

# SUPPLEMENT/FUELING STRATEGIES FOR TRIATHLETES

## \*\*\* PART ONE \*\*\*

### Supplement Strategies

By: Steve Born

As a competitive triathlete you're different from any other athlete in many ways. You have to manage your time wisely to train in three distinctly different disciplines. And in doing this type of training, you are recruiting and using many more muscles than most other athletes ever do. As a result, the opportunity for over training and injury may be more prevalent with triathletes than with any other athlete. In order to stay healthy and prevent the consequences of both over training and injury the serious triathlete will give serious consideration to an intelligent supplement program. But there's more to that...

I've often said that there are three key tangibles that are needed to achieve success in athletics:

1. **The use of high quality equipment** – You probably don't need the "limited edition, gold plated" model but you do need to use good equipment.
2. **The incorporation of an intelligent training and recovery program** - You can't just "wing it" in terms of a training regimen and hope that the pieces will fall into place. Similarly, you have to recovery as "hard" as you train to get the most out of your training.
3. **The consistent use of high quality nutritional supplements and fuels, and a sensible supplement/fueling program** - As a triathlete you're demanding a lot out of your body. Your nutrient requirements - just to maintain health - are much greater than the average person. But your goal isn't to just maintain health at a minimally acceptable standard; your goal is to achieve supreme health. In addition, you want to get the absolute most out of your body so that it can do what you want it to in your workouts and races, having more fun and achieving more success in the process.

All three of these tangibles are important and if one is lacking, the others are negatively affected. My sincere belief is that without the consistent use of an intelligent supplement and fueling program, all the equipment you spend so much money on and all the time you spend in training will never realize their full value.

In the next two articles we'll discuss fueling strategies. For now, let's focus on specific supplements, what they can do for you, and why you might consider incorporating them into your program.

I've categorized the products into four groups. The first one, "**ESSENTIAL**," contains supplements that are, without exception, the most important, the first products that should be considered and incorporated into your program, and the ones that should be taken every day, all throughout the year. In fact, these three products, because of the tremendous benefits they provide for general health, would be ones that even non-athletes should seriously consider using on a daily basis.

Supplements that make up the "next line of support/defense" are listed in a category entitled

**"VERY IMPORTANT."** These supplements do not replace the three Daily Essentials but would be the next logical step, complementing the ESSENTIAL products wonderfully by providing additional support and benefits. You'd benefit by taking these particular products daily, though some may be used on an "as needed" basis.

The third category listed is **"IMPORTANT,"** meaning that these products are not crucial in comparison to those found in the first two categories but are ones that provide specific benefits, adding to the nutrient strength of the supplements given higher priority. If you're seeking the ultimate supplement program for enhancing your athletic performance and overall health the addition of these products should be considered.

The fourth group is **"SPECIFIC,"** meaning these particular products may in fact be ESSENTIAL under specific conditions, as determined by you and your particular circumstances.

YOU'LL FIND SUGGESTED DOSES FOR ALL THE PRODUCTS IN ALL THE CATEGORIES  
COME LATER IN THE ARTICLE

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## ESSENTIAL

- **Premium Insurance Caps**
- **Race Caps Supreme**
- **Mito-R Caps**

All three of these products should be the cornerstone of any athlete's supplement program because they provide the widest range of benefits for enhancing both athletic performance AND overall health. These three products provide a solid nutrient foundation, working synergistically to accomplish four primary goals:

- 1.) Provide replenishment of basic vitamins and minerals, which athletes deplete in greater volume than do sedentary people, to optimize overall health.
- 2.) Provide enhanced support for the immune system and cardiovascular system by supplying a wide range of antioxidants for the neutralization of free radicals and the cellular destruction they cause.
- 3.) Provide key substrates to enhance and ensure efficient production of energy
- 4.) Provide support for mitochondrial health. Dr. Bill Misner writes, "The longer you can stimulate the lifespan or health of the mitochondria, the longer you will live and the better you will perform in endurance events. The athlete who has the most healthy/efficient active mitochondria is the athlete who performs at their best."

### Premium Insurance Caps

If we could obtain all the nutrients we need from our food supply then a multivitamin/mineral supplement would not be necessary. Unfortunately, this is simply not possible. Our belief is that today's food supply does not contain adequate amounts of nutrients for average people, let alone athletes, living in the world today. Dr. Bill Misner has stated, "Athletes today ingest only 11% of the organic nutrients from their food sources that the athletes of the 1940's enjoyed."

The truth is that our soils have been depleted because of today's farming techniques, which utilize fertilizers containing a mixture of nitrogen, phosphorus, and potassium (NPK) only. Prior to the 40's, farmers practiced crop rotation, mulching, manuring, and other techniques that maintained soil nutrient quality. After World War II, leftover chemicals used to make weapons were sold as fertilizers. Every successive crop grown using NPK fertilizers has further depleted the soils of essential nutrients, and if they aren't in the soil, they're not in the foods. If they're not in the foods, they're not in your body. Additionally, according to Dr. Misner, "the use of pesticides and herbicides has been observed to interfere with the complete absorption of vital organic substrates." So not only does the soil no longer contain many of the essential nutrients it used to, our ability to absorb what little there is left has been compromised by the use of pesticides and herbicides.

In addition to our food supply being degraded by crops grown solely on NPK fertilizers, commercial ripening, harvesting, shipping, storing, and processing practices further degrades it. Even the government's RDA handbook points to hundreds of studies showing that the nutrient content of our food supply is further diminished from the time it is harvested to the time it is consumed. If that wasn't bad enough, add to that the fact that as we age our rate of absorption of nutrients decrease. Taking medications of any kind? They interact and interfere with nutrient absorption. All of this strongly suggests that food alone cannot and will not provide enough vitamins and minerals necessary for optimal health.

I've always considered the Recommended Daily Allowances (RDA) to be an archaic standard that never took into account the particular needs of athletes and my belief in that is confirmed from one well-known sports nutritionist who states, "If you use the RDAs to plan your nutrition, you will never, never reach your athletic potential." Even the RDA handbook states, "RDA are recommendations for the average daily amounts of nutrients that population groups should consume over a period of time. RDA should not be confused with requirements for a specific individual." The former chairman of the RDA Committee has even been quoted stating RDA's "are not recommendations for the ideal diet."

Most compelling of all, in my opinion, for why a potent multivitamin/mineral supplement is necessary comes from Dr. Misner who states, "Science has concluded that even marginal nutritional deficiencies are responsible for 644 diseases or disorders. Researchers have established by applications of reliable research as well as through trial and error that athletes tend to deplete vitamins, minerals, enzymes, coenzymes, and other substrates more than sedentary people do." Simply put, the need for supplementation with a multivitamin/mineral supplement is not only a wise strategy, I consider it vital.

I believe that not supplementing the body with adequate supplies of basic nutrients is comparable to building a house without first putting in a strong foundation. Without this strong foundation, none of the other necessities of the house will have any structural integrity or be of much benefit. Similarly, without adequate replenishment of vitamins and minerals, other supplements, including ergogenic supplements, will most likely never realize their full potential.

## **Race Caps Supreme**

As many of us know, mitochondria are micro organelles ("little organs") found in virtually all cells in the human body, except red blood cells. The 20-2500 mitochondria per cell produce the majority of the body's energy (ATP) by means of an intricate and complex process called cellular respiration. The production of ATP within the mitochondria involves two metabolic cycles known as the tricarboxylic acid (TCA) cycle, which is also called the "Krebs" or "citric acid" cycle, and the oxidative phosphorylation electron transport chain, commonly abbreviated as ETC.

**Coenzyme Q10 (a.k.a. CoQ10)**, a main component of Race Caps Supreme is a vital catalyst, perhaps THE primary substrate involved in the mitochondrial electron transport chain. Without going into the complexities of this process, which would take several pages, we can truly say that CoQ10's importance cannot be understated because quite simply, without it, the chain of cellular energy production is broken. This is key not only for athletic performance but also for maintaining cardiovascular and brain health, and strong immunity. In regards to cardiovascular health, one well-known cardiologist is quoted as saying, "I have long considered CoQ10 a wonder nutrient because of its ability to support heart health." In addition, CoQ10 helps to lower blood pressure and may play a key role in the prevention of Parkinson's disease. For both athletic performance and general health applications, there is simply no question that the athlete MUST supplement with CoQ10.

**Idebenone**, also called hydroxydecyl Q, is an analogue of CoQ10 and the other primary ETC component of the formula. A superb compliment to CoQ10, some experts even suggest it may be even more powerful in action than CoQ10. Dr. Misner explains, "Idebenone supplies all of the same benefits as CoQ10 plus some distinct advantages based on its more complex chemical structure. Though very similar in chemical make-up to CoQ10, its longer chain organic structure gives it extra powerful antioxidant properties making it a more effective "free radical quencher" resulting in less cell and tissue damage." In essence, Idebenone extends the already powerful benefits of CoQ10 and under hypoxic (low oxygen) conditions Idebenone's ATP generating capabilities are even superior to CoQ10.

The problem with energy production is that it's not a completely "clean" process (more on that later), which is why **Vitamin E**, while not directly involved in the cellular respiration process, is a vital component in the Race Caps Supreme formula. This is because even essential antioxidants used in the complex process of energy production have a slight "dark side." Dr. Misner writes, "CoQ10 auto-oxidizes and unleashes massive amounts of various free radicals that damage delicate tissues and because CoQ10 is necessary for electron transport and ATP (chemical energy) production, cellular death may ensue." In other words, while CoQ10 is vital for energy production and provides antioxidant benefits, it, like other antioxidants, has biologically negative, PRO-oxidant capabilities as well. This is one reason why a substantial amount of vitamin E is included in Race Caps Supreme. The naturally derived, easily assimilated succinate form of this vitamin supports CoQ10 and Idebenone in neutralizing free radicals, which are a naturally occurring metabolic by-product of energy production. Succinates are also a key component in the TCA (or "Krebs") cycle.

Also included in the formula is a precise blend of **Trimethylglycine (TMG)**, **inosine**, and **glycerol phosphate** to provide benefits for enhancing oxygen utilization, optimizing fats-for-fuels capabilities, and for providing additional support for energy production and acid buffering. Dr. Misner calls TMG a "Lipotropic Antioxidant Supreme" and adds, "Trimethylglycine is more commonly known as betaine, an alkaloid of beets. As an oxidation product of choline... it (TMG) also has been shown to perform lipotropic activity (fatty-acid utilization for energy production). It (TMG)...has been used to treat muscular weakness and degeneration... is a powerful antioxidant, which primarily acts as a methyl donor, enhancing the transport of oxygen to muscle tissues. Inosine, also known as an anti-fatigue nutrient, is a naturally occurring metabolic product that is readily utilized by the body. Inosine increases the oxygen-carrying capacity of the blood, allowing more oxygen to be delivered to the muscles, thereby reducing fatigue. Phosphates (in the form of glycerol phosphate) are used in the muscle mitochondrial cells for the production of energy and are also beneficial for buffering excess acidity.

Earlier both the TCA and ETC cycles involved in ATP production were mentioned and that Race Caps Supreme's CoQ10/Idebenone combination fulfilled a major component for the ETC portion. For supporting the TCA (or "Krebs") cycle, the Race Caps Supreme formula supplies a precise amount of the **Krebs Cycle Intermediates (KCI)** Malate, Citrate, Aspartate, Lysinate, Glycinate, which are chelators for the minerals calcium, magnesium, and potassium. Another Krebs Cycle Intermediate, **alpha ketoglutarate**, is included as well. With this KCI donation now a part of the

formula, Race Caps Supreme provides key substrates to support and enhance both metabolic cycles involved in ATP production.

To maximize nutrient absorption, Race Caps Supreme contains a potent blend of various digestive aids. One of these is a proprietary formula called the **Enzyme Enhancement System** and the other is the well-researched standardized black pepper extract called **Bioperine**.

A long time ago Dr. Misner wrote, "The objective in formulating the original Race Caps was to provide the ultimate ergogenic aid not only for improved cardiovascular-musculoskeletal performance on the field of competition, but also to benefit the overall health of the athlete." This is still the objective of the Race Caps formula only now, with the arrival of the newest incarnation of the formula - Race Caps Supreme - the desired outcome of this objective has been realized.

The extraordinary combination of "super nutrients" found in Race Caps Supreme works powerfully and synergistically to cover a wide range of requirements for maintaining consistent and efficient energy production. Perhaps even more impressive are the overall health benefits that may be derived from this product. For enhancing both athletic performance AND overall health consistent supplementation with Race Caps Supreme is a wise strategy. I believe all people would benefit from this product and it's an absolute essential for athletes.

## **Mito-R Caps**

Time and space limit what could take thousands upon thousands of pages to fill describing the actions and benefits of the nutrients contained in this product. I'll go out on a limb and say that this product is arguably the most important one E-CAPS has ever introduced for promoting enhanced athletic performance and overall health. The Mito-R Caps formula is based on the studies of Dr. Bruce Ames regarding mitochondrial functioning, aging, deterioration, and regeneration. Mito-R Caps contains the two nutrients used in this landmark study: **acetyl L-carnitine (ALC)** and **r-alpha lipoic acid (r-ALA)**.

Mitochondria, the energy producing organelles of the cell, need certain substrates to maintain efficient energy production; that's where the nutrients in Race Caps Supreme, along with some of the B vitamins in Premium Insurance Caps, come in. However, energy production has a "dark side" as well in that it generates literally millions of free radicals. A free radical is an extremely reactive molecule carrying an impaired electron. Because of their reactive nature, all free radicals seek out and acquire an electron in whatever way possible. When free radicals steal electrons from "healthy" molecules they convert these formerly capabilities healthy molecules into free radicals themselves, or break down or alter their chemical structure. Needless to say, free radicals have a destructive, damaging trait, and excess amounts are extremely harmful. Free radicals, or perhaps more appropriately excess free radicals, are the basis behind the theory suggesting they play a key role in aging and many age-related diseases.

Certain antioxidants such as vitamins beta carotene, C and E, and the minerals manganese, zinc, and selenium in Premium Insurance Caps - along with the CoQ10, Idebenone, and vitamin E component of Race Caps Supreme - help protect cells from the continuous onslaught of free radicals, which is one reason why regular consumption of these two products is highly recommended for everyone, athletes especially.

But what about literally delaying, or even reversing, mitochondrial aging? What about restoring capabilities to more youthful levels? Antioxidants such as the ones mentioned above help protect cells, but can't do the whole job. What if there were nutrients available that would not only complement, enhance, and extend the of those nutrients, but also provide extraordinary benefits of their own? Ames' extraordinary studies have identified just such nutrients: acetyl L-carnitine (ALC) and r-alpha lipoic acid (r-ALA). Ames' studies found that ALC and r-ALA each had a role in improving mitochondrial activity and cellular metabolism.

The Acetyl L-carnitine (ALC) component boosts the activity of the enzyme carnitine acetyltransferase, which plays a vital role in mitochondrial fuel burning and energy production. ALC and other forms of carnitine are the main nutrients the body requires for efficient utilization of fat stores for fuel. ALC also boosts neurological functioning, which would support concentration and mental focus (a major benefit for ultra-endurance events). ALC is also believed to help preserve lean muscle tissue by decreasing excess levels of cortisol. Lastly, ALC seems to reduce the depletion of ATP by forming acetyl-CoA, which one nutritional expert states, "[is] the most important intermediary in the generation of energy from amino acids, fats, and carbohydrates."

The other molecule, R-alpha lipoic acid (r-ALA) plays an important role in cellular metabolism by acting as a coenzyme in energy production. Arguably though, among all the benefits this amazing nutrient provides, its primary importance is via its antioxidant capabilities. R-alpha lipoic acid is commonly known as the "universal antioxidant" because it functions as both a water- and fat-soluble antioxidant, with the ability to neutralize several different types of free radicals, perhaps more than any other antioxidant known to man. In addition to helping rid the body of a tremendous variety of destructive free radicals, it also has the unique ability to recycle, revitalize, and extend the effectiveness and potency of certain antioxidants in the body such as CoQ10 and vitamins C & E. It also enhances GSH levels in the body. GSH, or glutathione, is an antioxidant produced directly by the body and is a primary immune system protector. Every single one of r-ALA's effects may very well yield definite and positive impact on energy production and endurance, not to mention enhanced immunity.

*Note that most alpha lipoic acid supplements available today are a mixture of two forms, the "R" form which is the natural form, and the "S" form, which is synthetic. The "S" form of alpha lipoic acid, which is reduced in the cytoplasm, is inactive. Only the "R" form, the natural coenzyme which is reduced in the mitochondria, is active and which is why we only use that form in Mito-R Caps.*

The reason **DMAE** and **PABA** exist in the product is to amplify and potentiate the ALC and r-ALA components. The amounts of the latter two used in Ames' studies are extremely high and supplementation with those amounts are not only impractical but would be unbelievable expensive. DMAE and PABA are a nutrient substitute for the anti-aging "drug" GH-3 and mimic its effects (providing substantial benefits of their own). Dr. Misner writes, "By adding essentially what is a GH-3 formula, the resulting effects of ALC and r-ALA are remarkably multiplied." In other words, thanks to the effects of DMAE and PABA less ALC and r-ALA are required to achieve noticeable benefits.

The primary reason for including **vitamin E** and **vitamin B-6** in the formula is that in order for the GH-3 like effect to be secure, these two nutrients must be present and available. Put another way, for DMAE and PABA to yield their benefits, adequate amounts of both vitamin E and vitamin B-6 are necessary.

**Ascorbyl Palmitate** is a fat-soluble form of vitamin C. Most everyone knows that vitamin C has its own antioxidant capabilities, but it's also beneficial for enhancing carnitine synthesis. Vitamin C enhances the bioavailability of carnitine, which may translate into greater fat utilization capabilities.

This represents but a fraction of the capabilities of each of the nutrients in Mito-R Caps, both singularly and collectively. I consider this product to be a definite "cornerstone" supplement for any person, athlete or otherwise. For athletic performance alone, no one says it better than Dr. Misner...

"Mito-R Caps product is a plausible and safe supplemental intervention that may reduce mitochondria substrate depletion imposed by age and endurance exercise stress. I have taken these substrates for over a year now in several formulae, at both the dose used in the Mito-R

Caps and above, without any known side effects... except less fatigue, better endurance performance, and less required sleep. So few substrate molecules function biochemically inside mitochondria cells. Endurance athletes should realize how incredibly important it is to effect mitochondria and that every thing formulated in this compound influences mitochondria cell biochemistry function synergistically and remarkably. Mito-R Caps is a product that I recommend taken year-round."

## SUMMARY

The combination of the above three products, while certainly not eliminating the possibility or probability for the need of other supplements, will provide a tremendous range of benefits for enhancing both athletic performance and overall health. Providing the body with these nutrients will in essence build a strong foundation from which any other nutrient can realize its full value.

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## VERY IMPORTANT

- **Carlson's Norwegian Salmon Oil**
- **Super AO**
- **Phytomax**
- **REM Caps**

### Carlson's Norwegian Salmon Oil

This particular product, although I've listed it here in the "Very Important" category, is really a Daily Essential-type product and it'd be right up there with those three if I were to break my self-made "rule" and keep the Daily Essentials at three products only. Needless to say, it's a very important product and one I'd definitely recommend taking daily all year round.

There are two essential fatty acids (EFA) that we need for life itself – the Omega 3 fatty acids and Omega 6 fatty acids. Our bodies cannot make either of them so it's necessary that we obtain them from dietary sources. However, while most of us consume an overabundance of Omega 6's, our Omega 3 intake is woefully lacking. In fact, while research points to a 1:3 Omega 3 to Omega 6 ratio as ideal, most people's diets show a 1:20 ratio, which is obviously very much out of balance. The bottom line is that we need Omega 3 fatty acids and the best source for them is fish. However, consumption of certain types of fish (such as salmon, mackerel, and sardines) two to three times a week, while being an extremely wise strategy, is simply not possible for most of us. That's where the Carlson's Norwegian Salmon Oil supplement comes in.

Fish oils contain the Omega 3 fatty acids docosahexaenoic acid (DHA) and eicosahexaenoic acid (EPA) and among their many benefits for athletic performance they improve endurance by increasing mitochondrial efficiency via their positive effects on coenzyme Q10 and idebenone, two key substrates involved in energy production. The absorption rate of these two fat-soluble nutrients is greatly increased in the presence of a fat source and there's arguably not a healthier fat than fish oil.

For general health purposes, fish oils provide one of the absolute defenses against cardiovascular disease. For example, an ever-growing body of research suggests that athlerosclerosis, angina, heart attack, arrhythmias, stroke, and congestive heart failure may be prevented with the consumption of fish oils. Fish oils help to reduce blood pressure, maintain arterial wall elasticity, and prevent blood clotting... they really are the heart's "best friend."

Newer research shows that fish oils have a positive influence on brain function and mood, including the alleviation of anxiety, insomnia, and other symptoms of depression. In addition, Omega 3 fatty acids from fish oil have been shown to provide impressive anti-inflammatory benefits by reducing specific pro-inflammatory cytokines and Series 2 prostaglandins, while increasing the level of anti-inflammatory Series 3 prostaglandins.

### **Why Not Get Omega 3 From Flaxseed Oil?**

In the world of fats it's hard to beat flaxseed oil. It's got an attractive EFA "makeup" in that it is 54% Omega 3 (from alpha Linolenic Acid), 14% Omega 6 (Linoleic Acid), with the rest being comprised primarily of various monounsaturated fats. However, given the fact that most diets are already loaded with Omega 6 fatty acids, the O-6s in flaxseed oil are not really necessary. In fact, for highest absorption rates, Omega 6 should not be consumed with Omega 3 as they utilize a common enzyme for absorption.

The bottom line is that we really don't need any supplemental Omega 6s. We need Omega 3 EFAs and we need a lot of them to achieve appreciable amounts of the desired "end products" of Omega 3 EFA metabolism, the two acids Docosahexaenoic acid (DHA) and Eicosapentaenoic acid (EPA).

### **Pure, Clean, Contaminant-Free Norwegian Salmon Oil**

Carlson has a long history of producing the highest quality fish oil supplements, which is why we're pleased to include their Norwegian Salmon Oil product alongside our own supplements and fuels. Each Carlson Norwegian Salmon oil soft gel contains 1 gram (1000mg) of salmon oil from salmon found in the deep, unpolluted waters of Norway. This product is regularly tested using AOAC international protocols for potency and purity by an independent, FDA registered laboratory and found to be free of detectable levels of mercury, cadmium, lead, PCB's and 28 other contaminants. Carlson Norwegian Salmon Oil supplies your body with concentrated amounts of pure, contaminant-free, and ultra-healthy Omega 3 essential fatty acids... essential for athletic performance and overall health.

## **Super AO**

Our bodies need antioxidants to protect us from the damaging effects of free radicals. Free radicals (of which there are several types) are unstable atoms or molecules, usually of oxygen, containing at least one unpaired electron. Left unchecked, free radicals seek out and literally steal electrons from whole atoms or molecules, creating a destructive chain reaction. Excess free radicals, in the words of one nutritional scientist, "are capable of damaging virtually any biomolecule, including proteins, sugars, fatty acids and nucleic acids." Dr. Bill Misner writes, "Oxygen has the capacity to be both friend and foe. When energy fuels are metabolized in the presence of O<sub>2</sub>, 5% of them create molecules that contain an odd number of electrons. If free radicals are not neutralized by on-site antioxidant body stores immediately, tissue damage occurs to absolutely every cell membrane touched by these imbalanced molecular wrecking machines. Some theorize soreness and stiffness result because free radicals and waste metabolites build up during either prolonged or intense exercise. The more volume oxygen that passes into our physiology for energy fuel metabolism, the more increased free-radical-fatigue symptoms may be experienced."

Those words should sound the alarm bells loud and clear. You see, as an athlete you consume huge amounts of oxygen and metabolize greater amounts of calories – much more than sedentary people do – which means that you're generating tremendous amounts of free radicals. In fact, endurance athletes generate 12-20 times more free radicals than sedentary people do! During periods of increased training volume and stress, free radical production increases even more. So while the benefits of exercise far outweigh any potential negatives, excess free radical production and build-up – if not properly addressed and resolved - may very well be the

endurance athlete's worst nightmare. In essence, like rusting steel, the human body can oxidize and decay from excess free radical production and not only can this negate everything you've worked so hard to achieve in your training, it can result in severe consequences to your overall health. The necessity of neutralizing excess free radicals simply cannot be overstated.

The three Daily Essentials products will fulfill the primary antioxidants needs of the body. However, with so many types of free radicals produced in the body, a wide variety of synergistically working antioxidants are required to neutralize them. This is especially true during times of higher intensity, multiple daily workouts, and/or greater training volume, when free radical production and accumulation can be extreme. Supplementing with a wide variety of antioxidants all year long is a wise strategy, allowing you to recovery more completely and without compromising your immune system, and it's especially important during peak training periods. This is exactly where Super AO comes in, beautifully complementing, but not replicating, the antioxidants found in the three Daily Essentials products. However, Super AO goes beyond a mere "antioxidant only" supplement. Two of the nutrients contained in Super AO – Ginkgo biloba and vinpocetine – in addition to their antioxidant benefits, also enhance recovery by improving circulation. Some even provide the added benefit of supporting increased cognitive function. Whether you're looking to increase immune system support all year through, but especially if you're doing multiple workouts in a day, and/or when your training volume increases, adding Super AO to the Daily Essentials supplements is an excellent strategy and one that will help protect your immune system and preserve all your hard-earned gains.

#### **The Super AO Formula**

- 1.) **SUPEROXIDE DISMUTASE (SOD)** is an enzyme and one of the powerful endogenous (that which occurs naturally in the body) antioxidants. It is responsible for neutralizing the most common free radical known as superoxide. It also aids the body's utilization of the minerals copper, zinc, and manganese. The enteric-coated form in Super AO, which allows the nutrient to pass intake through the stomach acid to be absorbed in the small intestines, is an easy way to supplement this vital antioxidant.
- 2.) **GRAPE SEED EXTRACT** has a high content of compounds known as oligomeric proanthocyanidins (OPC), flavinoids that are believed to be several times more potent than even Vitamin C and E. OPCs are responsible for neutralizing three types of free radicals. In addition, the OPCs in Grade Seed Extract help strengthen and repair connective tissue and are excellent anti-inflammatories.
- 3.) **L-GLUTATHIONE** is a protein that is produced in the liver from three specific amino acids. Along with the mineral selenium, it forms the enzyme glutathione peroxidase, which, along with SOD, is one of the body's endogenous antioxidants, and perhaps the most important one of all. Glutathione is also part of another enzyme, which has liver protecting qualities. It protects individual cells as well as the tissues of nearly the entire body and is an important nutrient in helping with the prevention of cancer, particularly liver cancer.
- 4.) **GINKGO BILOBA** is an herb best known for its ability to enhance circulation and increase the supply of oxygen to the entire body. This allows it to help relieve muscle pain in addition to its antioxidant benefits. A potential benefit of increased circulation is the ability to speed delivery of antioxidants throughout the body in addition to helping eliminate metabolic wastes more quickly.
- 5.) **GOTU KOLA** is another herb that has antioxidant capabilities as well aiding in increasing circulation. It is helpful in decreasing fatigue and neutralizing blood acids and is useful for optimal heart and liver function.
- 6.) **VINPOCETINE** is chemically related to, and derived from vincamine, an alkaloid found in the periwinkle plant. Studies with vinpocetine indicate that it can dilate blood vessels, enhance circulation in the brain, improve oxygen utilization, make red blood cells more pliable, and inhibit aggregation of platelets. Vinpocetine also has antioxidant properties.

## Phytomax

It's almost guaranteed that you're not consuming anywhere near the recommended amounts of vegetables daily and as a result, your body is deprived of the nutrients it desperately needs to achieve and maintain optimal health. You're not alone; the sad truth is that 95% of all Americans fall well short of the mark when it comes to adequate vegetable consumption. Dr. Bill Misner, who has been conducting dietary analyses for many years, states, "Only 7% of the dietary analyses performed between 1996-2002 were consuming adequate amounts of dietary plant foods." Now, this is just one person who has done dietary analyses but still, he's done several hundred over the course of seven years and only 7% were consuming adequate amounts? That's a pathetically low amount!

Even if you're one of those rare individuals who does consume six servings of fresh vegetables each and every day your body is most likely still not getting adequate amounts of key phytonutrients and enzymes. The USDA recommends 5-6 servings of vegetables daily but it's almost a sure bet that none of us come close to that. Without adequate vegetables in the diet you're not giving your body the nutrient support and protection it needs and your health and performance is suffering as a result. Make no mistake about it, adequate and consistent vegetable intake is critically important!

Vegetables contain thousands and thousands of phytochemicals, which science is continually proving to be powerfully beneficial for optimal health. Unfortunately, while vegetables are key ingredients in the daily diet, today's food supply isn't what it used to be. As Dr. Misner points out, "Some authors from the food science industry argue that even 5 servings a day of fresh vegetables do not provide the organic substrates necessary for optimal cellular health. In the past 50 years, chemo-agricultural farming has depleted 90% of the soil's original minerals. Today's "veggies" contain only 11% of the organic minerals found in produce during World War II. To get what we once got from 3-5 servings of vegetables per day, we would have to consume 40 servings per day, or approximately the amount consumed by a medium-sized horse. What are we really missing? Plant sterols and phytoestrogens, which have been shown to protect us against cholesterol absorption, tumor formation, colon cancer, radiation poisoning, and the side effects of most allopathic medicines. Most of these protective phytonutrients, phytosterols, phytoestrogens are lost during processing, degumming, refining, deodorizing, canning, bottling and packaging; we simply are not getting enough."

So you see, while vegetable intake is still important, most of us rarely eat enough to begin with and what we do eat probably does not contain the quantity of nutrients we need. This is where Phytomax comes in. Derived from *Hydrilla verticillata*, three capsules of Phytomax will provide your body with more of the vegetable nutrition it demands than blue-green algae, spirulina, chlorella, wheat grass juice, barley grass juice, or any other similar product. In addition, Phytomax is a concentrated source of enzymes, phytosterols, and phytonutrients, which are so important for overall health but are unfortunately no longer available in appreciable amounts in our food supply. Dr. Bill Misner states, "If you chose to supplement all of the micronutrient profile found in Hydrilla from food sources you would require 5 tossed salads, 1 cup of tomato juice, 1 cup of spinach, 1 cup of lima beans, 1 cup of green beans, and 7 glasses of whole milk. Such a food volume would also yield 41 grams of fiber, 36 grams of saturated fat, 234 grams of cholesterol, 110 grams of sugar, and 2,486 grams of sodium."

### **Phytomax's Phytosterol Benefits**

Dr. Misner writes, "Phytosterols may decrease cholesterol absorption by displacing cholesterol from bile salt micelles. Cholesterol analogs found in plants may be protective against colon cancer. Superoxide dismutase (SOD), a free radical fighter, antioxidant and enzyme found in most plant life is being seriously studied for its plausible positive effects in halting the aging

process. SOD has been shown to provide a natural defense against the potentially damaging superoxide free radicals generated during exercise or aerobic metabolism. Including a source of "green" foods may not only enhance recovery, but also prevent the side effects from radiation, carcinoma formation, and the initiation of leukopenia. University studies report that milk production from dairy cattle and the egg-laying capacity of chickens were significantly enhanced when these animals were supplemented with this form of Hydrilla (Phytomax). The assumption is that carry over to human physiology is obvious, though not yet confirmed by reliable research. Some studies do suggest that the nutrients from this plant may have direct application for free radical scavenging, anti-arthritis effect, stress management, remediating aging disorders, promoting healthy skin, and energy recovery."

Don't get me wrong; I believe that athletes and active people need to address the diet first and foremost because, more than any supplement pill, this is the foundation from which optimal health and performance can be achieved. Still, even our best efforts at improving our diet and consuming healthy foods on a consistent basis usually falls short more times than not. That's why supplementation in general is so important - to close the gap between what we need nutrient-wise and what we actually obtain in the diet - and it is especially true when it comes to vegetable intake. This is where Phytomax really shines. No, doesn't replace eating vegetables but instead, it efficiently and effectively bridges the gap between what we should eat and what we actually do eat. It's an important product that is a wonderful complement to the vitamins and minerals provided in Premium Insurance Caps. Gram for gram Phytomax is a powerhouse of enzymes, fatty acids, antioxidants, RNA, DNA, chlorophyll, sterols, and phytonutrients. Think of it as "completing the puzzle" when it comes to vitamin/mineral supplementation. With consistent intake of Phytomax you can experience what many athletes using the product enjoy, increased energy levels, faster recovery, improved immune system function, improved moods and mental clarity, and a higher quality of sleep.

## **REM CAPS**

Unfortunately, in today's stressful world, it's oftentimes difficult to obtain adequate sleep. Athletes engaged in hard training are even more susceptible to being unable to get to sleep quickly and stay asleep completely. There is a definite link between obtaining a sufficient amount of sleep and the achievement of optimal health and athletic performance. One well-known coach calls insufficient sleep "The Ultimate Performance Killer". If you're like a lot of athletes you might find it hard to fall asleep easily, especially when your training volume and/or intensity increases. If that's the case, if you're suffering from part-time to chronic insomnia, there is a good chance that you will have increased levels of stress hormones in the blood, which may compromise your health and sabotage everything you've worked so hard to achieve in training. REM Caps, with a combination of powerful, yet completely safe and effective nutrients, is your ally, ensuring you obtain the full benefits of a sound, restful, and productive night's sleep.

An additional reason for why I feel so highly about REM Caps is due to its melatonin component. Melatonin, in addition to it being an effective aid to alleviate insomnia, is also a very powerful antioxidant. One well-known nutritionist has stated that melatonin is "one of the most powerful antioxidants ever discovered - with a greater range of effectiveness than vitamin C, vitamin E, or beta-carotene..." Another respected nutritionist writes, "melatonin neutralizes one of the most damaging free radicals, and does so five times more effectively than the antioxidant enzyme glutathione..." Due to its antioxidant benefits melatonin has been shown to be a powerful immune system stimulator and a substance that is garnering substantial attention as having genuine anti-aging properties.

If only for the antioxidant benefits that melatonin provides, REM Caps - used regularly or on an "as needed" basis - might be a great product to have in your "arsenal."

### **The REM Caps Formula**

1.) **Valerian Root Extract** – Valerian is perhaps the most widely used herb for the treatment of nervousness, stress, anxiety and insomnia. Valerian is also beneficial for improving circulation, treating high blood pressure, reducing mucus accumulation during colds, relieving muscle cramps, and helping to relieve the symptoms of irritable bowel syndrome.

2.) **Melatonin** – Melatonin is a hormone that is naturally produced and secreted by the pineal gland, a tiny organ in the brain. Melatonin is responsible for regulating the biological rhythms in humans and is an effective aid to alleviate insomnia. It is also a very powerful antioxidant and is purported to be one of the premier anti-aging nutrients (see above).

3.) **5-HTP (5-Hydroxy tryptophan)** – 5-HTP is isolated from the seed of the *Griffonia simplicifolia* plant and is a natural precursor of the hormone serotonin that, along with melatonin and valerian, helps to prevent insomnia. Along with melatonin, 5-HTP also enhances the release of growth hormone during sleep. In addition, several other low-serotonin-level conditions are aided by the use of 5-HTP:

- Depression
- Carbohydrate craving
- Tension and Migraine headaches
- Premenstrual syndrome
- Fibromyalgia

4.) **Magnesium** (as Amino Acid Chelate) – Of the dozens and dozens of roles magnesium plays in the body, one of the primary benefits for aiding sleep is that it helps the muscles to relax. Along with the valerian component in REM Caps, magnesium can provide real benefits for anyone suffering from night cramping.

5.) **Enzyme Enhancement System™** (proprietary blend of protease, amylase, cellulase, lipase, phytase) - The aging process can deplete/diminish the amounts of digestive enzymes the body produces. Adding enzymes to products works with the body, replenishing what it no longer can provide, and help a person absorb and assimilate the maximal amount possible

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## **IMPORTANT**

- **Tissue Rejuvenator**
- **Xobaline**
- **ChromeMate™**
- **iFlora**
- **Boron**

## Tissue Rejuvenator

No athlete wants to lose valuable training time or miss an important race due to injury. Unfortunately, that sometimes happens to the best of us, especially when we stray from the safe haven of "maximum training" to that inhospitable territory called "overuse injury." Triathletes are at a potentially even greater risk for injury, if only due to the fact that this particular sport involves a number of disciplines (not just cycling, for example). As a result, triathletes use a lot of different muscles and joints, arguably more than most other athletes do. Other athletes who would benefit from the regular use of Tissue Rejuvenator are adventure races and runners, whose constant pounding can stress the joints tremendously.

So whether you are...

- A. Trying to prevent injuries from occurring to begin with, or
- B. If you're currently nursing and you want to do everything possible to get back into action as quickly as possible

...Tissue Rejuvenator is an important product for you. To accomplish either one of those goals - preventing injury or helping promote tissue healing if injured - one of the best things you can do is supply your body with nutrients that provide the "raw materials" it needs to promote rapid tissue repair, while also helping to reduce inflammation, soreness, and pain. Tissue Rejuvenator does all that - it is exactly what your body needs in support, especially during times of injury - and it does it without requiring you to use NSAID-type medications, which can have undesirable side effects. With Tissue Rejuvenator, in its newer, more powerful formula, your body receives a mega-potent dose of a wide variety of nutrients including glucosamine sulfate, chondroitin sulfate, MSM, and undenatured type II collagen (UC-II™), which provides an extraordinary range of benefits.

**IMPORTANT NOTE:** Tissue Rejuvenator was designed to primarily for use during periods of injury but it absolutely can be used daily as a preventative.

### **The Joint-Health Components of Tissue Rejuvenator**

- 1.) **Glucosamine sulfate** is classified as an amino sugar, a type of carbohydrate used for structural tissues instead of as an energy source. It is the basic building block/raw material in joint cartilage, ligaments, and tendons. Glucosamine sulfate plays a major role in the synthesis of collagen, cartilage, bone, skin, and various lubricating fluids in joints. Glucosamine sulfate helps promote elasticity of joint movement and also functions as a mild anti-inflammatory.
- 2.) **Chondroitin sulfate** is a natural component of several tissues in the body. Like glucosamine, chondroitin sulfate is one of the important building blocks for the repair of damaged cartilage. One of chondroitin sulfate's important functions is its ability to block the activity of enzymes that break down cartilage. This helps reduce inflammation and protects cartilage from further damage. Chondroitin sulfate also promotes lubrication and cushioning in the joints.
- 3.) **Methylsulfonylmethane**, better known as **MSM**, is a metabolite of dimethylsulfoxide (DMSO), a well-known solvent, which has been used topically as an analgesic and anti-inflammatory. MSM is an organic form of sulfur, which is necessary for proper synthesis and maintenance of tissues such as skin, hair, nails, tendons and cartilage. MSM has been reported to reduce arthritic joint pain, enhance wound healing, and reduce allergic symptoms.
- 4.) Tissue Rejuvenator's **Enzyme Blend** of peptidase, bromelain, papain, amylase, lipase, cellulase, and phytase not only aids in the complete absorption of the nutrient components in the product, it provides its own potent anti-inflammatory benefits.

- 5.) **Boswellia serrata** is an Ayurvedic herb that has been extensively used as an anti-inflammatory for the treatment of arthritis. Its primary active ingredients are triterpene acids, which may also be useful for treating exercise-induced asthma and irritable bowel syndrome.
- 6.) **Devil's Claw** is a South African herb containing substances called iridoid glycosides that have anti-inflammatory properties. It is also purported to help relieve mild stomach upset.
- 7.) **Yucca Root** is frequently used to combat osteoarthritis and rheumatoid arthritis symptoms. It contains high levels of beneficial phytochemical compounds known as saponins, which may provide anti-viral, anti-fungal, and antibacterial benefits as well.
- 8.) **Turmeric** (*Curcuma longa*) contains a substance called curcumin, which has not only anti-inflammatory properties but also liver protecting, antibiotic, and antioxidant properties as well.
- 9.) **Quercetin** is a water-soluble flavonoid typically found in onions, apples, leafy vegetables, and other food sources. It is both a potent antioxidant and anti-inflammatory and may also act as an antihistamine.
- 10.) **Undenatured Type II Collagen (UC-II™)** is a patented, extensively studied dietary ingredient derived from chicken sternum cartilage. Through a complex process called oral tolerization, UC-II™ works with the immune system to promote healthy joints and increase joint mobility and flexibility.

## Xobaline

Endurance athletes can use all the help they can get to ensure optimal energy production, oxygen utilization, and muscular regeneration. Even a marginal deficiency in specific nutrients can negatively affect performance and health. Stress of any type, whether it's physical or emotional, is known to deplete the body of many essential nutrients, including two important B vitamins: **folic acid** and **B12**. Of the many important roles these two nutrients play in the body, perhaps the most noteworthy ones for athletes are those that point to folic acid and B12 as being important catalysts for supporting increased aerobic capacity, energy production, and improved recovery, via their involvement in the production of red blood cells as well as RNA production and re-synthesis.

RNA is a long chain nucleic acid composed of linked nucleotides, a polynucleotide, which is the building block basis for all living tissue cellular reproduction. Science suggests that improving RNA "status" within the body results in, among other benefits, gains in both lean muscle mass and mitochondrial resynthesis. When this occurs, the athlete may expect increases in energy capacity, metabolism, and enhanced recovery after exercise.

Both folic acid and vitamin B12 have key roles in the manufacturing and re-synthesis of RNA, which, as mentioned earlier, is crucial for the regeneration of soft tissue lean muscle mass. Folic acid, when ingested, is converted to folinic acid, the required co-factor for the re-synthesis of RNA. In addition, folic acid plays an important role in the lowering of homocysteine, elevated levels of which are believed to be a primary culprit in various cardiovascular diseases. Lastly, folic acid is a required substance for the synthesis of heme, the iron-carrying component of the hemoglobin in red blood cells.

Vitamin B-12 is crucial for all the cellular reactions involved in carbohydrate, protein, and fat metabolism (which, of course, is key for optimal energy production) and is essential for cellular growth and cell function, in particular red blood cells. Vitamin B12 is an essential co-factor for the

conversion of folic acid to its metabolically active form and, like folic acid, plays an important role in the reduction of elevated homocysteine levels. B12 is also known to alleviate the tiredness associated with fatigue.

In order for these two vitamins to provide maximal benefits they need to be taken together. Dr. Bill Misner writes, "Folate [folic acid] & B12 must be together for gains hoped for in RBC [Red Blood Cells], homocysteine methylation, cardiovascular effects, and downstream DNA strand synthesis."

In early 2005 we reformulated the Xobaline (pronounced Zo-buh-lean) formula and eliminated both the liquid and encapsulated products. Xobaline now comes in small, easy-to-take sublingual (under the tongue) tablets. More importantly, Xobaline consists of both vitamin B12 (200 mcg) in the methylcobalamin form, the most biologically active form available, *and* folic acid (800 mcg). After much research we're undeniably convinced that this dual nutrient combination presents several significant advantages versus the original "B12 only" formula.

A 7-capsule packet of Premium Insurance Caps will provide ample amounts of B-12 (100 mcg) and folic acid (400 mcg) for normal conditions/lighter training volume periods. During periods of higher volume training, and/or to support cardiovascular health (via lowered homocysteine levels) on a daily basis, taking a sublingual Xobaline tablet is a wise strategy.

## **ChromeMate™**

The trace mineral chromium is a hormone-like compound, which regulates carbohydrate metabolism. This has profound effects on athletic performance and, especially, recovery. Dr. Bill Misner writes, "Since all carbohydrates are eventually reduced in the body to simple glucose (the body's primary source of energy), a go-between for "plugging" simple glucose from the bloodstream into the cell is supplied in the presence of naturally-occurring, niacin-bound GTF chromium substrate (ChromeMate™)." Citing Kamen's 1990 research [Kamen, B. The Chromium Diet Supplement & Exercise Strategy. Nutrition Encounter Inc., Novato, CA; 1990; pp.11-13.], Dr. Misner continues, "Most diets do not contain adequate amounts of this GTF chromium to support prolonged endurance activities."

Studies suggest that chromium polynicotinate (not to be confused with chromium picolinate), when taken with carbohydrate, enhances recovery by increasing the rate of glycogen synthesis. Chromium, critically involved in insulin production, also has an essential role in energy production and the synthesis of glucose, fatty acids, and amino acids. Chromium rapidly depletes via perspiration, urination, stress, pollution, and extreme temperatures, so supplementation becomes a necessity.

Optimal suggested daily intake of chromium is suggested to be anywhere from 200 - 600 mcg so even if you're currently using Premium Insurance Caps, which contains 200 mcg ChromeMate™ per 7-capsule packet, consider taking one ChromeMate™ capsule with post-workout recovery fuel to enhance glycogen synthesis and storage capabilities. Dr. Bill Misner writes, "Within 2 hours of exercise, taking 2 grams of carbohydrates for each 2.2 lbs. body weight with GTF Chromium (ChromeMate™) will result in a 300% increase in the rate of glycogen synthesis compared to no supplementation. The 2-hour post-exercise window is needed for conversion of carbohydrates to muscle glycogen through the insulin (IGF) mechanism. This anabolic response will not completely take place in the absence of GTF chromium. If only a minute amount of GTF chromium is available, only a third of the amount of muscle cell refueling will occur." If you're interested in enhancing recovery completely, make sure you have enough chromium (200-400 mcg) in your post workout supplements or fuel.

## **iFlora**

In the nutrition world there's a well-accepted train of thought that suggests, "Disease begins in the gut." This can be interpreted to mean that intestinal health plays a crucial role in regards to overall health. The battle between healthy and unhealthy bacteria for colonization in the intestinal tract is fierce, and if this area of the body is not healthy, the entire body is negatively affected. Infections, poor diet, stress, overuse of anti-inflammatory medications (NSAIDs), antibiotic use, and even chlorinated water can deplete or destroy the healthy bacteria living in the human digestive system. This can allow undesirable bacteria to flourish and compromise digestive system function, nutrient absorption, intestinal health, and immunity.

Maintaining healthy intestinal flora should be a special priority for athletes. Dr. Bill Misner writes, "Poor diet, stress, antibiotics, and aging can tend to increase the "bad" pathogenic bacteria, which may be blamed for several gastrointestinal problems endurance athletes suffer from during extreme events. Probiotics are "Good" bacteria that are healthful for normal intestinal function that prevent harmful bacteria from causing stomach problems or at worse disease."

One well-known nutritionist states, "Unhealthy flora can result in the liberation of abnormally high levels of ammonia as protein-containing foods are digested. This irritates the intestinal membranes. In addition, the ammonia is absorbed into the bloodstream and must be detoxified by the liver..." High blood levels of ammonia are linked to fatigue and every step that can be taken to minimize excess ammonia production and accumulation should be taken. For many, many reasons, one of which is to help prevent excess ammonia production where it first manifests, the wise athlete will make sure the "gut is healthy" at all times.

Fortunately, there is an easy way to keep the all-important balance of intestinal flora in favor of the "good guys," and it's extremely important after a course of antibiotics, when ALL bacteria, both good and bad, are destroyed. iFlora is that product, providing a greater variety (16 different strains) and potency (15 billion viable cells per capsule) than any other probiotic supplement. There is nothing stronger or more beneficial, especially after a course of antibiotics, for re-establishing optimal intestinal health.

## **Boron**

Boron isn't as well known as other minerals such as calcium, magnesium, and phosphorus, but they can't do their job without boron. Studies indicate that boron, among its many benefits, helps maintain bone health and aids in the prevention of prostate cancer. Excessive supplemental boron does not lead to overproduction of anabolic hormones (as was once suggested by some bodybuilding-specific manufacturers), but taking enough boron does result in adequate production of these hormones. This is vital both for maintaining healthy bone mineral mass and also for ensuring complete recovery from high-volume training, when this mineral may be severely depleted.

During most of the year a 2.5 mg dose (obtained from one packet of Premium Insurance Caps) is an adequate daily amount and in general, most sport science nutritionists suggest that no more than 3-6 milligrams of boron per day is required, stating the body has only a micro-appetite for this hormone-enhancing/supporting mineral. However, during peak training periods, taking an additional 5 mg of boron may be quite useful because it's during this time that boron levels may become depleted through more intense and/or higher volume training. Because boron supports adequate production of specific anabolic hormones and because these hormones are critical for ensuring optimal recovery this additional boron support goes a long way during these periods of higher volume training.

There is no RDA for boron and a safe and adequate daily intake is estimated between 1 and 10 mg. As far as toxicity/toxic effects of this mineral are concerned (the effects being manifested as loss of appetite, nausea, diarrhea, and skin rashes) most sources suggest that doses of 100 mg daily or more (some sources cite amounts as high as 500 mg daily) are required for any toxic effects to appear. Considering that two full packets of Premium Insurance Caps provides 5 mg of boron and that an additional boron capsule provides another 5 mg the maximum amount being taken would still fall far, far below any toxic potential amount.

So while boron may not be in the same category as our "Daily Essentials" products, it has a definite place in the E-CAPS product line and an additional Boron capsule may be very beneficial to support enhanced recovery during peak training periods.

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## SPECIFIC

- **Anti-Fatigue Caps**
- **Liquid Endurance**
- **ATP 100**
- **Race Day Boost (see the section "Fueling Strategies For Triathletes – PRE-RACE & RACE DAY" in Part Three for more information about this supplement)**

### Anti-Fatigue Caps

A major enemy of endurance athletes is the production and excess accumulation of ammonia. And guess what? It compromises athletic performance big time. You see, during exercise, the body produces ammonia as a natural by-product of protein metabolism. It doesn't matter what type of exercise you do, aerobic or anaerobic, you will still produce ammonia; it's unavoidable. Problems arise however, during longer distance efforts (approximately 3-5 hours and beyond) when more ammonia is produced and accumulates. One well known expert has stated that, "ammonia is toxic to all cells, reduces the formation of glycogen, and inhibits the energy cycle." A study in particular examined the changes in blood ammonia levels in humans during exercise and determined that the higher the blood ammonia, the poorer performance will be.

One way to help prevent excess ammonia accumulation is to make sure you're using Perpetuem or Sustained Energy as your primary fuels during workouts and races that exceed 2-3 hours. The amount of protein these two products supplies your body helps prevent the "cannibalization" of your lean muscle tissue. When your body literally "feeds upon itself," metabolizing the protein from lean muscle tissue to satisfy energy requirements, a huge amount of ammonia is produced, which is a primary culprit in fatigue. So again, the primary step to preventing excess amounts of lean muscle tissue from being cannibalized, and excess amounts of ammonia being produced, is to use a fuel that contains both carbohydrates and protein; with Perpetuem or Sustained Energy you've got that covered.

During your longer workouts and races it's an excellent strategy to go beyond that first "line of defense" and provide the body with additional support for the removal of ammonia. That's where Anti-Fatigue Caps comes in. It's a one-of-a-kind product combining a potent arsenal of three known ammonia-scavenging nutrients - **aspartate, l-citrulline, and OKG**. Now, if all Anti-Fatigue Caps did was aid in the removal of excess ammonia it'd be completely worth it. However, these nutrients do more than just that and provide these additional benefits:

- More consistent energy from the conversion and increased production of a key substrate, oxaloacetate
- Support in the prevention of muscle tissue catabolism from effective, non-ammonia producing glutamine replenishment
- Additional support for the prevention of cramping, from the aspartate component being chelated to magnesium and potassium

So while Anti-Fatigue Caps isn't a product you'd want nor need to take daily, it can be an extremely valuable ally and a terrific "secret weapon" under certain circumstances.

## **Liquid Endurance**

In hot conditions, especially beyond a 2-hour effort, your core temperature can increase substantially, causing profuse sweating. The ensuing fluid depletion forces your heart to work harder and slows metabolic reactions necessary for efficient fuel transport. At the very least this means decreased athletic performance with the increased possibility of more serious consequences from dehydration. The glycerol component in Liquid Endurance increases blood volume and cellular/intracellular fluid storage capacity, giving you extra fluid reserves.

In addition to glycerol, Liquid Endurance contains L-carnitine, which is the essential nutrient for the utilization of fatty acids for fuel. We include it in Liquid Endurance because the glycerol component, which increases the uptake and distribution of L-carnitine at the cellular level. In other words, L-carnitine is a vital nutrient for enhanced endurance and the presence of glycerol in blood serum will enable more of it to be available for use in the process of fats-for-fuel utilization.

Finally, Pyridoxine HCL, the coenzyme of Vitamin B-6 is included in Liquid Endurance as it is a key factor in the metabolism of all fuels including fatty acids. Without sufficient supplies of Vitamin B-6 the body cannot make L-Carnitine therefore it cannot access fatty acids efficiently, thus depleting the amount of glycerol produced.

With Liquid Endurance, you get so much more than a "heat tolerance" product. You'll appreciate its benefits any time, but especially during hot weather races.

## **ATP 100**

There comes a time, whether in a tough workout or race, when having a shot of instant, readily available energy would be highly beneficial. Prior to a big climb, during interval sessions, or in the last couple miles of a race are but a few times that come to mind. These times are where ATP 100 comes in *very* handy. When you put an ATP 100 tablet under your tongue and let it dissolve, you get a nice boost of energy, exactly when you need it.

Adenosine Triphosphate (ATP) is produced by every mitochondria cell within the human body. It is formed from a long chain of metabolic events in which a variety of substrates are transferred from the foods you eat, especially carbohydrates. Although science is still struggling to fully understand the nature of this unstable compound, E-CAPS has been harnessing its universal power for over 10 years and thousands of satisfied customers can attest to its effectiveness where it counts - at the races. E-CAPS' proprietary sublingual (under the tongue) formula allows for direct absorption through the mucosa of the mouth and throat, going directly into the bloodstream and avoiding the stomach. The anecdotal data of ATP 100's effectiveness is somewhat substantiated by the work of Dr. Irshad Chaudry, who showed there is evidence that ATP can cross the cell membrane. Dr. Chaudry suggests that the release and uptake of ATP or its substrates are part of the physiological process of energy metabolism.

During that crucial time in your workout or race (like when it's time to drop the competition for good) having an ATP 100 tablet or two available and ready to go to work for you can make all the difference!

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## \*\*\*\*\*SUGGESTED DOSES\*\*\*\*\*

### -- ESSENTIAL --

#### *Workout days under 1.5 hours and on days off*

- **Premium Insurance Caps - For all athletes, regardless of size or age -** suggested dose is 1 packet per day, in divided doses, with food. On non-workout days take 4 capsules with breakfast and 3 capsules with lunch. On workout days take 4 capsules after workout with food, the other 3 at another time during the day with food. Note that supplementation with this product is not necessary and not recommended prior to workouts unless at least a 3-hour window exists between consumption of the product and the beginning of the workout.

- **Race Caps Supreme - Athletes weighing less than 150 pounds or any athlete under the age of 20 -** Suggested dose is 1 capsule twice daily with food on non-workout days. On workout days of 90 minutes or less take 1 capsule 60-120 minutes prior to exercise (with or without food) and 1 capsule after exercise with food.

**Athletes weighing more than 150 pounds -** Suggested dose is 1 capsule three times daily on non-workout days. On workout days of 90 minutes or less take 2 capsules 60-120 minutes prior to exercise (with or without food) and 1 capsule after exercise with food.

- **Mito-R Caps - For all athletes, regardless of size or age -** suggested dose is 1 capsule three times daily, with food, on non-workout days. On workout days of 90 minutes or less take 1 capsule 30-60 minutes prior to workouts (with or without food) and 2 capsules after workouts with food. A 4th capsule may be taken with dinner on workout days that were 60-90 minutes in length.

#### *Workout days over 1.5 hours*

- **Premium Insurance Caps - Athletes weighing less than 150 pounds or ANY athlete under the age of 20 -** Suggested dose is 4 capsules after workout, with food, the other 3 at another time during the day, with food. Note that supplementation with this product is not necessary and not recommended prior to workouts unless at least a 3-hour window exists between consumption of the product and the beginning of the workout.

**Athletes weighing more than 150 pounds -** Suggested dose is 2 full packets per day (total of 14 capsules) in divided doses with 1 full packet (7 capsules) taken with food after workout. The other full packet is to be split into two doses and taken at other times of the day with food. If there is a 3-hour window prior to exercise 3 capsules may be taken at that time. If there is not a 3-hour window, skip that dose and take those capsules at other times throughout the day.

- **Race Caps Supreme - Athletes weighing less than 150 pounds or ANY athlete under the age of 20** - Suggested dose is 1 capsule 30-90 minutes prior to exercise (with or without food). If workout exceeds two hours, 1 additional capsule may be taken every hour during the workout. Another 1 capsule after workouts, with food, is also suggested.

**Athletes weighing more than 150 pounds** - Suggested dose is 2 capsules 30-90 minutes prior to exercise (with or without food). If workout exceeds two hours, 1-2 additional capsules may be taken every hour during the workout. Another 1-2 capsules after workouts, with food, is also suggested.

- **Mito-R Caps - For all athletes, regardless of age** - suggested dose is 2 capsules 30-60 minutes prior to exercise (with or without food), 2 capsules after exercise with food, 2 capsules with dinner. If workout exceeds two hours, 1 additional capsule may be taken every hour during the workout.

## -- VERY IMPORTANT --

- **Carlson's Norwegian Salmon Oil** – 1-2 capsules twice daily with food. In addition, consider taking 1 capsule with your pre-workout Race Caps Supreme dose as this will enhance the absorption of both the CoQ10 and idebenone components of Race Caps Supreme.
- **Super AO** - For enhanced recovery take 1 or 2 capsules with food after workouts (use the higher dose after workouts over 2-3 hours and after races). For supporting enhanced cognitive function, 1 capsule of Super AO may be taken in the morning with food. For supporting enhanced performance (via free radical neutralization) during ultra distance workouts and races, Super AO may be used at a suggested intake of 1 capsule every 2-3 hours. Super AO may be used daily all year round.
- **Phytomax** - 1 to 2 capsules three times daily with food. The larger dose should be considered during peak training periods.
- **REM Caps** - 1-3 capsules 60 minutes prior to sleep. Start with the lowest dose, as that will provide 3 mg of melatonin, which is a dose that works for most people.

## -- IMPORTANT --

- **Tissue Rejuvenator** - 4 capsules twice daily with food during periods of injury. For prevention purposes, 1-2 capsules twice daily with food is suggested.
- **Xobaline** - 1 tablet after workout. Allow tablet to dissolve completely (don't chew).
- **ChromeMate™** - 1 capsule with post-workout recovery food.
- **iFlora** - Especially after a course of antibiotics or when extra strength support is needed (after an illness is a good example) suggested dose is two capsules per day in the morning, with or without food, for two weeks. This allows ideal re-colonization of healthy bacteria in the intestines and colon.

Once this two-week course is completed the continued use of iFlora is certainly acceptable. However, at this point the amounts even one capsule of iFlora provides may

not be necessary. Therefore a suggested protocol to consider would be to use iFlora for two weeks then switch to Digest Caps as a maintenance dose.

- **Boron** - 1 capsule with post-workout recovery food.

## -- SPECIFIC --

- **Anti-Fatigue Caps** - 2 to 4 capsules one hour prior to lengthy workouts or races. 1 to 2 capsules per hour during lengthy workouts or races, beginning at the second hour.
- **Liquid Endurance** - 2 tablespoons Liquid Endurance mixed in 24 ounces of water sipped slowly every 3 hours, 4 times daily. Do this for 3 days prior to event. It is VERY IMPORTANT to weigh each day. If you gain 3% of your body weight before the 3-day loading is finished, it is time to stop loading. Beyond the 3% body extracellular water-weight gain is performance-ineffective. Most people gain 1-2%. The more-exacting loading protocol: 1 tablespoon Liquid Endurance for each 100-lbs. bodyweight mixed in 24 fluid ounces water taken every 3 hours, 4 times daily for 3 consecutive days prior to event.
- **ATP 100** - 1-2 tablets dissolved under tongue as needed during exercise. For faster absorption, chew ATP 100 tablets into a paste then dissolve under the tongue.

# \*\*\* PART TWO \*\*\*

## Fueling Strategies - TRAINING

By: Steve Born

The first article in this series dealt with the use of specific E-CAPS supplements on a daily or "as needed" basis; now we're talking fueling - the fluids, calories, and electrolytes your body needs during and after your workouts.

Whether your workouts or races last an hour or two, or a week or two, Hammer Nutrition has the fuels your body craves. You can completely and perfectly fulfill your pre, during, and post-workout requirements from our line of fuels. However, with so many choices and combinations of choices, how do you know which to choose?

This article describes our fuels in detail and tells you how to best use them. For ease of comparison and for systematically sorting out your needs, we divide our fuels into four categories: Energy Sources, Electrolytes, Protein Powders, and Recovery Drink.

### Calorie/Energy Sources

We have four products in this category. The first two listed – Hammer Gel and HEED – have carbs only as their energy source. Both are maltodextrin-based and contain no added simple sugars. They are your best choices for events lasting up to two hours, especially when the pace is fast and intense (75-85% MHR). The next two on the list – Sustained Energy and Perpetuem – contain protein also and other components for fueling longer exercise sessions.

#### All-Carb Fuels:

**Hammer Gel** - Our original fuel, an athletic mainstay for over 15 years, this is our most basic, and therefore our most versatile fuel, ideal for those who desire to carefully monitor and dispense each component of their fueling separately. You can use it as all or part of a pre-race meal, to stanch hunger immediately before an event, to provide all your energy needs for events up to about two hours, to supplement the protein-based fuels in longer events, and as part of your post-workout recovery nutrition. You can use Hammer Gel in your water bottle, in the Hammer Flask, in a one-serving pouch, or to flavor other products and foods. You can keep an extra pouch or flask in your pocket in case your planned fuel outlay in a race or training event comes up a bit short. Don't leave home without it!

**HEED** – HEED (High Energy Electrolyte Drink) is our newest fuel, designed for those who want an all-in-one energy drink option. It contains a number of extras that offer you convenience when precision is less of an issue. HEED is ideal for those whose fueling needs do not entail the refinements or duration of our other products. Use HEED as your one-source fuel supply for lighter or shorter workouts, to add variety during ultra-long events, and in any situation that favors simplicity over precision and completeness.

## Comparing Hammer Gel and HEED

- Hammer Gel is a concentrated complex carbohydrate gel with the consistency of thick syrup. HEED is a powdered sports drink mix.
- Hammer Gel contains a small amount of the amino acids L-leucine, L-isoleucine, L-valine (known as the branched chained amino acids, or BCAAs), and L-alanine. BCAAs help prevent the cannibalizing of lean muscle tissue. L-alanine aids in carbohydrate metabolism. HEED does not contain BCAAs or L-alanine.
- HEED contains a full spectrum, amino acid-chelated electrolyte profile; two servings equal approximately 1.25 capsules of Endurolytes. Hammer Gel contains very small amounts of sodium chloride and potassium for digestive and preservative purposes.
- HEED contains ChromeMate™ brand chromium polynicotinate for stabilizing blood glucose levels, and L-carnosine for lactic acid buffering. Hammer Gel does not have these.
- HEED comes in two subtle citrus flavors: lemon lime and mandarin orange.
- Hammer Gel comes in eight flavors: orange, banana, chocolate, raspberry, vanilla, espresso, apple-cinnamon, and plain.

### Carb/Protein Fuels:

**Sustained Energy** - This is our time-tested standard fuel for extended exercise. As explained in other articles in this handbook, any exercise beyond about two hours requires a protein component in the fuel. Sustained Energy contains about 87% carbohydrates (almost all from maltodextrin and glucose polymers-no added simple sugars, of course), and about 13 % isolated soy protein (7:1 ratio), the ideal combination to use when rate of exercise is between 70-85% MHR in "sustained" efforts lasting anywhere from 3-12 hours.

**Perpetuem** - This newer product takes the concept of long-distance fueling to the max. We designed it primarily for extreme endurance events lasting about six hours to many days. Perpetuem contains 75% carbohydrates (from long-chain maltodextrins-no added simple sugars), 13% fatty acids from a specially made long-chain lyso-lecithin, and nearly 10% soy protein. A small portion of fat seems to cue your body to more liberally release its fatty acids stores, which account for up to 70% of one's energy requirements in long bouts of exercise. A little fat in the fuel also slightly slows the rate of digestion and thus promotes "caloric satisfaction," another attractive plus during primarily aerobic ultra-long distance events. Perpetuem provides maximal benefits at an aerobic pace (under 70% MHR).

## Comparing Sustained Energy and Perpetuem

- Sustained Energy is a neutrally flavored powder. Perpetuem has an orange-vanilla "Dreamsicle" flavor.
- Perpetuem contains lyso-lecithin fat, whereas Sustained Energy does not.

- Perpetuem contains tribasic sodium phosphate, which is a tremendous lactic acid buffer. Sustained Energy does not contain this nutrient.
- Both fuels contain l-carnosine (an antioxidant that also buffers lactic acid) l-carnitine (to promote fatty acid utilization), and chromium polynicotinate (to stabilize blood sugar level). to have superb cardiovascular health benefits. Sustained Energy has soy protein and an excellent isoflavone content, but the strain used in Perpetuem has even more.
- Perpetuem contains the new "XT" soy protein preparation, which, along with the sodium in tribasic sodium phosphate, provides a more complete mineral profile. The mineral content in a two-scoop serving of Perpetuem may allow you cut back to one Endurolytes capsule per hour. Also, the "XT" soy protein contains higher isoflavone content, believed

### Important Fueling Notes

1. The above fuel selection guidelines are just that; they're guidelines only, and what may be ideal for some athletes under specific conditions may not work for others in identical conditions. For example, though Perpetuem was designed for more aerobic paced, longer distance efforts, we receive positive reports daily from athletes who use Perpetuem in much shorter races.
2. All Hammer Nutrition fuels are completely compatible with one another, so you can use them interchangeably as desired. This is especially beneficial in ultra-endurance events as it provides a greater variety of quality fuels to choose from. For example, you can use Perpetuem and/or Sustained Energy from start to finish, or you can occasionally switch to HEED and/or Hammer Gel to add variety. However, you should meet at least two-thirds of your fueling requirements from Perpetuem or Sustained Energy.
3. When you use Hammer Gel and HEED for events longer than two hours, you do not need to start with them and then switch to Sustained Energy or Perpetuem. You can use Hammer Gel and/or HEED at any time during your workout. An extra flask of Hammer Gel in your pocket can save the day if you have already drained your Sustained Energy or Perpetuem mix and you begin to flag with several miles still to go. It will give you a quick pick-up just when you need it, even if it's many hours into your event.

## Electrolytes

**Endurolytes** - A full-spectrum, rapidly assimilated electrolyte supplement is as important to your fueling as the water you drink and the calories you eat. While the above four fuels provide the calories your body needs to make energy (the body's "gasoline"), electrolytes can be thought of as the "motor oil" for the body, providing it with the essential minerals it needs to maintain the optimal performance of many important functions, such as muscular contraction.

Far too many athletes forget to replenish electrolytes consistently, or they mistake sodium or salt intake for true electrolyte replenishment. Sodium chloride (salt) is indeed an important component of electrolyte replenishment, but it does not fulfill the entire requirement. A satisfactory electrolyte replenishment product needs to include sodium, chloride, calcium, magnesium, and potassium as all these minerals play key roles in the maintenance of these important body functions. Endurolytes is that product, and you will search in vain to find another like it on the market.

Unlike calorie and fluid absorption and depletion rates, which remain fairly constant from athlete to athlete, electrolyte expenditure (and thus replenishment) varies tremendously. Body weight, level of fitness, weather conditions, acclimatization level, and biological predisposition all greatly

affect electrolyte depletion and the need for replenishment. That's why the hourly Endurolytes dose can range from 1-6 capsules an hour. That being said, a good starting dose to consider is:

- Lighter weight athletes: 1-2 capsules/hour
- Medium weight athletes: 2-3 capsules/hour
- Larger athletes: 4-6 capsules/hour

Remember though, these are only suggested starting doses and the amount you need may be different, and may vary from hour to hour.

## Protein Powders

You will not use these two products during your workouts, but as part of your pre-workout meals and post-workout recovery refueling. Hammer Nutrition offers two choices, each with its own set of benefits. Both products come in pure protein form; they are made from the finest quality preparations and have no added artificial flavorings or sweeteners.

**Hammer Soy** - A great all-purpose, all-vegetable protein that has many health benefits. Believe it or not, most endurance athletes have woefully inadequate protein intakes from their daily diet. Soy protein, in addition to the health benefits it provides, is a concentrated protein source, which helps athletes to fulfill their daily protein requirements. Each scoop of Hammer Soy contains 25 grams of isolated soy protein and absolutely no GMO (genetically modified organism) soy protein.

**Note:** Soy is the preferred protein for use during exercise, as it minimizes ammonia build-up. Sustained Energy and Perpetuem contain an adequate amount of soy protein for your needs during prolonged exercise. Hammer Soy is formulated for meal supplementation; it is far too concentrated for use during exercise.

**Hammer Whey** - The standard for promoting rapid recovery. For the rebuilding of lean muscle tissue and optimal immune system functioning between workouts and races, whey protein has no peer. It is the most bioavailable form of protein with the highest amount of branched chain amino acids (BCAAs) of any protein source. One scoop of Hammer Whey provides 18 grams of whey protein isolate. Each scoop also contains a huge six grams of glutamine, providing even more muscle rebuilding and immune system enhancing benefits.

### Comparing Hammer Whey and Hammer Soy

- We believe you'll not find a better protein for recovery and immune system boosting than whey protein (Hammer Whey), and for cardiovascular/general health benefits it's hard to top soy protein (Hammer Soy). That doesn't mean using Hammer Soy for recovery purposes would be "wrong" or in any way harmful, or that Hammer Whey must be used solely for recovery (but we don't recommend using it in the three hours prior to workouts or races).
- Whey protein is arguably the most rapidly absorbed protein source. After exercise, you want the protein to get into your system immediately so your body can receive the amino acid support it urgently needs. Rapid assimilation is but one area where whey protein shines.

- Whey protein has the highest BV (Biological Value, a rating system that ranks bioavailability) of any protein source.
- Whey protein's amino acid profile (particularly the high amounts of BCAAs) is superb for preventing catabolism (lean muscle tissue breakdown) and thus reducing post-workout muscular soreness. The amino acids cysteine, methionine, and glutamine, also found in abundance in whey, increase endogenous levels of glutathione, which is arguably the strongest endogenous antioxidant and provides both immune system and liver support.
- Soy protein is a purely vegan source that has an amino acid profile as complete as any animal protein.
- Scientific research has established many connections between soy consumption and lower rates of certain cancers, notably breast, prostate, stomach, lung and colon.
- Soy has more phenylalanine than whey. This may aid in maintaining alertness during extreme ultra-distance races.
- Soy has higher amounts of histidine (half of the dipeptide carnosine), which provides both antioxidant and acid buffering benefits.
- Soy protein has higher levels of aspartic acid, which plays an important role in energy production via the Krebs cycle.
- Soy protein's isoflavone component may impart exceptional cardiovascular benefits.

## Recovery Drink

**Recoverite** - The delicious all-in-one recovery drink with each serving (two scoops) providing 30 grams of complex carbohydrates, 10 grams of whey protein isolate, and three grams of glutamine. While the standard 4:1 carbohydrate to protein ratio is certainly acceptable for recovery, a 3:1 ratio may be even more beneficial for hard training athletes. Also, while some companies may use monosaccharides and disaccharides ("simple sugars") such as glucose, sucrose, or dextrose in their recovery drinks, due to their high glycemic index (GI) (and thus fast elevation of blood sugar), we use only complex carbohydrates (maltodextrin). Maltodextrin has a GI on a par with simple sugars (except fructose), so it too elevates blood sugar levels rapidly, with the added benefit of providing up to three times more calories compared to products containing simple sugars. This is vital for preventing stomach distress and also ensuring that your body quickly and efficiently obtains the full amount of calories it needs.

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## Basic Fueling Principles

Although the topic of how to properly fuel the body during endurance exercise is a subject that requires much more than a few paragraphs (please see ***The Endurance Athlete's Guide to Success*** for more detailed information), there are some key things that endurance athletes should know and apply, which I believe will yield tremendous benefits.

Dr. Bill Misner, the head of R&D at E-CAPS/Hammer Nutrition states: " To suggest that fluids, sodium, and fuels-induced glycogen replenishment can happen at the same rate as it is spent

during exercise is simply not true. Endurance exercise beyond 1-2 hours is a deficit spending entity, with proportionate return or replenishment always in arrears. The endurance exercise outcome is to postpone fatigue, not to replace all the fuel, fluids, and electrolytes lost during the event. It can't be done, though many of us have tried."

What this means, in regards to fluids, calories, and electrolytes/sodium, is that the body cannot be replenished at the same rate that it becomes depleted. Yes, the body needs your assistance in replenishing what it loses but that donation must be in amounts that cooperate with normal body mechanisms, not in amounts that override these crucial mechanisms.

## **FLUIDS**

When it comes to fluid intake, experts such as Dr. Tim Noakes and Dr. Ian Rogers suggest that a fluid intake between 500-750 milliliters/hr (16.9-25.4 fluid ounces per hour) will fulfill most athlete's hydration requirements under most conditions. I like what Dr. Rogers says: "Like most things in life, balance is the key and the balance is likely to be at a fluid intake not much above 500 milliliters (16.9-25.4 fluid ounces per hour) per hour in most situations, unless predicted losses are very substantial." [Fluid and Electrolyte Balance and Endurance Exercise: What can we learn from recent research? by Ian Rogers @: <http://www.wms.org/education/Hyponatremia.htm>]

We at E-CAPS/Hammer Nutrition have found that most athletes do very well under most conditions with a fluid intake of 20-25 ounces per hour. Sometimes you may not need that much fluid (15-16 ounces per hour may be quite acceptable) sometimes you might need somewhat more, perhaps up to 28 ounces. Our position, however, is that the risk of dilutional hyponatremia increases substantially when an athlete repeatedly consumes more than 30 fluid ounces per hour. If more fluid intake is found to be necessary (under very hot conditions, for example) proceed cautiously and remember to increase electrolyte intake as well to match your increased fluid intake. You can easily accomplish this by consuming a few additional Endurolytes capsules.

## **CALORIES**

As far as calorie replenishment is concerned, the body has a limit to what it can accept from carbohydrate donation for return to the energy cycle. Researchers such as Coleman, Noakes, and others (in carbohydrate oxidative research) agree that up to 1.0 - 1.1 grams of carbohydrate per minute can be utilized from exogenous (outside) carbohydrate donation. A 1.0 g/carb per minute donation is 240 carbohydrate calories per hour. A 1.1 g/carb per minute donation is 264 carbohydrate calories per hour. Taking into account that some of those calories - approximately 6-23% - are burned/lost during the digestive process, this suggests that for the average athlete the minimum intake is 254.4 calories to obtain 240 calories per hour (1.0 per minute with 6% lost in route) while the absolute upper maximum is 324.72 carbohydrate calories required in order to regenerate 264 carbohydrate calories (1.1 per minute with 23% lost in route).

We take a slightly more conservative side and suggest a slightly lower overall dose after finding that these higher amounts only induced gastric stress disorders and reduced performance in many athletes. This is why our common recommendation is approximately 60-70 grams of carbohydrates hourly (240-280 calories). That will, in most situations, and for most athletes, provide enough carbohydrates for energy production (the limit of what the body can metabolize) while taking into account a percentage of those calories being lost/burned during the digestive/metabolic processes.

### **Simple Sugars vs. Complex Carbohydrates**

Another primary factor of importance to endurance athletes is the type of carbohydrate used. We believe the only type that any athlete should consume, especially during exercise, are long-chain

(a.k.a. "complex") carbohydrates and never short-chain carbohydrates (a.k.a. "simple sugars"). Fuels containing simple sugars (glucose, sucrose, fructose, dextrose) must be mixed in weak 6-8% solutions in order to match body fluid osmolality and be digested with any efficiency. Unfortunately, solutions mixed and consumed at this concentration will only provide about 100 or so calories an hour, which is inadequate for maintaining energy production. However, you can't make a "double or triple strength" mixture from a simple sugar-based in the hopes of obtaining adequate amounts of calories because the concentration of that mixture will exceed 6-8%. Once that 6-8% solution concentrate is exceeded (or if a simple sugar-based fuel is consumed with or near a complex carbohydrate product) osmolality is raised and, unless more water and electrolytes are added to the mix (at which point the athlete might very well be flirting with over hydration), that concentrated simple sugar solution will not pass the gastric channels... it will literally sit in the stomach. Even more problematic is that if more fluids and electrolytes are not available the body will recruit these from other areas in the body (areas that critically need these fluids and electrolytes) and divert them to the digestive system to aid in the digestion of this too-concentrated simple sugar mix. Simply put, simple sugar-based drinks or gels have to be mixed and consumed at very dilute (and thus, calorically weak) concentrations in order to be digested with any efficiency. And again, when a simple sugar-based product is used it at properly mixed proportions it cannot provide adequate amounts of calories for energy production.

Complex carbohydrates, however, will match body fluid osmolality, not at a 6-8% solution, but a more concentrated 15-20% solution. Even at this seemingly too-high concentration complex carbohydrates (such as maltodextrins/glucose polymers) will empty the stomach at the same efficient rate as normal body fluids and provide substantially more calories (up to three times more) than simple sugar mixtures will.

To sum up, if the athlete consumes a simple sugar fuel the body will only permit 6-8% of it in solution into circulating serum for fuel replacement. On the other hand, complex carbohydrate fuels are easily and more-rapidly absorbed in a 15-20% solution. More calories are absorbed faster, and are available for energy production, from complex carbohydrates than simple sugar. The higher the simple sugar content, the higher the solution osmolality, the less of it is absorbed immediately. The longer the chain of sugars linked together as a complex carbohydrate the more of it is absorbed in higher solution because its osmolality is closer to that of body fluids. Therefore, the ideal carbohydrate source for athletes is long-chain complex carbohydrates.

## **The Need For Protein**

When exercise goes into the second hour and beyond, supplemental protein will fulfill the 5-15% energy requirements of the body while also preventing the cannibalization of lean muscle tissue (which, among other things, produces excess amounts of performance-robbing ammonia). Therefore, it makes sense during long exercise sessions or races, to include some protein in the fuel mix. A donation in the range of 3-10 grams of protein (12-40 calories) will satisfy this 5-15% protein requirement. We believe that soy protein, with its specific amino acid profile and naturally occurring isoflavones, is an ideal protein source for use during exercise.

## **ELECTROLYTES**

Electrolyte replenishment is as important a component of proper fueling as the fluids you drink and the calories you consume because they are crucial for maintaining the optimal performance of many of the body's functions such as proper muscular contraction. Far too many athletes forget to replenish electrolytes consistently or mistake "electrolyte replenishment" for "sodium or salt replenishment." Sodium chloride (a.k.a. "salt") is indeed an important component of electrolyte replenishment but it does not fulfill the entire requirements. A satisfactory electrolyte replenishment product needs to include sodium, chloride, calcium, magnesium, and potassium as all these minerals play a key role in the maintenance of these important body functions.

In terms of sodium replenishment, far too many athletes "over salt" their bodies during exercise, with bloating, water retention (edema-like symptoms), and stomach distress being the usual outcome. We want our body to re-circulate adequate amounts of sodium for supporting systemic balance of osmolality, carbohydrate transit across gastric membranes, and nerve transmission for muscle contractions. Too much of a sodium donation neutralizes this re-circulation process and again, may contribute towards those aforementioned, performance-inhibiting problems. The key for electrolyte replenishment, as it is with calories and fluids, is to provide an adequate dose to support bodily functions without overwhelming the body with too much, which will override and neutralize those body functions. Therefore, to satisfy the body's crucial electrolyte requirements, we suggest consistent/hourly replenishment from a balance of electrolytes, which would include a donation of up to 300-600 mg sodium chloride (a.k.a. "salt").

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## Pre-Workout Fueling

1. First, let's talk about pre-workout food consumption. There are two ideal choices available in terms of pre-workout food consumption:
  - Complete food consumption (200-400 calories is all that is necessary) three hours prior to the workout. This will prevent the too-rapid depletion of muscle glycogen stores, which is a hard-earned, premium fuel, the first your body will use when exercise begins.
  - If completing food consumption three hours prior to the beginning of a workout is not possible (if your workout begins first thing in the morning, for example) you can accomplish the same "muscle glycogen preservation" goal by either consuming a small amount of fuel (approximately 100-275 calories) 5-10 minutes prior to the workout or eating nothing at all prior to the workout; simply begin refueling the body shortly after it begins.

For more detailed information about this particular subject, please read "The Pre-Race Meal Simplified" in the fueling handbook ***The Endurance Athlete's Guide to Success***.

2. Using the suggested dosages suggested in the Supplement Strategy article, remember to take your pre-workout dose of Race Caps Supreme, Mito-R Caps, and, prior to longer workouts, Anti-Fatigue Caps.
  3. Take 1-3 Endurolytes with your other pre-workout supplements. Consider this dose as a "pre-emptive" strike of sorts, having these minerals in your body prior to the workout will take care of your electrolyte requirements during the first portion of your workout.
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# During Workout Fueling

## Workouts of 1-2 Hours

### Calories - Suggested Doses\*:

- **Up to 120 pounds:**  
Hammer Gel – 2 servings/hour **or**  
HEED - 1 to 1.5 scoops/hour
- **120-155 pounds:**  
Hammer Gel - 2.5 servings/hour **or**  
HEED - 2 to 2.5 scoops/hour
- **155-190 pounds:**  
Hammer Gel - 3 servings/hour **or**  
HEED - 2.5 to 2.75 scoops/hour
- **190+ pounds:**  
Hammer Gel - 3 to 3.5 servings/hour **or**  
HEED - 3 scoops/hour

*\* These are estimated doses. Each athlete should determine in training, under a variety of conditions, their personal optimum.*

If you've consumed some fuel just prior to your workout (in the 5-10 minute window) that may very well satisfy energy requirements for workouts up to 2 hours in length. However, it still is a good idea to carry additional calories in the event additional fuel becomes necessary (the "it's better to be looking at it, than looking for it" train of thought). If no calories are consumed just prior to the workout you'll definitely need to refuel your body during your workout, especially if it goes beyond an hour. Hammer Gel or HEED will be ideal fuels to use during workouts of 1-2 hours, when carbohydrates + muscle glycogen stores will fulfill energy needs.

### Electrolytes - Suggested Dose:

- 1-6 Endurolytes per hour

Unlike calorie and fluid absorption and depletion rates, which remain fairly constant from athlete to athlete, electrolyte expenditure (and thus replenishment) varies tremendously. Body weight, level of fitness, weather conditions, acclimatization level, and biological predisposition all greatly affect electrolyte depletion and hence, the need for replenishment. That's why the hourly replenishment dose of Endurolytes can be anywhere from 1-6 capsules an hour. That being said, here's a good "starting dose" to consider:

- For lighter weight athletes - 1-2 capsules an hour
- For medium weight athletes - 2-3 capsules an hour

- For larger athletes - 4-6 capsules an hour

Remember though, these are suggested starting doses and the amount you need may be different, and may vary from hour to hour. If you've consumed Endurolytes prior to your workout that may completely fulfill most, if not all, your electrolyte requirements during one-hour training sessions.

**NOTE:** Each 2-scoop serving of HEED contains the equivalent of about 1.25 capsules of Endurolytes; for some, that may completely fulfill an hour's worth of electrolyte requirements. For others it's a good base from which to add a few Endurolytes capsules.

## **Workouts 2-3 Hours or longer**

### **Calories - Suggested Doses\*:**

- **Up to 120 pounds:**  
Sustained Energy - 1.5 scoops/hour **or**  
Perpetuem - 1 scoop/hour
- **120-155 pounds:**  
Sustained Energy - 1.75 - 2 scoops/hour **or**  
Perpetuem - 1 - 1.5 scoops/hour
- **155-190 pounds:**  
Sustained Energy - 2.25 - 2.5 scoops/hour **or**  
Perpetuem - 2 scoops/hour
- **190+ pounds:**  
Sustained Energy - 2.5 - 3 scoops/hour **or**  
Perpetuem - 2.25 - 2.5 scoops/hour

*\*These are estimated doses. Each athlete should determine in training, under a variety of conditions, their personal optimum.*

### ***To achieve best results during longer workouts, remember:***

1. Sustained Energy or Perpetuem should be your primary source of fuel (approximately two-thirds to, ideally, three-quarters of the time).
2. You can use Sustained Energy or Perpetuem as your sole calorie source every hour from beginning to end or you can use Hammer Gel and/or HEED occasionally during the workout to provide a little variety in your menu (remember to keep Sustained Energy or Perpetuem as their primary source of fuel).
3. You do not need to start with Hammer Gel or HEED the first two hours, then switch to Sustained Energy or Perpetuem.
4. If you're using E-CAPS supplements, don't forget to take your hourly doses of them, as suggested in the " Supplement Strategies For Triathletes" article (Part One in this series).

## Electrolytes - Suggested Dose:

- 1-6 Endurolytes per hour

Remember, electrolyte expenditure (and thus replenishment) varies tremendously due to many variables such as body weight, level of fitness, weather conditions, acclimatization level, and biological predisposition. That being said, here's a good "starting dose" to consider:

- For lighter weight athletes - 1-2 capsules an hour
- For medium weight athletes - 2-3 capsules an hour
- For larger athletes - 4-6 capsules an hour

Remember though, these are suggested starting doses and the amount you need may be different, and may vary from hour to hour. If you've consumed Endurolytes prior to your workout that should take care of the first hour's electrolyte requirements. Remember to take Endurolytes every 30-60 minutes during your workout.

## Sustained Energy/Perpetuem Mixing Options

You can mix and consume Sustained Energy or Perpetuem three different ways depending on individual preference and logistical concerns. Please experiment with the following options to determine which works best for you.

**The One-Hour Bottle:** This method works best in training or racing situations where you have a support crew and vehicle. Because you have a crew going along with you, they can keep your mixed bottles chilled, mixing up fresh bottles of fuel along the way. If you're without a support crew but want to use this option for mixing, keep in mind that because both hydration and caloric requirements are essentially trying to be satisfied from one source, this limits your ability to adjust your fluid intake without affecting your caloric intake and vice versa. To use this method, simply mix the suggested amount of scoops of Sustained Energy or Perpetuem for your bodyweight in a water bottle, small (20 ounces) or large (24-28 ounces). Consume one bottle hourly.

**The Multi-Hour Bottle:** This is by far the most convenient method of fueling because it allows you to be self-contained for many hours, requiring only additional plain water along the way. The only limitation is how many scoops you can fit into a bottle. Determine your proper hourly intake in scoops by experimenting with the numbers from the dosage chart above. Let's say you've determined through testing that 2 scoops of Perpetuem per hour is your ideal caloric intake. You need a 4-hour fuel supply. Mix eight scoops (2 scoops x 4 hours) in a large bottle with as much water as will fit in. You may need to add a few scoops at a time to get it all to mix well. You then "nurse" this bottle, taking small sips every 15-20 minutes. In this concentration, the water in the mixed bottle does not contribute more than a couple of ounces to your hourly fluid intake needs. To meet your fluid requirements, you carry a second and possibly even a third bottle of plain water, or use a hydration system, or know where you can refill along your route. Drink according to the temperature/humidity and your exertion level so that you consume in the range of 20-25 ounces of plain water per hour. This way, as long as you can obtain water along the way, you're set for hours of hard training.

**Gel or Paste:** If you want to carry the highest volume of calories in the least amount of space, this is your best option. Sustained Energy or Perpetuem can be made into a super-concentrated, near paste-like consistency and dispensed from a Hammer Gel flask. Using a blender or bowl

and spoon, mix scoops of powder with a small amount of water, gradually adding water as necessary to create the consistency desired. Remember that the heavier and more concentrated Perpetuem is mixed, the sweeter and stronger the flavor will become. Depending on how many scoops per hour you have determined you require, and based on how concentrated the mix is, each flask of Sustained Energy or Perpetuem can supply you with 2-4 hours of fuel. As with the multi-hour bottle, you must carry additional bottles of plain water or use a hydration system to meet your fluid requirements. Drink from them according to the temperature so that you are consuming amounts in the range of 20-25 ounces of plain water per hour, depending on the severity of the heat. As with the multi-hour bottle, as long as you can obtain water along the way, you're set for hours of hard training.

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## Post-Workout Fueling

Recovery begins as soon as the workout ends and the sooner you "re-fill" the tank, the quicker your recovery will be and the better prepped your body will be for the next workout. In other words, how well you recover today greatly determines how well you perform tomorrow. To put the "finishing touches" on your workouts, and to get the full value out of every minute you've put into them, make sure you consume adequate amounts of high quality and easily digested carbohydrates and protein as soon as possible after each of your training sessions. Now is also a good time to take the post-workout supplements as suggested in the " Supplement Strategies For Triathletes" article. For more detailed information on the importance of post-workout fueling, please refer to the article "Superior Recovery" in *The Endurance Athlete's Guide To Success*.

### Suggested Recovery Formulas\*:

- 1 - 3 servings (2-6 scoops) Recoverite in 8 - 16 ounces (or more, if desired) of cold water is the most convenient way to refuel, providing 30-90 grams of complex carbohydrates, 10-30 grams of whey protein isolate, plus ample amounts of glutamine.
- 1 - 1.5 scoops Hammer Whey + 3-4 servings of your favorite flavor of Hammer Gel in 6-8 ounces cold water. You can of course use more water than the 6-8 ounces suggested. However, both the Hammer Whey and Hammer Gel components will all mix quite easily in very little water, which may be desirable if you don't want to eat or drink much after a hard workout.
- 1 - 1.5 scoops Hammer Whey + 2-3 scoops of Sustained Energy in 12-24 ounces orange juice.

\* Experiment! The amount you use can be determined by your body size (lighter weight athletes may use the lower amounts, heavier athletes the higher amounts) or by length/intensity of the workout (you can use the lower suggested amounts after shorter workouts, the higher amount after longer or harder workouts).

# \*\*\* PART THREE \*\*\*

## Fueling Strategies - PRE-RACE & RACE DAY

By: Steve Born

In the previous articles, I suggested a supplement and fueling protocol for use during training. This article covers fueling requirements prior to and during a triathlon. Hopefully, you're already using your chosen E-CAPS supplements and Hammer Nutrition fuels in training. As is the case in any sport, you experiment with all aspects of your sport in training well in advance of the actual race and race day is not the time to test any supplement or fuel. Use the guidelines I've provided in the previous articles in your training, adapting according to your personal needs, and keep a written record of your intake, weather, workout intensity, and results. Come race time you'll be dialed in - supplement and fueling-wise - which means you can race with confidence.

All triathletes can benefit from taking Race Day Boost in the four days prior to the event (make sure you test it in training first). The product information is below. After that, I'll discuss the pre-race meal, the information of which is applicable for all triathletes, followed by specific supplement and fueling suggestions for the various triathlon race distances - Sprint, Olympic, and Half & Full Iron. We'll close the article with post-workout recovery suggestions.

### Four Days Prior To the Race - **For All Triathletes**

**Race Day Boost** - Take one (1) teaspoon in 4-6 ounces of a carbohydrate beverage 4x/day for four days prior to the event. For example, if your race starts on Saturday you would begin the loading dose on Tuesday). ***This protocol MUST be tested during training.***

If you found a supplement that enhanced the functions and performance of your body's three energy production pathways, and also effectively buffered lactic acid, you'd take it, wouldn't you? Race Day Boost is that product-and yes, it's safe and legal! To tell you how Race Day Boost can help you to a triathlon PR, let's review a few basics of molecular-level energy production.

Our muscles rely on three different energy systems, or metabolic pathways, to produce ATP, the molecule directly responsible for muscle function. We have the ATP-CP system, the lactic acid system, and the oxygen, or aerobic, system. Every muscle fiber has all three of these systems available, utilizing each depending on the length and intensity of exercise.

The first energy system is the ATP-CP (adenosine triphosphate and creatine phosphate) system. ATP is the immediate source of energy for muscle contraction, breaking down to ADP (adenosine diphosphate) as it releases the energy to fire a muscle fiber contraction. This system releases energy very rapidly, but also depletes very rapidly, in just a few seconds of continued effort. It is the energy source used in brief, intense activities such as weightlifting or sprinting. Creatine phosphate, another high-energy compound naturally occurring in all muscle cells, also breaks down, releasing energy as it loses its phosphate group, but unlike ATP, it does not cause muscle contraction. Instead, the phosphate goes to an ADP, converting it back into ATP, thus replenishing the system. The sodium tribasic phosphate in Race Day Boost supplies phosphate groups used in the re-synthesis of CP and ATP, thus improving the performance of this short-

term energy system.

The second energy system is the lactic acid system. A key feature of this system is its relationship with blood pH. Normal blood maintains a slightly alkaline pH of 7.3 to 7.4, optimal for the enzymes that produce energy via the lactic acid energy system. This system uses carbohydrates as fuel, primarily in the form of glycogen stored in the muscles. Our bodies break down muscle glycogen (a process known as glycogenolysis) into glucose, which then undergoes further breakdown via glycolysis. Glycolysis converts sugar to pyruvic acid, releasing energy and creating ATP. Glycolysis occurs with or without the presence of oxygen. At rest, glycolysis occurs at a slower rate sustained by the oxygen you take in (aerobic glycolysis). As you begin to exercise, the rate of aerobic glycolysis increases. As intensity of exercise increases, aerobic glycolysis becomes inadequate to support energy production and the system switches to anaerobic glycolysis. Through a series of chemical reactions in muscle cells, the formation of lactic acid allows anaerobic glycolysis to continue. However, excess lactic acid accumulates during high intensity efforts, increasing the hydrogen ion concentration within the muscle cells and disrupting the ideal alkaline blood pH. This results in that all-too-familiar "burn" we all hate. Race Day Boost's phosphate salt buffers blood acidity and helps maintain this acid-alkaline balance by neutralizing excess hydrogen ions within the muscle cell. Effectively buffering excess lactic acid allows the lactic acid system to provide energy for a longer time.

Phosphates also aid in improving the third energy system in the body, the oxygen energy system. This system uses primarily carbohydrates and fats to produce ATP, but after 90-120 minutes of sustained exercise, this system starts to chew on protein, with about 5 - 15% of the energy coming from amino acids. The oxygen system can't produce ATP as rapidly as the other two systems, but it does produce greater quantities of ATP. It serves as the primary energy system of aerobic, or "conversational level," athletics. In other words, if you're breathing easily enough that you can talk while you're running or cycling, you're still in the aerobic mode. Even though it seems that you're always going anaerobic in a race, or at least going back and forth between all the energy systems, once you settle into a rhythm during the race, your body relies mostly on the oxygen energy system. Phosphates form part of a compound found in red blood cells known as 2,3 diphosphoglycerate (2,3-DPG). This molecule helps release oxygen from hemoglobin into the muscle cells. An increase in 2,3-DPG will improve the availability of oxygen to working muscles for the process of creating ATP. The dose of sodium tribasic phosphate used in Race Day Boost exactly matches the dose used in all studies done with this nutrient, including one that showed an 8% improvement in performance in a 40k time-trial. Sodium tribasic phosphate improves all of the body's three energy systems, making it a superb ergogenic aid.

In addition, we have added 500 mg of glutamine per serving. A full dose of four servings per day (2000 mg glutamine) enhances muscle and liver glycogen storage. During exercise, your body uses muscle glycogen stores more effectively than ingested carbohydrates, as the latter must first reach the bloodstream, and then go through chemical conversion before becoming available for energy. Improved glycogen storage capacity means improved endurance performance.

## **The Pre-Race Meal - For All Triathletes**

If a pre-race meal is desired, you must complete the meal at least three hours prior to the start of the race or you will increase the rate of glycogen depletion and decrease your fat burning capabilities once the race begins. However, do not sacrifice sleep just to get up early to eat; it's neither crucial nor necessary. Muscle glycogen stores, the fuel your body will use first and foremost when the race begins, remain unaffected even after a nightlong fast. If you have been consistent in replenishing carbohydrates immediately after all your workouts, you will have stored in your muscles and liver enough glycogen to propel you through about 90 minutes of strenuous exercise. Remember, if you eat too close to the start of the race, muscle glycogen stores will be

depleted much more rapidly, an obvious disadvantage. So, it's more important to refrain from eating too close to the start than to load up three hours before the gun goes off. Refer to the article "The Pre-Race Meal Simplified" in *The Endurance Athlete's Guide To Success* for detailed information.

If a pre-race meal is consumed I suggest a total of 200-400 calories primarily from complex carbohydrates (some soy protein is also acceptable) with no simple sugars and a minimal amount of fiber and fat. A two to three-scoop serving of Sustained Energy, a readily digestible source of carbohydrates and protein, provides approximately 49-73 grams of complex carbohydrates, 7-10.5 grams of soy protein, a minimal amount of fat, and a total of approximately 229-343 calories. It's a perfect pre-race meal.

All standard triathlon formats start with the swim, your hardest event for refueling; so you might desire some caloric consumption just before the start, especially if you feel hungry. Here's a better strategy than eating from one to three hours before start time: sip two or three servings of Hammer Gel approximately 5-10 minutes prior to the start of the race. By the time these calories are digested and blood sugar levels elevated, you'll be well into your race and the problem with elevated muscle glycogen depletion is no longer a physiologically an issue.

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## -- Sprint Distance Triathlons --

### Pre-Race Supplements

**Race Caps Supreme** - For athletes weighing less than 150 pounds or ANY athlete under the age of 20 the suggested dose is 2 capsules (with or without food) one to three hours prior to the start of the race. Athletes weighing more than 150 pounds should take 3 capsules. The primary nutrients in Race Caps Supreme are the "spark plugs" your body needs to convert food and oxygen into energy. This dose gives your body the raw materials it needs to ensure efficient and consistent energy production.

**Mito-R Caps** - The perfect companion to Race Caps Supreme, Mito-R Caps significantly amplifies that product's benefits and supports optimal functioning of the mitochondria, the energy-producing organelles in the cells, which enhances efficient energy production. In addition, the nutrients in Mito-R Caps protect mitochondrial DNA from free radical damage, which occurs naturally, but in even higher volumes during exercise. Suggested dose is 2 capsules one to three hours prior to the start of the race.

**Endurolytes** - Take 1-6 capsules one to three hours prior to the race start to ensure proper electrolyte levels for the race. The amount you take is of course determined by what you've been using in training, while also taking into account the race day weather.

**Premium Insurance Caps** - If you consume a pre-race meal, you can include 2 or 3 capsules of Premium Insurance Caps. This will provide antioxidant and B vitamin support. However, niacin (vitamin B3) has a tendency to inhibit fat utilization, so you need to maintain the three-hour pre-race meal gap. If you don't take a pre-race meal, skip the dose of Premium Insurance Caps.

## Fueling and Supplements During the Race

Because most triathletes will finish a sprint race under 1:40 there is most likely no need to consume any fuel or supplements during a race of this distance. Muscle glycogen stores plus any calories consumed in the pre-race meal or in the 5-10 minutes prior to the start of the race should very adequately satisfy energy requirements throughout the entire race, and your pre-race consumption of Endurolytes should fulfill your electrolyte requirements. Water alone should be all you need during the race. Still, it's a good idea to carry additional calories and electrolytes with you just in case the race takes you longer than you're expecting (over 1:30). If this is the case, 1-2 scoops of HEED during the bike portion will easily fulfill a good portion of your fluid requirements, along with any additional caloric and electrolyte requirements, for the remainder of the race.

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## **-- Olympic Distance Triathlons --**

### Pre-Race Supplements

**Race Caps Supreme** - For athletes weighing less than 150 pounds or ANY athlete under the age of 20 the suggested dose is 2 capsules (with or without food) one to three hours prior to the start of the race. Athletes weighing more than 150 pounds should take 3 capsules. The primary nutrients in these products are the "spark plugs" your body needs to convert food and oxygen into energy. This dose gives your body the raw materials it needs to ensure efficient and consistent energy production.

**Mito-R Caps** - The perfect companion to Race Caps Supreme, Mito-R Caps significantly amplifies that product's benefits and supports optimal functioning of the mitochondria, the energy-producing organelles in the cells, which enhances energy production. In addition, the nutrients in Mito-R Caps protect mitochondrial DNA from free radical damage, which occurs naturally, but in even higher volumes during exercise. Suggested dose is 2 capsules one to three hours prior to the start of the race.

**Endurolytes** - Take 1-6 capsules one to three hours prior to the race start to ensure proper electrolyte levels for the swim portion of the triathlon. The amount you take is of course determined by what you've been using in training, while also taking into account the race day weather.

**Premium Insurance Caps** - If you consume a pre-race meal, you can include 2 or 3 capsules of Premium Insurance Caps. This will provide antioxidant and B vitamin support. However, niacin (vitamin B3) has a tendency to inhibit fat utilization, so you need to maintain the three-hour pre-race meal gap. If you don't take a pre-race meal, skip the dose of Premium Insurance Caps.

### Swim-to-Bike Transition (T1)

At T1, before getting on the bike, I suggest consuming 2-6 Endurolytes, washing them down with some of your fuel mixture. This will help replenish the electrolytes used during the swim and provide sufficient amounts for the first hour of the bike portion. A few seconds spent at the

transition to replenish electrolytes and a few calories will more than repay you during the ride because it allows you to focus solely on establishing a smooth pedaling rhythm during that crucial initial portion of the bike phase. To expedite this even more quickly have the Endurolytes ready in a small container such as a pill bottle, film canister, or "quick coin" coin purse/pill holder. Carry additional electrolytes with you during the ride (the "quick coin" pill holders work perfectly for this) and take a second dose after the first hour is completed.

## **Bike Fuel And Supplements**

**FUEL** - The fueling requirements for the swim portion are easily met through your muscle glycogen stores + any pre-race calorie and electrolyte consumption. The middle leg of the triathlon affords the best fueling time for the rest of the race. It's the right time physiologically, and on the bike you have the easiest intake.

During this portion of the race you can carry all your nutrition in one water bottle. Based on how long you anticipate your bike portion to be, mix the appropriate amount of either Sustained Energy or Perpetuem in a 20-25 ounce water bottle (dosage suggestions below), sip from it during the bike portion, and augment with additional water to fulfill hydration requirements (remember that most athletes benefit from a fluid intake, from ALL sources, of approximately 20-25 ounces hourly). To maintain optimal palatability of your fuel mixture you can make it the night prior to the race and freeze it overnight (this is especially helpful if race day looks like it's going to be a hot one). Or, you can make it first thing in the morning using ice-cold water and ice cubes. Using an insulated water bottle is an excellent idea to consider as well.

### **Calories - Suggested Doses:**

#### **Up to 120 pounds:**

Sustained Energy - 1.5 scoops/hour **or**  
Perpetuem - 1 scoop/hour

#### **120-155 pounds:**

Sustained Energy - 1.75 - 2 scoops/hour **or**  
Perpetuem - 1 - 1.5 scoops/hour

#### **155-190 pounds:**

Sustained Energy - 2.25 - 2.5 scoops/hour **or**  
Perpetuem - 2 scoops/hour

#### **190+ pounds:**

Sustained Energy - 2.5 - 3 scoops/hour **or**  
Perpetuem - 2.25 - 2.5 scoops/hour

**SUPPLEMENTS** - If your race will be in the 3-4 hour range, I suggest taking 1-2 Race Caps Supreme and 1-2 Mito-R Caps halfway through the bike portion. If your race is in the 2.5-hour range or shorter your pre-race consumption of these supplements should be sufficient. Don't forget to take another dose of Endurolytes after the first hour is completed.

## **Run Fuel**

Depending on how long your run portion takes you may or may not need to consume any calories during the run portion. Muscle glycogen stores + pre-race food consumption + bike fuel should satisfy your energy requirements for the entire race if you'll be finishing the race under three hours. If your run portion is going to be close to or over an hour then yes, you should carry some fuel with you. Hammer Gel's superb complex carbohydrate formula, it's long "shelf life" once mixed (something that most carb/protein drinks can't claim), and its relative ease of consumption

make it the fuel of choice during the run portion. Consistent, reliable energy without the concerns of stomach distress, so common with many other energy gels and sports drinks, are Hammer Gel's hallmarks. You can easily carry up to five servings in the Hammer flask, or you can use single serving pouches and vary your menu. If carrying a fuel bottle is not a hassle for you, consider using HEED to fulfill at least a portion of your caloric needs. Suggested doses for both Hammer Gel and HEED are below.

Especially in hot weather races it's a good idea to take 2 - 6 Endurolytes at T2, or shortly into your run, to help prevent the possibility of cramping during the run.

### **Calories - Suggested Doses:**

#### **Up to 120 pounds:**

Hammer Gel - 2 servings/hour (or 2 pouches) **or**

HEED - 1 to 1.5 scoops/hour

#### **120-155 pounds:**

Hammer Gel - 2.5 servings/hour (or 2 pouches) **or**

HEED - 2 to 2.5 scoops/hour

#### **155-190 pounds:**

Hammer Gel - 3 servings/hour (or 3 pouches) **or**

HEED - 2.5 to 2.75 scoops/hour

#### **190+ pounds:**

Hammer Gel - 3 to 3.5 servings/hour (or 3 pouches) **or**

HEED - 3 scoops/hour

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## **-- Half and Full Iron-Distance Triathlons --**

### **Pre-Race Supplements**

**Race Caps Supreme** - For athletes weighing less than 150 pounds or ANY athlete under the age of 20 the suggested dose is 2 capsules (with or without food) one to three hours prior to the start of the race. Athletes weighing more than 150 pounds should take 3 capsules. The primary nutrients in these products are the "spark plugs" your body needs to convert food and oxygen into energy. This dose gives your body the raw materials it needs to ensure efficient and consistent energy production.

**Mito-R Caps** - The perfect companion to Race Caps Supreme, Mito-R Caps significantly amplifies that product's benefits and supports optimal functioning of the mitochondria, the energy-producing organelles in the cells, which enhances energy production. In addition, the nutrients in Mito-R Caps protect mitochondrial DNA from free radical damage, which occurs naturally, but in even higher volumes during exercise. Suggested dose is 2 capsules one to three hours prior to the start of the race.

**Endurolytes** - Take 1-6 capsules one to three hours prior to the race start to ensure proper electrolyte levels for the swim portion of the triathlon. The amount you take is of course

determined by what you've been using in training, while also taking into account the race day weather.

**Anti-Fatigue Caps** - Unlike the shorter duration events, ammonia production and accumulation will be an issue. To help prevent the performance-inhibiting consequences of excess ammonia, taking 2-4 Anti-Fatigue Caps one to three hours prior to the start (and during the race) is recommended.

**Premium Insurance Caps** - If you consume a pre-race meal, you can include 2 or 3 capsules of Premium Insurance Caps. This will provide antioxidant and B vitamin support. However, niacin (vitamin B3) has a tendency to inhibit fat utilization, so you need to maintain the three-hour pre-race meal gap. If you don't take a pre-race meal, skip the dose of Premium Insurance Caps.

## **Swim-to Bike Transition (T1)**

At T1, before getting on the bike, I suggest consuming 2-6 Endurolytes, washing them down with some of your fuel mixture. This will help replenish the electrolytes used during the swim and provide sufficient amounts for the first 30-60 minutes of the bike portion. A few seconds spent at the transition to replenish electrolytes and a few calories will more than repay you during the ride because it allows you to focus solely on establishing a smooth pedaling rhythm during that crucial initial portion of the bike phase. To expedite this even more quickly have the Endurolytes ready in a small container such as a pill bottle, film canister, or "quick coin" coin purse/pill holder.

The Race Caps Supreme, Mito-R Caps, and Anti-Fatigue Caps taken prior to the start should still be sufficient until you are in the first hour of the bike leg.

## **Bike Fuel And Supplements**

**FUEL** - The fueling requirements for the swim portion are easily met through your muscle glycogen stores + any pre-race calorie and electrolyte consumption. The middle leg of the triathlon affords the best fueling time for the rest of the race. It's the right time physiologically, and on the bike you have the easiest intake. You want to do the bulk of your fueling during the bike portion where consuming fuel is easiest and you want to use Sustained Energy or Perpetuem as your primary fuel used at this time. Of the two, I consider Perpetuem to be the most ideal fuel, especially in a full iron-distance race, though both are excellent choices. Hammer Gel alone, easily carried in a single-serving pouch or small flask, can satisfy energy requirements during the run portion, where carrying and consuming fuel creates more a bit of a nuisance.

Carrying enough fuel to satisfy a lengthy bike portion can be logistically challenging. One way to make this easier is to make concentrated solutions of Sustained Energy or Perpetuem. Depending on how long your bike portion is you can make all your fuel in one or two bottles. For example, if you find that 2 scoops of Perpetuem an hour is the right amount (suggested doses below), you can make a 6-scoop bottle and have three hours of fuel in one bottle. Drink one-third of that bottle every hour, augmenting with 20-25 ounces of fluid every hour (from other sources such as a hydration pack or system, or other "water-only" bottles) and 1-6 Endurolytes every hour (the dose being dependent on the weather/your personal needs), and your energy requirements will be fulfilled. By making these concentrated bottles of fuel you make things a lot easier for yourself logistically because you don't have to stop and make more - all you have to do is get more water along the way - and you don't have to rely on aid station food.

As always, cold is better: cold fluids taste better, are more refreshing, suffer less degradation, and absorb more quickly. Mix your fuels the night before and freeze the bottles. Using insulated bottles is an excellent idea to consider. Sustained Energy especially needs to be kept cold; when

warm it has some palatability issues.

In addition to calories, you need to keep an eye on your electrolytes. Depending on the weather conditions, hourly consumption of 1-6 Endurolytes will keep your muscles (heart included) contracting on schedule sans cramping. Carrying additional electrolytes with you during the ride is easy using the "quick coin" pill holders, which keep the capsules dry and make consumption of Endurolytes a simple task.

### **Calories - Suggested Doses:**

#### **Up to 120 pounds:**

Sustained Energy - 1.5 scoops/hour **OR**  
Perpetuem - 1 scoop/hour

#### **120-155 pounds:**

Sustained Energy - 1.75 - 2 scoops/hour **OR**  
Perpetuem - 1 - 1.5 scoops/hour

#### **155-190 pounds:**

Sustained Energy - 2.25 - 2.5 scoops/hour **OR**  
Perpetuem - 2 scoops/hour

#### **190+ pounds:**

Sustained Energy - 2.5 - 3 scoops/hour **OR**  
Perpetuem - 2.25 - 2.5 scoops/hour

**SUPPLEMENTS** - In addition to your Endurolytes intake (which is part of your fuel, along with the calories and fluids you're consuming), I suggest the following supplements every hour, starting one hour into the bike: 1-2 Race Caps Supreme, 1-2 Mito-R Caps, and 1-2 Anti-Fatigue Caps.

Replenishing with Race Caps Supreme and Mito-R Caps will ensure adequate levels of these critical energy-producing nutrients. Even moderate exercise exhausts the nutrients in these supplements; replacing them during a strenuous triathlon becomes critical for top performance. Once depleted, you can only expect compromised performance and a very long day. The Anti-Fatigue Caps will help clear out any excess ammonia. It's a small strategy that can have significant benefits, especially prior to the run portion. An easy way to carry these three supplements is to use small zip lock bags and make hourly doses/bags prior to the race that contain the appropriate amount of capsules. Your dose of Endurolytes may change (if the weather gets hotter for instance) so keep those separate in the "quick coin" pill holders. For the other three supplements use the zip lock bags and every hour (beginning at the second hour) tear one open and allow the pills to fall into your mouth. Wash down with your fuel mix and/or water and you're set for an hour.

If you have been fueling your body properly, supplying adequate amounts of calories from Sustained Energy or Perpetuem, sufficient amounts of electrolytes from Endurolytes, and nutritional support from the above three supplements, you can enter the run with confidence. You will know and feel that you have provided your body with the right amounts of the right nutrients to maximize Sustained Energy production.

## **Bike-to-Run Transition (T2)**

If your last Endurolytes dose was longer than 20 - 30 minutes prior to T2 it's probably a good idea to take more at the transition, just to have them in your system prior to the run, where, like you did

at T1, you'll be using a lot of new muscle fibers. If your last dose was 0-20 minutes prior to T2 you can skip this "at the transition" dose and start dosing into the run.

## **Run Fuel**

The physical demands placed on the body by running a half or full marathon immediately after dismounting from 56 to 112-mile all-out bike race are, to say the obvious, extreme. Because eating and drinking on the run can be difficult on one's digestive system (and face!), my key suggestion here is make sure you fuel properly during the bike portion. As mentioned earlier, your primary fuel should consist of some combination of Sustained Energy and Perpetuem, both of which satisfy energy demands more completely than carbohydrate-only fuels. Fuel requirements will vary with each individual, as well as with the different distances of triathlons, but sufficient fueling on the bike will set up the run ideally.

During the run portion, where carrying and consuming fuel can be a real nuisance, Hammer Gel's superb complex carbohydrate formula, it's long "shelf life" once mixed (something that most carb/protein drinks can't claim), and its relative ease of carrying and consumption make it the fuel of choice. Consistent, reliable energy without the concerns of stomach distress, so common with many other energy gels and sports drinks, are Hammer Gel's hallmarks. You can easily carry up to five servings in the Hammer flask, or you can use single serving pouches and vary your menu. If carrying a fuel bottle is not a hassle for you, consider using HEED to fulfill a portion of your caloric needs.

### **Calories - Suggested Doses:**

#### **Up to 120 pounds:**

Hammer Gel - 2 servings/hour (or 2 pouches) **or**  
HEED - 1 to 1.5 scoops/hour

#### **120-155 pounds:**

Hammer Gel - 2.5 servings/hour (or 2 pouches) **or**  
HEED - 2 to 2.5 scoops/hour

#### **155-190 pounds:**

Hammer Gel - 3 servings/hour (or 3 pouches) **or**  
HEED - 2.5 to 2.75 scoops/hour

#### **190+ pounds:**

Hammer Gel - 3 to 3.5 servings/hour (or 3 pouches) **or**  
HEED - 3 scoops/hour

Finally, remember your critical need for enough, but not too much, hydration. Continue to drink up to 25 ounces of fluids per hour to maintain hydration and take an hourly dose of 1-6 Endurolytes to prevent cramping and ensure that your muscles contract properly and efficiently.

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# Post Race Nutrition and Supplements

## For All Triathletes

Recovery begins when the race ends. As soon as practical after you leave the chute and cool down it's time to replenish your body with high quality, easily digested carbohydrates and protein. The following are three superb recovery drink possibilities:

- 1 - 3 servings (2-6 scoops) Recoverite in 16-24 ounces cold water. Recoverite is Hammer Nutrition's all-in-one, 3:1 ratio of carbs and protein recovery drink. Also provided in each serving of Recoverite are a full electrolyte profile and additional recovery-specific nutrients, including a huge 3-gram dose of l-glutamine, a vital recovery amino acid. Recoverite is convenient, easy to make, delicious, and absolutely perfect for enhancing recovery.
- 1 - 1.5 scoops Hammer Whey + 3-4 servings of your favorite flavor of Hammer Gel in 6-8 ounces cold water. You can of course use more water than the 6-8 ounces suggested. However, both the Hammer Whey and Hammer Gel components will all mix quite easily in very little water, which may be desirable if you don't want to eat or drink much after a hard race.
- 1 - 1.5 scoops Hammer Whey + 2-3 scoops of Sustained Energy in 12-24 ounces orange juice.

In addition to "re-filling the tank" with calories, it's essential to supply your body with key nutrients for enhancing recovery and supporting optimal immune system function. For that I recommend the following supplements and doses, part of which you can take with your post-workout fuel, and part over the next one to two hours.

**Premium Insurance Caps** - One full packet (seven capsules) will replenish the body's stores of essential vitamins and minerals including vital antioxidants.

**Super AO** - Two capsules will perfectly complement Premium Insurance Caps by providing additional antioxidant benefits while also enhancing circulation to help accelerate recovery.

**Race Caps Supreme** - 1 to 2 capsules provides excellent amounts of CoQ10 and Idebenone, both powerful antioxidants.

**Mito-R Caps** - 1 to 2 capsules provides several different antioxidants, including the mitochondrial-protecting nutrients acetyl l-carnitine and r-alpha lipoic acid.

Steve Born is a technical advisor for E-CAPS with over a decade of involvement in the health food industry. He has developed supplement/fueling programs for hundreds of athletes, ranging from recreational athletes to world-class professionals. Steve is a three-time RAAM finisher, the 1994 Furnace Creek 508 Champion, 1999 runner-up, and the only cyclist in history to complete a *double* Furnace Creek 508. He holds two ultra-marathon cycling records, and was inducted into the Ultra Marathon Cycling Hall of Fame earlier this year.

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