregulatory role of this extract.

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Zinc– *Galvanize Your Training by Jeff Rocco MD*

Zinc is a trace element and an essential component of good nutrition. Many of us have seen zinc when it is used to coat steel to protect against corrosion—like that old trash can where Oscar the Grouch lives. Zinc works as a co-factor and is required to facilitate the activity of over 300 enzymes in our bodies. Zinc plays a key role in carbohydrate, fat and protein metabolism. The enzyme superoxide dismutase requires zinc in order to protect against free radical damage. Immune system function is also bolstered by zinc. Obviously these roles are important to everybody, and they are even more important to endurance athletes trying to balance the stresses of training and racing with those of recovery.

Endurance athletes are at risk for being zinc deficient. Several studies have shown athletes to be deficient in zinc. (1, 23) Athletes may be at risk for zinc deficiency both through inadequate dietary intake and through losses that occur with high intensity and long duration exercise. Athletes can lose up to 9% of the USRDA for zinc in a single 2-hour training session (4). Vitamin B6 depletion may also play a role in decreased zinc and magnesium serum levels. *(Note: Previously we have discussed some of the roles of magnesium. For a review of that material please see: Energy and Electrolyte Considerations and A Tale of Five Electrolytes)*. Magnesium deficiency, like zinc, has been shown to result in decreased strength as well as decreased exercise endurance.

There is compelling evidence to suggest that zinc supplementation can decrease cortisol level (5). *(Note: Previously we have discussed cortisol. For a review of that material please see: Cortisol and Overtraining Syndrome: Why an Athlete Should Care.)*. When zinc is replete, anabolic hormones such as testosterone and insulin-like growth factor-1 (IGF-1) actually increase. This is very exciting news for athletes suffering from chronically elevated cortisol levels. IGF-1 is a hormone that promotes recovery and rebuilding of lean tissue in adults, and increases growth rates in children. Zinc and magnesium deficiencies are associated with growth retardation in children. Repleting zinc and magnesium has lead to a 70% increase in IGF-1 and restoration of growth rates for those same children.

For athletes, IGF-1 is a key recovery hormone. A study using rats demonstrated a 60% or 80% decrease in IGF-1 when the animals were deprived of magnesium and zinc, respectively. When zinc and magnesium levels were repleted, IGF-1 levels increased 194% (6). While the effects of zinc and magnesium in rats are interesting, we are more interested in what these elements can do for the human athlete.

A double-blind, randomized, controlled study of the effects of zinc-magnesium preparation combined with vitamin B6 was conducted using ZMA (30mg zinc monomethionine aspartate, 450mg magnesium aspartate, and 10.5mg of vitamin B6) (7). In this study, a group of college football players were given ZMA nightly for a period of eight weeks during spring football training. Zinc, magnesium, testosterone, and IGF-1 levels were measured and strength was tested both before and after the supplement period. The placebo group exhibited significantly decreased levels of zinc, magnesium, testosterone and IGF-1, while the supplemented group demonstrated significantly increased levels of the same. Why does this matter? The supplemented group also exhibited leg torque and power increases of approximately 10%, which was statistically significant compared to controls. While a subsequent study (8) was not able to support these results, the athletes in the subsequent study had normal zinc and magnesium levels before and after the study period, which may explain the lack of performance increases.

Training, competing, and everyday life generate stress for athletes. In the absence of adequate zinc and magnesium, these stresses can have catabolic rather than anabolic effects. Much like a healthy dose of zinc can protect steel from corrosion, athletes should protect their bodies from catabolism. A bioavailable supplement of zinc and magnesium, like ZMA, is recommended.

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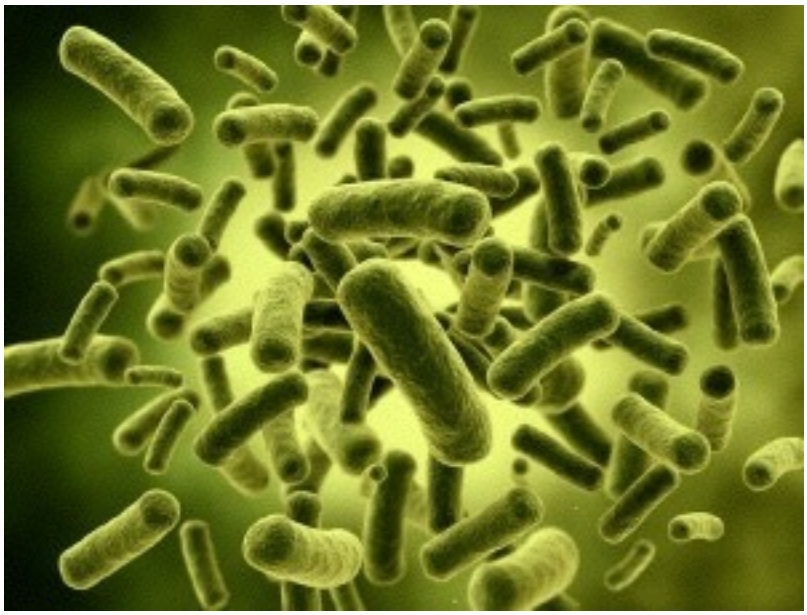
Prebiotics & Probiotics– *Improve Your Performance by Loukia Lily PhD*

Distance runners, competitive cyclists, elite triathletes or any other kind of endurance athletes require a vast amount of caloric intake to maintain optimal hydration and energy levels. This alone puts a lot of stress in the gastrointestinal (GI) tract. On top of that, quite frequently during training or racing, endurance athletes may experience GI problems. Research shows that up to 70% of athletes experience some GI difficulties at some point of their training or racing (1-3). GI complaints may vary from bloating and flatulence to episodic stomach aches, stomach cramps, acid reflux, constipation or diarrhea.



Don't panic. Excluding any pathological issues behind these GI problems, there are nutritional steps that can be taken regularly to enhance the GI function and, in the long term, avoid potential distress caused either by a caloric overload or other reasons.

Good GI activity is fundamental for effective nutrition because most of the essential nutrients are absorbed and digested in the gut. A healthy gut means better nutrient absorption, improved utilization of energy from food, and less stress throughout the digestion process. This may also lead to fewer GI complaints during training and racing.

However, advancing GI health is a process that does not happen overnight. GI activity is enhanced by an increase in the number of the microorganisms that live normally in the gut (mainly types of bacteria). When these bacteria grow in number, they create colonies. Colonies are formed only by long-term and consistent food and supplement intake.

Among the most widely used food supplements to improve digestion health are probiotics and prebiotics. Over the years, research has shown that **probiotics**, (mainly bacteria and yeast) are digestible microorganisms that can alleviate symptoms of lactose intolerance and treat or prevent diarrhea (4, 5). The **prebiotics** on the other hand, are non-digestible oligosaccharides that can stimulate and regulate the growth of probiotic microorganisms and, over time, improve nutrient absorption and health (4, 5).

During the past decade, research has started considering the health benefits from a combined formula of probiotics and prebiotics. In an extensive review of clinical trials in humans published by the British Journal of Nutrition in 2002, the authors mention the therapeutic and prophylactic benefits of **probiotics**, as well as their ability to enhance the immune system by activating a variety of immune system related genes. Also, the authors mention the immunological effects that **prebiotics** have by activating or enhancing the activity of the probiotic microorganisms (6). So, the prebiotics increase the numbers of the probiotic microorganisms (the bifidobacteria in particular) that exist in the gut. Additionally, prebiotics have been linked to an enhancement of mineral absorption in the large bowel (8). Interestingly, more research results demonstrate that patients with chronic GI diseases or individuals with compromised or distressed GI tract receive the greatest benefit from prebiotic supplementation (7).

In conclusion, a combination of probiotics and prebiotics may work synergistically. The former has been proven over the years to enhance the number of the healthy microorganisms in the gut, and the latter to enhance the activity of the former. Healthy GI activity begins with optimal nutrient absorption, which requires a healthy gut. And a healthy gut can be achieved by regular intake of probiotics and prebiotics to provide a beneficial, synergistic effect that supports training and racing at the highest levels.

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Become FREE of Vitamin C & E– *Enhance Physiology by Matt Hansen PhD*

Antioxidant use has long been incorporated into the regular routines of numerous athletes. Historically, this has been especially true for endurance athletes. Antioxidants such as vitamins A, C, and E as well as beta carotene have long been suggested to protect active people from oxidative tissue damage. Although most evidence suggests non-athletes consuming a balanced diet do not benefit from additional antioxidant supplementation, numerous authors have encouraged endurance athletes to take supplemental antioxidants due to the increased oxidative damage, which occurs as result of sustained physical activity. However, recent evidence suggests that antioxidant supplementation during endurance activity may actually hinder athletic performance.

Let's take a few steps back. Antioxidants are nutrients that act to prevent oxidative damage resulting from free radical formation. A free radical is a molecule that has an unpaired electron in its outer orbit making it highly reactive. They often react with a stable compound in order to pair the unpaired electron. Free radicals are believed to be produced in numerous ways. The most commonly cited mechanism of exercise related production is mitochondrial leak due to the increased oxygen flux to the mitochondria during exercise. Jenkins and Goldfarb (1993) estimated that 4-5% of the oxygen consumed in mitochondrial oxidation would eventually form oxygen species with unpaired electrons. More recent evidence suggests that other mechanisms may contribute more free radicals than mitochondrial leak including the inflammatory response, auto-oxidation of heme proteins, and ischemia-reperfusion. Regardless of how they are created, free radicals produced in excess can result in cellular damage. Antioxidants can scavenge free

radicals, bind metal ions to prevent them from reacting with reactive species, and even repair damage resulting from oxidation.

As previously suggested, antioxidant supplementation has become a commonplace with endurance athletes. Knez and Peake (2010) assessed the nutrition records of 37 ultraendurance triathletes for one week and found that all included subjects met or exceeded dietary reference intakes for all vitamins with the exception of Vitamin D. Over 60% of the athletes included in the study took vitamin supplements although only one athlete was recommended to do so based on formal medical advice. The most common supplements were vitamin C (96%) and vitamin E (80%), both antioxidants. The inherent dangers of this practice are relatively slim as most common antioxidant supplements are not toxic even at relatively high levels of supplementation. However, the overall benefits may not be all they have been purported to be and indeed may even hinder performance if taken at the wrong time.

The benefits of an antioxidant rich diet on enhancing the immune system have been well supported in literature. However, the benefits of antioxidant supplementation on performance are poorly understood. Numerous supplement companies suggest that antioxidant supplementation may possibly delay fatigue and improve endurance performance, however the scientific documentation supporting these claims has been lacking. In fact, recent evidence suggests it may be counterproductive to take antioxidants during endurance activities. Braakhuis and colleagues (2013) found that an antioxidant rich diet had no effect on performance in competitive rowers which was also the finding in Keith (2006). No evidence has been found supporting the use of vitamin E as an ergogenic aid either. According to Rokitzki et al. (1994) and Tidus et al. (1995), vitamin E supplementation had no performance effect in swimming, submaximal cycling, cycling to exhaustion, hockey, and marathon running. Furthermore, in a separate 2013 study, the Braakhuis et al. found that consuming a beverage containing vitamin C during performance actually hinders performance in female distance runners. This supported the findings by Ristow et al. (2009) who suggested high levels of vitamins E and C led to a retard of training adaptations during exercise and was further supported by Gomez-Cabrera et al. (2008) who found high levels of vitamin C decreased endurance capacity.

The fact that evidence now suggests the use of vitamin C during physical activity actually hinders performance may require a bit more explanation. There is a growing body of literature which supports the need for free radicals during exercise in order to enjoy the benefits of training adaptations. Reactive oxygen species have been shown to serve as a signal to promote the expression of skeletal muscle proteins, mitochondrial proteins, and heat shock proteins. Oral supplementation of vitamin C has been shown to blunt the body's natural ability to fight inflammation thus further limiting overall training adaptations. Furthermore, evidence suggests that endurance training promotes increased endogenous antioxidants in muscle fibers, thereby increasing the natural level of protection against exercise-mediated oxidative damage. Finally, it has been reported that vitamin C prevented expression of transcription factors, which are involved in biogenesis, which is consistent with the previous suggestions that vitamin C supplementation reduced training-induced adaptations. According to Braakhuis et al. (2013), training status appeared to have a greater impact on antioxidant mobilization after exercise than diet in elite athletes.

It is without a doubt that more research will be performed in this area in the future. Braakhuis et al. (2013) claimed to be the first to investigate the relationships between diet, exercise training, performance, and antioxidant status in elite athletes. Based on the available evidence, it seems that a few conclusions can be made. First, most endurance athletes are already getting sufficient levels of most vitamins, including vitamins C and E. Endurance athletes with diets containing antioxidant levels which exceed the dietary reference intakes will not likely improve performance. However, there may be an associated reduced risk for upper respiratory tract infections as well an increased ability to sustain iron status and home proteins through the processes noted above. A final conclusion is that consuming antioxidants during endurance exercise may have a negative effect on performance. Athletes should focus first on gaining antioxidants through a balanced diet. However, the addition of low level supplemental antioxidants may still provide health benefits.

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Beta Glucan– *Reduce URTI, Enhance Performance & Recovery by Dr. Donald Cox*

Run faster, jump higher, get stronger is the mantra of many serious athletes focused on improving performance. In terms of supplementation, athletes have traditionally relied on products that build muscle, fuel endurance, and aid recovery as an important part of their training. But without the benefit of good health, training programs and performance gains fall by the wayside. In other words, if you're sick you cannot train, at least not effectively. This is a common occurrence among athletes based on substantial research demonstrating that high intensity exercise weakens the immune system.

New clinical research with a natural immune health ingredient called Wellmune® may change how athletes, trainers and coaches approach supplementation. In studies involving marathon runners and cyclists in a heat-stress lab, Wellmune reduced the incidence of upper respiratory infection symptoms and activated protective immune responses that maintain health.

Wellmune is a food, beverage and supplement ingredient that is clinically proven to safely prime the key immune cells that help keep the body healthy. It is a beta 1,3/1,6 glucan derived from the cell walls of a proprietary strain of bakers yeast (Saccharomyces *cerevisiae).* Wellmune triggers human immune defenses that have evolved over thousands of years to protect the body. Researchers have demonstrated that Wellmune mobilizes billions of innate immune cells that are part of the body's natural defenses. It helps these cells to do their jobs effectively without over stimulating the immune system, which can be harmful

to long-term health. This unique ingredient's patented, year-round protection is the culmination of more than $300 million in research with leading university and government institutions. Wellmune is a product of Biothera, a U.S. biotechnology company dedicated to improving immune health.

University of Houston Study

The Department of Health and Human Performance at the University of Houston conducted a clinical study that found that Wellmune might enable both recreational and elite athletes to exercise longer and harder with less risk of immune system suppression that normally occurs following high intensity exercise (1). The effectiveness of the immune system drops sharply below its normal state two to six hours after strenuous exercise and then gradually recovers within 24 hours. According to Brian McFarlin, Ph.D., FACSM, during this 'open window' period the athlete is more susceptible to infection, which may result in lost training time as well as missed work or school. McFarlin is the lead researcher and Associate Professor of Exercise Physiology, Nutrition, and Immunology at the University of Houston.

Study Design

The randomized, double-blind, placebo-controlled study involved 60 recreational athletes who engaged in sustained aerobic exercise: 31 women (age 22 +5) and 29 men (age 23 +5). Following initial screening, study subjects were given either a placebo or 250 mg of Wellmune daily for 10 days. At the end of the period, the athletes rode an exercise bicycle for approximately one hour in the heat stress chamber at the Health and Human Performance lab at the University of Houston. Exercise conditions in the chamber were set at 38°C (100°F) and 45% relative humidity to create an environment that placed the athletes under physiological and psychological stress.

The athletes were closely monitored during the exercise challenge to ensure their safety. Blood samples were drawn at day zero and ten days later, immediately before and after the exercise session and again two hours post exercise. The samples were analyzed for 25 immune system measurements.

Using a cross-over study design, the athletes next observed an eight-day "wash out" period during which no supplement was given to clear their bodies of any supplement effect. The study subjects then repeated the 10-day supplementation with the other test variable (Wellmune or placebo). At the end of the second supplementation period, the subjects then replicated their initial exercise regimen.

Study Results

Study subjects taking Wellmune had statistically significant higher concentrations of monocytes in their blood compared with the blood samples while taking the placebo. The higher monocyte level was recorded immediately before and after exercise, as well as two hours post exercise. Study participants also had higher levels of key cytokines (IL-2, IL-4, IL-5 and IFN gamma) following Lipopolysaccharide (LPS) stimulation when taking Wellmune. (figure 1). LPS is derived from gram-negative bacteria and is used to mimic a bacterial challenge to stimulate an immune response. The data also showed higher levels of plasma cytokines (IL-4, IL-5, IL-7, IL-8, IL-10 and IFN gamma) two hours after exercise when the subjects had supplemented with Wellmune. All of these results were statistically significant ($p<0.05$).

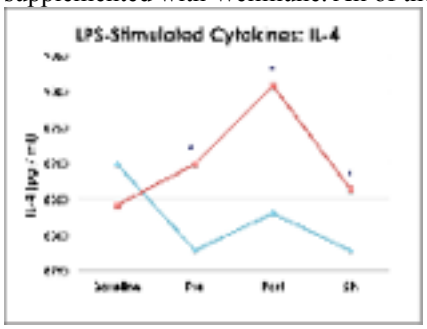

Figure 1: Study participants also had higher levels of key cytokines (IL-2, IL-4, IL-5 and IFN gamma) following Lipopolysaccharide (LPS) stimulation when taking Wellmune. LPS is derived from gram-negative bacteria and is used to mimic a bacterial challenge to stimulate an immune response.

The effect of Wellmune on LPS-stimulated IL-4 and IL-5 production suggests that leukocytes were primed for higher plasma cytokines that directly mediate innate and humoral dependent immune responses. The

research demonstrated that Wellmune not only reduced the open window effect, but also actually resulted in a higher level of immune responsiveness than the study subjects' normal immune state. Dr. McFarlin concluded that Wellmune provided a greater degree of protection before and after exercise, as measured by monocyte concentrations and certain protective cytokine levels. This may enable athletes to maintain a strenuous training program, avoid down time and ultimately enhance their overall athletic performance.

Carlsbad Marathon Study

The immune health benefits of Wellmune were also demonstrated in a clinical study with marathoners who participated in California's Carlsbad Marathon in 2007. Runners taking Wellmune experienced increased vigor and mental clarity and a reduction in fatigue and upper respiratory tract infection symptoms (2).

Study Design

The double-blind, placebo-controlled study included 75 marathon runners (35 men, 40 women) ages 18-53 (mean age 36 years) who were recruited at the 2007 Carlsbad Marathon. Subjects consumed 250 mg of Wellmune daily or a placebo for four weeks. Both groups monitored and recorded symptoms that included nasal congestion, runny nose, sore throat, sneezing, cough, fatigue, headache, general malaise and body aches. The study measured the psychological states of the participants using a Profile of Mood States (POMS) questionnaire. The POMS profile method, which measures six primary moods states (tension, depression, anger, fatigue, vigor and confusion), has been employed in thousands of health studies.

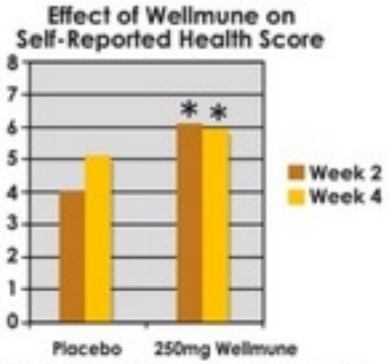

Figure 2: Effect of Wellmune on self-reported health scores.

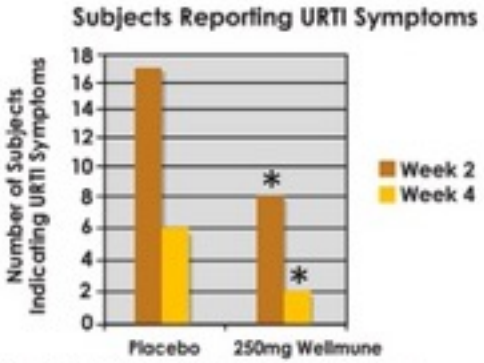

Figure 3: Subjects reporting URTI symptoms.

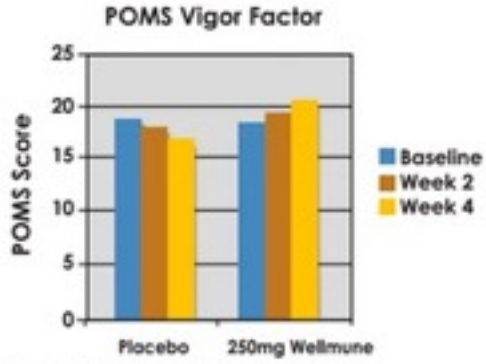

Figure 4: POMS vigor factor.

Study Results

Marathoners taking Wellmune had statistically significant ($p<0.05$) improvements in measurements of physical health, including reported upper respiratory tract infection symptoms and overall health status (figure 2). At the two-week interval, 68% of subjects in the placebo group reported symptoms associated with URTI, but only 32% in the 250 mg Wellmune treatment group reported similar symptoms (figure 3). Upper respiratory tract infection symptoms were reported by only 8% of subjects in Wellmune group at week four vs. 24% of placebo subjects. In addition, study participants taking Wellmune rated their health 44% higher as compared to normal.

It was unsurprising, perhaps, that the POMS results mirrored the physical health assessment. The marathoners taking Wellmune experienced fewer symptoms of upper respiratory tract infections so their energy levels and general sense of wellness were higher than the placebo group. In contrast with the placebo group, the Wellmune marathoners reported a:

- 22% increase in vigor (figure 4)
- 48% reduction in fatigue (figure 5)
- 38% reduction in tension (figure 6)

- 38% reduction in stress-related con- fusion (figure 7)

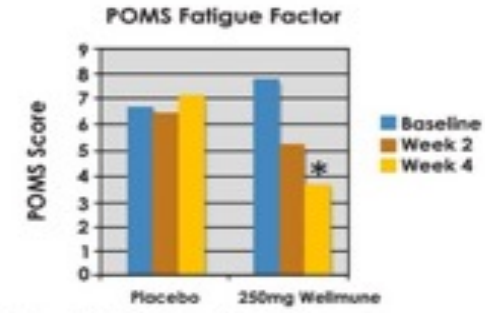

Figure 5: POMS fatigue factor.

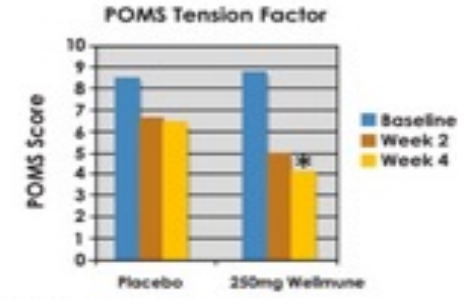

Figure 6: POMS tension factor.

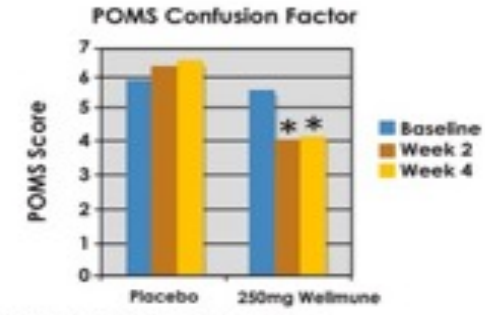

Figure 7: POMS confusion factor.

Livestrong Marathon Study

A study of 182 runners who completed the 2011 LiveStrong Marathon in Austin, Texas, confirmed previous clinical research showing that Wellmune's support of the immune system has health benefits for individuals under real-life conditions. The Health and Human Performance Lab at the University of Houston conducted the study.

Study Design

This was the second marathon runner study to evaluate Wellmune and was completed in 2011. The study was conducted by the University of Houston and included evaluation of both the dispersible and soluble forms of Wellmune. The study was similar in methodology to the Carlsbad marathon study published by Talbott. The randomized, double blind, placebo-controlled study included 96 men and 86 women with an average age of 34 and an average finish time of four hours. These participants were given either 250 mg of Wellmune soluble or Wellmune dispersible daily or a placebo of 250 mg of rice flour to take for four weeks following the LiveStrong marathon. Cold and flu symptoms were tracked via several survey tools daily (including the WURSS-21 survey). The investigators did not know the identity of the variables until after all the data analysis was completed.

Study Results

Both forms of Wellmune (dispersible and soluble) significantly reduced the average number of days subjects reported cold or flu symptoms compared to the placebo. There was no significant difference

between average number of symptom days between the dispersible and soluble groups. This study confirms the efficacy of both dispersible and soluble forms of Wellmune. Based on previous studies conducted by the University of Houston, it is reasonable to speculate that the improvements associated with Wellmune were likely due to alterations in monocytes, plasma cytokines, and improved mucosal immunity (1,3).

Future Research

Statistically significant benefits of Wellmune have been demonstrated in other clinical trials involving wildland firefighters, fourth year medical students and other individuals with high stress lifestyles. This body of research may have broad implications for elite athletes and ordinary consumers, as well as food, beverage, and supplement manufacturers in the immune health category. Biothera is committed to an ongoing research program that advances understanding of the immune system and the technology of Wellmune. The company is focused on continued biomarker research linked to specific health benefits.

In the meantime, both recreational and elite athletes may want to rethink their mantra for obtaining performance goals. Maintaining immune health is a requirement for *running faster, jumping higher and getting stronger.*

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Green Tea Extract – *Stimulating Fatty Acid Use*

Green tea is made up of polyphenols (catechins) and flavonols. The primary catechins found in green tea with the most potent antioxidant activity are epicatechin (EC), epigallocatechin (EGC), epicatechin gallate (ECG) and epigallocatechin gallate (EGCG). EGCG makes up 10 - 50% of the total catechin content and appears to be the most powerful of the catechins. Green tea's antioxidant activity is 25 - 100 times more potent than vitamins C and E. Green tea is generally standardized to total polyphenol content and/or EGCG content. For years this extract has been widely studied for its wealth of health benefits including blood clotting reduction, cholesterol lowering, weight loss and as an anti-carcinogen. Recently green tea has also shown an ability to improve endurance performance.

A study done on mice investigated the effects of green tea extract (GTE), on endurance capacity, energy metabolism, and fat oxidation in mice over a 10-week period. Swimming times to exhaustion for mice fed 0.2-0.5% (wt/wt) GTE were prolonged by 8 - 24%. The effects were dose-dependent and accompanied by lower respiratory quotients and higher rates of fat oxidation as determined by indirect calorimetry. In addition, feeding with GTE increased the level of beta-oxidation activity in skeletal muscle. Plasma lactate concentrations in mice fed GTE were significantly decreased after exercise, concomitant with increases in free fatty acid concentrations in plasma, suggesting an increased lipid use as an energy source in GTE-fed mice. Epigallocatechin gallate (EGCG), a major component of tea catechins, also enhanced endurance capacity, suggesting that the endurance-improving effects of GTE were mediated, at least in part, by EGCG. The beta-oxidation activity and the level of fatty acid translocase/CD36 mRNA in the muscle was higher in GTE-fed mice compared with control mice. These results indicate that GTE is beneficial for improving endurance capacity and support the hypothesis that the stimulation of fatty acid use is a promising strategy for improving endurance capacity.

The new study, published on-line in the journal *Life Sciences* (doi: 10.1016/j.lfs.2005.11.001), looked at the effect of EGCG on hypoxia-induced apoptosis for human haematoma cells. This study found

epigallocatechin gallate (EGCG), the main extract from green tea, improves oxygen flow to tissues deprived of adequate supply.

Hypoxia occurs when oxygen supply to tissue or the whole body is restricted. If cells are denied oxygen for too long they die, a process called apoptosis. The most well known form of hypoxia is altitude sickness, which can occur when travelers go above an altitude of 1,829 to 2,438m. Cells were exposed to varying concentrations of the tea extract (12.5, 25, 50, 100 micromoles) and the number of live cells tested. In the control cell culture, 40 per cent of cells died due to lack of oxygen. In the test groups though, cell death was decreased for all EGCG concentrations. Exposure to 12.5 micromoles of EGCG reduced cell death by 10%, while all cells were still alive after exposure to 100 micromoles of EGCG. The mechanism was proposed to be due to green tea preventing the expression of a certain enzyme called caspase 3, which plays an important role in programmed cell death.

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MultiV-Pro™ Q & A

How does MultiV-Pro™ differ from regular MultiV?
The new MultiV-Pro is designed for the very hard training endurance athlete. This upgraded formula uses a clinically documented 1,3/1,6 beta-glucan with a wealth of research showing production of a robust immune system. It contains 50% more iron amino acid chelate along with a prebiotic/probiotic blend designed specifically for endurance to aid in the digestion of micro and macro nutrients. Due to recent research showing the detrimental effect of too much vitamin C & E, it is also the first multivitamin that is free of vitamins C & E, yet still offers a blend of polyphenols for oxidative support.

How does MultiV-Pro™ differ from other multivitamins?
Hard training athletes put a lot of stress on their body and, because of this, differ greatly from the general population. With hard training, many micro nutrients become compromised as do the immune system, digestive system, and cardiovascular system. The clinically effective levels of nutrients found in MultiV-Pro, like iron amino acid chelate, 1,3/1,6 beta-glucan, gingko biloba, polyphenol blend and pre and probiotics, are not found in any other multivitamin.

What is beta glucan and what does it do?
Beta glucans can come from various sources, yet not all of these are equal. First Endurance uses the ONLY yeast derived (*saccharomyces cerevisiae*) 1,3/1,6 beta glucan clinically studied on endurance athletes and clinically proven to decrease upper respiratory tract infections, reduce the risk of illness and infection associated with hard training. The specific beta glucans used in MultiV-Pro™ will assure you are healthy every day of training allowing athlete to stay strong day in and day out. Read more here:
http://firstendurance.com/2014/05/29/importance-beta-glucan/

What are prebiotics and probiotics and how do they help my endurance?
Endurance athletes require more calories than average people in order to fuel their training. This, coupled with the stress of everyday life, can compromise one's digestive system which is the gateway to the absorption of all micro and macro nutrients. Prebiotics are non-digestible oligosaccharides that can stimulate and regulate the growth of probiotic microorganisms and, over time, improve nutrient absorption and health. Probiotics are digestible microorganisms that can alleviate symptoms of lactose intolerance and treat or prevent diarrhea. Read more on what this means to your performance here:
http://firstendurance.com/2014/05/23/pre-pro-biotics-improve-performance/

Why are there no vitamins C & E?
Recent clinical studies have shown that these two micro-nutrients may be detrimental to endurance capacity and training due to the body's down-regulation of its own natural inflammatory response. The downside of not consuming vitamins C & E is that these micronutrients have been used to help aid in boosting the immune system and reducing the incidence of sickness and upper respiratory tract infections. With the addition of prebiotics and probiotics and beta glucan, the MultiV-Pro™ will still be able to deliver an even more robust immune response and will still reduce the incidence of sickness without the detrimental effects of consuming vitamins C & E. First Endurance athletes will be able gain all the benefits of training without getting sick. Read more on this here.
http://firstendurance.com/2014/05/14/studies-show-vitamin-c-e-can-decrease-endurance-capacity-hinder-performance/

Is this much iron good for me?
The new MultiV-Pro™ contains 150% DV of iron. Consuming iron above 100% is not recommended for the general public. For hard training athletes, however, iron and blood ferritin is often compromised and can therefore limit oxygen carrying capacity and endurance performance. Consuming 150% of our highly bioavailable iron amino acid chelate is not only safe, it's recommended and highly beneficial.

What are the benefits of using MultiV-Pro™ daily?
Benefits include improved performance and the most bio-available sources of nutrients to ensure you're not deficient in any which are critical. Additionally, you'll experience unmatched antioxidant protection with our full spectrum of endurance-specific vitamins and minerals and reduction in sickness caused by over-training.

What will gingko biloba do for me?
The levels of gingko biloba in MultiV-Pro™ have been clinically shown to improve circulation.

What are chelated minerals and are they better?
Chelation is a patented process that creates chemical bonds with nutrients like chromium, iron and magnesium. This process makes minerals highly bioavailable. This is important because it ensures the nutrient is bonded with the amino acid chelate and is easily absorbed and digested.

What is iron amino acid chelate and how is that better than other iron sources?
Amino acid chelates (AAC) form a highly stable bio-available bond. Unlike iron as ferrous fumarate, iron AAC does not compete for the binding sites of some minerals like calcium. In addition, there are no toxicity issues so it's also very safe. This iron used in MultiV-Pro™ is highly bio-available and will not diminish your calcium or other minerals.

Should I use MultiV-Pro™ in my off training months? Can I use it every day?
Yes. MultiV-Pro is designed to be your daily multivitamin and should be used every day all year long.

How many servings are in a container of MultiV-Pro™?
There are 30 servings per container.