
Ultragen Research Packet

Rev. 2.0, June 2008



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Corporate Philosophy

Our Mission

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

Research Philosophy

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

Commitment to Quality

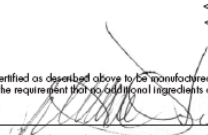
First Endurance uses only the finest ingredients and follows stringent quality control. Supplements can be easily ruined. Even if you buy the right ingredients, they can degrade quickly and lose their efficacy if they aren't handled under the most stringent controls. We are determined to ensure nothing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

Certificate of Analysis

A Certificate of Analysis (C of A) is a document which states every active and inactive substance used to manufacture a product. A C of A also shows that there are no additional ingredients added to the Ultragen formulation. In order to assure the safety and efficacy of Ultragen, First Endurance provides a C of A with every bottle of Ultragen.

CERTIFICATE OF ANALYSIS		
Product : Ultragen Tropical Punch		Lot: 23364 03-05
Formula Ingredients	Specification	Formulation Amount
Whey Protein Isolate	Assay NLT 92% (dry basis)	Conforms
Milk Protein Isolate	Assay NLT 91% (dry basis)	Conforms
Whey Protein Hydrolysate	Assay NLT 86% (dry basis)	Conforms
Dextrose	Assay NLT 99% (dry basis)	Conforms
L-Glutamine	Assay NLT 99% (dry basis)	Conforms
Vitamin/Mineral Pre-Blend	Per Official Specifications	Conforms
Sodium Chloride	40%Na:60%CL	Conforms
Potassium Chloride	48%K+:52%CL	Conforms
Natural Flavors	Per Official Specifications	Conforms
Natural Color(Carmine)	Per Official Specifications	Conforms
Net Formula Weight	1361.1 Grams	Conforms
Total Plate Count	< 100,000/g	Conforms
Yeast & Mold	< 1,000 CFU	Conforms
E. Coli	Negative	Negative
Salmonella	Negative	Negative

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

Certified by: 

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

Safe and Legal

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

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

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

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

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

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

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

[UCI Banned Substance List](#)

[WADA](#)

[USADA](#)

Use Directions: Take one serving immediately following long or exhaustive exercise.

Easy to use: Spoon mixable all natural formula is completely instantized so you don't have to fight clumps.

Glutamine	
6000mg	
Isoleucine	
1182mg	
Leucine	
2146mg	
Valine	
1194mg	
Tyrosine	806mg
Threonine	
1135mg	
Alanine	
866mg	
Aspartic Acid	
1817mg	
Cystine/Cystein	
272mg	
Serine	
1054mg	

Supplement Facts		
Serving Size: 2 scoops (91g)		
Supplement Facts	Amount Per Serving	%DV*
Serving size 1 packet (94g): makes 12 fluid ounces		
Calories	320	
Calories from fat	0	
Total fat	0 g	0%
Cholesterol	0 g	0%
Total Carbohydrate (100% from Dextrose)	60 g	21%
Sugars	60 g	**
Protein (from Whey Protein Isolate, Milk Protein Isolate, Hydrolyzed Whey Protein)	20 g	40%
Vitamin A (100% as beta-carotene)	2,500 IU	50%
Vitamin C (as ascorbic acid and calcium ascorbate)	400mg	670%
Vitamin D (as cholecalciferol)	200 IU	50%
Vitamin E (as natural d-alpha tocopherol)	400 IU	1250%
Vitamin B1 (as thiamin)	8 mg	500%
Vitamin B2 (as riboflavin)	8.5 mg	500%
Niacin (as niacinimide)	20 mg	100%
Vitamin B6 (as pyridoxine hydrochloride)	8 mg	500%
Folate (as folic acid)	200 mcg	50%
Vitamin B12 (as cyanocobalamin)	6 mcg	100%
Biotin	150 mcg	50%
Pantothenic Acid (as d-calcium pantothenate)	20mg	200%
Calcium (as Calcium carbonate and calcium ascorbate and from milk isolates and whey isolates)	500mg	50%
Phosphorous (from milk isolate)	105mg	11%
Magnesium (as magnesium oxide)	250mg	65%
Zinc (as zinc oxide)	7.5mg	50%
Chloride (as sodium and potassium chloride)	150mg	4%
Sodium (from sodium chloride, milk isolate and whey Isolate)	350mg	12.5%
Potassium (as potassium chloride)	200mg	6%
BCAA's† (Leucine, Iso-Leucine, valine)	4.5g	*
Glutamine† (L-glutamine and glutamine peptides)	6g	*
*Daily Value Not Established		
**Percent Daily Values are based on a 2,000 calorie diet.		

About Ultragen

Racing and intense training puts the body under incredible stress, depleting glycogen stores, elevating cortisol and draining essential vitamins and minerals. For endurance athletes, it is crucial to focus on recovery in order to be competitive the day after a hard workout or race. That's why the scientists at First Endurance developed Ultragen, the most advanced post-recovery formulation ever produced. Each serving of Ultragen delivers the levels of nutrients that have been shown in clinical research to maximize recovery and provide an extra edge over the competition. In other words, First Endurance does not use "pixie dust" quantities of ingredients just to name it on the label.

Ultragen's state of the art formula contains superior proteins, a carbohydrate catalyst, glutamine, branched-chain amino acids, cortisol modulation and electrolytes. Each of these components is engineered with the highest quality ingredients and at clinically effective doses. No other formula provides a comparable option.

Whey Protein

To help prevent the breakdown of muscle tissues, whey protein contains beta-lactoglobulin, a rich source of branched-chain amino acids (BCAAs). Whey protein is also a rich source of the amino acid Cystein and has been shown to increase glutathione levels in the body. Glutathione is an antioxidant that helps provide an added boost to the immune system.

Whey protein is a high quality *complete protein* containing all of the essential amino acids required by the body each and every day. There are several different methods that are used today evaluate protein quality. No matter which method is used, whey proteins have been proven to be an excellent, pure source of protein.

Whey proteins have a **Protein Digestibility Corrected Amino Acid Score (PDCAAS)** of 1.14. The reported score is 1.0, which is the maximum value allowed by the USDA for reporting purposes. The PDCAAS is the USDA's officially approved method of scoring protein quality.

Another method used to measure protein quality is the **Protein Efficiency Ratio (PER)**. Whey proteins have a PER of 3.2, making it one of the highest single source proteins. The PER rating is based upon the evaluation of the growth of animals consuming a fixed amount of dietary protein from a single source. As the PER increases, so does the quality of the protein.

Biological Value (BV), another measure of protein quality, measures the amount of protein that is retained from the absorbed protein for maintenance and growth. It measures the fraction of the nitrogen in the diet that remains after the nitrogen losses in the waste products have been subtracted. Whey proteins have a biological value of 100, which is higher than the value for casein (milk protein), soy protein, beef, or wheat gluten.

Protein Type	Protein Digestibility Corrected Amino Acid Score (PDCAAS) ¹	Amino Acid Score	Protein Efficiency Ratio (PER) ²	Biological Value (BV)
Whey Protein	1.00*	1.14	3.2	100
Whole Egg	1.00	1.21	3.8	88-100
Casein	1.00	1.00	2.5	80
Soy Protein	0.99	0.99	2.2	74

Beef Protein	0.92	0.94	2.9	80
Canned Kidney Beans	0.68	NA	NA	49
Wheat Gluten	0.25	0.47	NA	54

*Whey protein has a PDCAAS of 1.14. The reported score is 1.0, which is the maximum value allowed by the USDA for reporting purposes.

Whey protein is not a single protein; it consists of a number of individual protein components. In recent years new technology has enabled manufacturers to isolate and further purify some of these individual components, including technology that allows the protein to be isolated from the fats and sugars (whey isolate or hydrolysate). Due to its lower molecular weight, whey in its isolate form is more quickly and fully absorbed than other forms. The following is a list of the individual components in whey protein:

Beta Lactoglobulin: The most abundant whey protein component, making up approximately 50-55% of the whey protein. Binds fat soluble vitamins making them more available to the body. Provides an excellent source of essential and branched chain amino acids (BCAAs), which help prevent muscle breakdown and spare glycogen during exercise. Hydrolyzed versions are often used in infant formulas to reduce potential allergic reactions.

Alpha-lactalbumin: The second most abundant whey protein component, making up approximately 20-25% of the whey protein. The primary protein found in human breast milk. High in tryptophan, an essential amino acid; potential benefits include sleep regulation and mood improvement under stress. Excellent source of essential amino acids and BCAAs. The only whey protein component capable of binding calcium.

Immunoglobulins: Makes up approximately 10-15% of the whey protein. Provides immunity enhancing benefits to infants and others. Predominant whey protein component found in colostrum.

Bovine Serum Albumin: Makes up approximately 5-10% of the whey protein. Large sized protein with a good essential amino acid profile and fat binding properties.

Lactoferrin: Makes up approximately 1-2% of the whey protein. Inhibits the growth of bacteria (including some pathogenic bacteria) and fungi due to its ability to bind iron. Iron is an essential nutrient often required for bacterial growth. The USDA recently approved the use of lactoferrin on meat to prevent the growth of pathogens such as E. coli and Salmonella. Promotes the growth of beneficial bacteria such as Bifidus. Helps infants establish good microbial conditions in the intestines. Regulates iron absorption and bio-availability. May help to reduce inflammation. An antioxidant that naturally occurs in many body secretions such as tears, blood, breast milk, saliva and mucus.

Lysozyme Makes up less than 0.1% of the whey protein. Contains immunity enhancing properties.

Whey Protein Isolate (WPI)

Whey protein isolate is the purest form of whey protein and contains 90-95% protein. It contains little, if any, fat or lactose. In contrast, whey protein concentrate can have a protein content ranging from 25% to 89%. It will contain some lactose, fat, and minerals. As the protein level increases the amount of lactose decreases. Whey protein concentrate at 70% - 80% protein content is the form most readily available as a protein powder supplement.

Whey protein, a milk derivative, is by far the most popular protein on the market and comes in various forms, from the lower grade, higher fat whey concentrate to the highly purified isolate or hydrolysate form (the latter of which provides the benefits of microfractions and is low in fat and lactose). Most of the whey protein on the market is usually found as ion-exchange, a process using electric charges to extract the protein. There are some advanced procedures (like cross flow microfiltration) that produce higher quality whey, with subsequent added benefits over ion-exchange whey isolate in preserving key microfractions which are essential to its benefits. Whey protein isolate that is not heat-treated contains key microfractions, like alpha lactalbumin and glycomacropeptides, which can both positively support immune function. Some of the microfractions or growth factors found in whey protein can even enhance IGF-1 levels which can increase lean muscle mass—good news for hard training athletes. Whey protein has a very high biological value which means it's most readily utilized by human muscle tissue thus making it a very fast absorbing protein and anabolic as a result. Some users of whey protein concentrate may experience bloating or gas due to its lower quality, but it is very cost effective. Due to its low molecular weight, the higher quality isolate and hydrolysate forms are easier to absorb preventing any digestion pitfalls.

A properly selected whey isolate contains high amounts of beta-lactoglobulin, alpha-lactalbumin, Glycomacropeptides, Immunoglobulins, Bovine Serum Albumin, Lactoferrin, Lactoperoxidase, Lysozyme and a high amino acid profile. All of these elements are very important to heavy training athletes, as these compounds can aid in reducing the risk of over training and aid in the digestion process. Whey isolate also gives a quick “boost” in aminos due to its easy and rapid digestion, especially useful in post training when the body needs those aminos to replenish itself. However, it is not a singular source of all the aminos needed to optimally repair broken down muscle tissue.

Quality whey protein isolate provides key microfractions, has a very high concentration of BCAAs for positive effect on lean muscle mass and lower muscle breakdown (whey protein contains about 25% BCAAs—the highest of any protein source), enhances glutathione levels in the body (glutathione is the body's most powerful natural antioxidant and is a key part of the immune system), features high digestibility and absorption rate, contains virtually no lactose and very low fat, and provides about 50% of the essential amino acids.

Hydrolyzed Whey Protein

The process of hydrolysis breaks the protein chains down into smaller segments called peptides. Hydrolyzed whey protein is more easily digested and has a reduced potential for allergic reactions versus non-hydrolyzed whey protein. The quality of the protein, however, remains very high. Sports nutrition products and infant formulas often use hydrolyzed whey protein for these reasons. A recent clinical study also found that a specific type of hydrolyzed whey protein was helpful in lowering blood pressure.

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Glutamine

Glutamine is the most abundant amino acid in the body, accounting for greater than 60% of the total intramuscular free amino acid pool. Virtually every cell in the body uses this non-essential amino acid. Glutamine is synthesized in both skeletal muscle and in adipose tissue in addition to the lungs, liver and brain. Because the body has the ability to produce glutamine it has long been considered a non-essential amino acid, which simply means the body has a mechanism to produce this powerful amino acid. However,

there is evidence that, during times of stress, the body cannot produce enough glutamine to keep up with demand which in turn can reduce performance, immune function and mood. As a result, glutamine has recently been classified as a conditional non-essential amino acid. Glutamine offers a significant benefit to exercising individuals and those looking to increase lean muscle mass and decrease body fat. Supplemental glutamine can help promote cell volumization, the phenomenon of drawing of water INSIDE muscle cells which can help increase muscle "fullness", increase protein synthesis (the making of proteins), and decrease proteolysis (the breakdown of protein).

Glutamine and overtraining

Intense physical exercise drains glutamine stores faster than the body can replenish them. When this occurs, the body breaks down muscles and becomes catabolic. There is evidence that supports glutamine supplementation for recovery, glycogen storage, synthesis of other amino acids and reduction of the catabolic effects of over-training. With reduced glutamine levels, performance and recovery are also compromised. It's been proven that glutamine levels in the serum are dramatically reduced following exhaustive exercise. Glutamine has also been shown to aid in recovery and recuperation in addition to boosting immune function. It accomplishes this as one of the building blocks for the body's most powerful anti-oxidant, glutathione, and may possibly cause extra growth hormone release with just a 4 gram oral dosage.

A strict and strenuous training program, which does not allow for enough recovery time, may cause an athlete to experience over-training syndrome (OTS). Researchers have effectively correlated OTS to amino acid imbalances. Decreased performance, decreased mood, and increased incidence of infections characterize these amino acid imbalances caused by OTS. Athletes who exercise extensively and are suffering from OTS may become immuno-suppressed. This can lead to increased infection and upper respiratory illness. In addition, recent clinical trials have shown that over-trained endurance athletes suffer from chronic low plasma glutamine levels. Maintaining normal levels of intramuscular glutamine is critical in preventing the breakdown of skeletal muscle and catabolism (the breakdown of muscle). There is also strong evidence that glutamine acts as an immuno-stimulant, which reduces the incidence of infection during training and racing. The best time to take a glutamine or glutamine peptide supplement is right after a hard exercise session since glutamine stores in muscle can be depleted up to 40% after exhaustive exercise.

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Branched Chain Amino Acids (BCAAs)

Low levels of branched chain amino acids (BCAAs) may contribute to fatigue so BCAAs should be replaced within two hours or less following exercise. These include the essential amino acids leucine, isoleucine, and valine. They are very popular among athletes and there is some research validating their use. Numerous research studies have shown these three key amino acids are extremely important to consume, especially during dieting and exercising (and according to one study, BCAAs are even more important when exercising in the heat). During exercise, the body uses a mix of glucose, fats, and even protein as a fuel source. When diet and carbohydrate intake is lower than normal, the percentage of protein the body uses for fuel (specifically Leucine, Isoleucine, and Valine) dramatically increases. The body will pull those needed amino acids from the continuously circulating pool of amino acids in the bloodstream. And if not replenished from an outside source, i.e. specific amino acid ingestion in the form of BCAAs, the body will breakdown other areas of the body in order to supply this pool. Studies have shown that subjects who consume an effective dose of BCAAs while endurance training have greater levels of lean muscle mass retention than control subjects who ingest a placebo (and typically *lose* muscle during the same dieting period). Additionally, BCAAs form antibodies that combat invading bacteria and viruses. The body cannot manufacture its own BCAAs, so they must be supplied through diet and supplementation. BCAAs have also been studied for their ability to improve exercise capacity in heat. In a 1998 study, subjects supplementing with BCAAs significantly improved moderate exercise performance in the heat.

BCAAs and Central Fatigue

Branched Chain Amino Acids are also associated with a syndrome termed *central fatigue*. Following exhaustive exercise, BCAAs are depleted from the working muscle and from the circulating pool of amino acids. This depleted state causes an imbalance of the BCAA to Tryptophan (another amino acid) ratio. . When BCAAs are low, Tryptophan (a precursor to serotonin) is more readily available and can cause increases in serotonin. Low levels of BCAAs cause an increase in serotonin, which causes a feeling of sleepiness and lethargy. It is this imbalance that can cause an athlete to become lethargic and almost sleepy. Supplementing with higher levels of BCAAs will help stop the Tryptophan/serotonin mechanism. All whey protein supplements contain Tryptophan, however only some will actually disclose an amount on the label. An effective supplement should contain at least three grams of BCAAs and minimal levels of tryptophan.

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Cortisol

Cortisol, known as the regulator of immune response, is a hormone controlled by the adrenal cortex. This powerful hormone is also known as an adrenalcorticol hormone, a glucocorticoid and hydrocortisone or simply cortisone. Cortisol has a catabolic (muscle breakdown) effect on tissue and is associated with a decrease in anabolic (muscle growth) hormones like IGF-1 and GH. Thus reducing levels of cortisol is ideal for an athlete to achieve tissue growth and positive adaptations to exercise training. Playing many different roles in the body, cortisol can have a negative impact on sleep, mood, sex drive, bone health, ligament health, cardiovascular health and athletic performance, potentially causing fatigue and inflammation. Its primary functions are to increase protein breakdown, inhibit glucose uptake and increase lipolysis (the breakdown of fats).

While cortisol in normal amounts is necessary for proper metabolic function, a chronic elevated cortisol level has adverse effects on health, mood, body composition and performance. Elevated cortisol secretion from physical or mental stress causes fat, protein and carbohydrates to be rapidly mobilized in order for the body to take action against the stressor. This is sometimes referred to as the 'fight or flight' response. The mobilization of these nutrients in addition to epinephrine and a number of other endocrine hormones allows the body to take quick action when presented with stress. During this mobilization, cortisol and adrenaline increase while DHEA (Dehydroepiandrosterone) and testosterone decrease. A chronic elevated cortisol level causes the body to enter a state of constant muscle breakdown and suppressed immune function, increasing risk of injury while reducing muscle.

It is only with chronic elevated cortisol levels that performance will suffer, but the effect is dramatic. Excess cortisol suppresses the immune system, producing a greater risk of upper respiratory infections and depressed levels of testosterone. On top of that, the body will be in a catabolic state -- breaking down muscle and storing fat. In addition to reducing muscle and getting sick, suppressed testosterone means suppressed recovery. Aerobic and anaerobic muscle fibers need time to repair and recover from hard workouts to improve their capacity to exercise. Elevated cortisol and suppressed testosterone do not allow maximized recovery, leading to slower performance gains. A Swiss study of elite male cyclists suggested that ratios of anabolic to catabolic hormones (ie. testosterone/cortisol or IGF-1/cortisol) may be useful markers for the detection of overtraining (Hug et al. 2003). In fact, scientists use this Free Testosterone/Cortisol ratio to evaluate an athlete's training state. A ratio where cortisol is elevated

indicates overtraining, so the modulation of this ratio can be key for those athletes who are susceptible to overtraining.

A literature review of hormonal responses to exercise by Steinacker et al. (2003) suggested that with glycogen deficiency, cortisol levels are elevated and induce a “myopathy-like state” in skeletal muscle. And it’s not only what is eaten but when. Breakfast is a necessity, which will help regulate blood sugar and cortisol prior to workouts. In a recent paper by Dr. Mark Davis and Dr. Adrienne Brown, it was clearly demonstrated that ingesting carbohydrates during exercise modulates many of the endocrine hormones, including cortisol. To ensure that glycogen stores are not depleted, carbohydrates should be ingested while exercising along with a high quality recovery drink with high levels of carbohydrates immediately following exhaustive exercise. The bottom line: endurance training should not be attempted on a high protein, low carbohydrate diet.

A high dose of B vitamins and calcium can help regulate the endocrine hormones necessary for proper cortisol control. Supplementing with 4+ grams of branched chain amino acids (BCAAs) and 6+ grams glutamine following exhaustive exercise can have a dramatic effect on cortisol. In fact, in a 25-week study of intercollegiate swimmers the group supplementing with BCAAs and glutamine showed a significant decrease in serum cortisol. A study done by Stone entitled “Effects of Vitamin C on cortisol and the Testosterone: cortisol ratio” showed a decrease in cortisol levels in 17 junior elite weight lifters. This study also showed that the individuals taking vitamin C (an extra gram a day) improved their testosterone to cortisol ratio by over 20%. This type of decrease in cortisol can lead to increased muscle and connective tissue hypertrophy and enhanced recovery from training. Since vitamin C also decreases the chance of suffering from a cold or flu infection by 30% and may aid in collagen synthesis, it would be wise to take some extra vitamin C when involved in an intense training program. Beta-Carotene, which is often times used for healthy skin function, may also minimize cortisol levels according to Dr. Sapse. He suggested this in an abstract he presented at the 1997 conference on cortisol and anti-cortisols.

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Antioxidants

Through training as athletes more oxidative stress is caused than in the average individual. In fact, studies have shown that endurance and strength training athletes produce more free radicals than sedentary individuals. This oxidative stress not only causes damage to cells and DNA, it may also limit aerobic capacity. Antioxidant supplementation helps maintain the integrity of cell membranes, allowing oxygen to be carried more efficiently and effectively to the working muscles. Damage to membranes may compromise the blood's oxygen carrying capacity, negatively affecting aerobic performance. Antioxidants like vitamin C also have powerful immune enhancing properties, beneficial because intense exercise may cause a suppressed immune system in athletes. For example, after an intense aerobic bout phlegm and coughing may last a few hours or a few days. Vitamin C may help combat this suppressed immune function allowing an athlete to train at a higher level day in and day out.

Because of the wide variety of reactions in which vitamin C plays a role, many structure/function claims can be made for supplements. Perhaps the most well known function of vitamin C is as one of the key nutritional antioxidants – where it protects the body from free radical damage. As a water-soluble vitamin, ascorbic acid performs its antioxidant functions within the aqueous compartments of the blood and inside cells and can help restore the antioxidant potential of vitamin E (a fat-soluble antioxidant).

Vitamin C is thought to strengthen the cell membrane, thereby preventing the viruses from entering the cell. In addition, vitamin C supports immune cell function, an effect which may help fight infections in their early stages. The combined effects of cellular strengthening, collagen synthesis and antioxidant protection are thought to account for the multi-faceted approach by which vitamin C helps to maintain health.

A number of smaller targeted studies, however, in subjects under heavy acute physical stress, show that vitamin C decreases common cold incidence by half. In other studies, healthy subjects consuming low levels of vitamin C (below 60 mg/day), have a cold incidence that is about one-third lower following vitamin C supplementation. Vitamin C, mainly known for its antioxidant properties and ability to fight infection, may also have some anti-cortisol effects (*see cortisol section*).

Vitamin E

Several studies published over the last 2-3 years have clearly shown that natural vitamin E, the "d-" form, is 2-3 times more bioavailable than synthetic "d-" vitamin E. The natural form of the vitamin is extracted from vegetable oils, mostly from soybeans, which are cheap and plentiful in the United States. Synthetic vitamin E, in contrast, is manufactured from chemicals related to petroleum products, resulting in a chemical mixture in which only one eighth of the mixture is the powerful "d-" isomer.

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Electrolytes

Electrolytes, the mineral salts that conduct the electrical energy of the body, perform a cellular balancing act by allowing nutrients into the cell, while excreting waste products. Certain elements, sodium, chloride, magnesium, calcium and potassium, play a primary role in cellular respiration -- that of muscle contraction and nerve impulse transmission. It is at the cell membrane where these electrolytes conduct electrical currents similar to nerve impulses. Not only is it critical to get adequate amounts of each of these electrolytes, it is equally important to get these in the correct ratio.

Sweat

Endurance performance in heat is normally lower in warmer temperatures than cooler temperatures. Here's why: in order to control an excessive rise in body temperature, the blood flow to the skin increases in order to dissipate heat to the environment. This shift of blood to the skin will result in a lesser proportion of blood, and hence oxygen, being delivered to the working muscle. So, in warmer temperatures the body has to slough off more heat through sending more blood to the skin, which results in less blood and oxygen in muscles. In some individuals the circulatory adjustments may not be adequate and the body temperature will rise rapidly, leading to hyperthermia (excessive body heat). About 99% of sweat is water, with a number of major electrolytes found in varying amounts. Since sweat is derived from the extracellular fluid (fluid outside the cell) the major electrolytes found are sodium and chloride. The concentration of salt in sweat is variable, but averages about 2.6 grams per liter of sweat loss. Potassium, magnesium, calcium, iron, copper, zinc, amino acids and some of the water-soluble vitamins can also be found in sweat.

Sodium and Chloride

Sodium is one of the principle positive ions in the body's fluid and is found primarily outside the cell (extracellular). Chloride, another extracellular electrolyte, has a negative ion and works closely with sodium in the regulation of body-water balance and electrical impulses across the cell membrane. Consuming adequate amounts of sodium chloride, more commonly known as table salt, is crucial to maintaining the volume and balance of fluids outside the body's cells, including in blood. Sodium is especially important because it plays a key role in transporting nutrients into cells to be used for energy production, tissue growth, and repair. Sodium also assists in muscle contraction and nerve impulse transmissions. During exercise, the body loses fluids and sodium through sweating. This causes a decrease in blood volume, thereby increasing sodium and chloride concentrations in the blood. The increased concentration of electrolytes in the blood through decreased blood volume is what triggers the thirst mechanism. By the time thirst results, electrolytes are already out of balance, so restoration of blood volume is critical for the prevention of dehydration. Water consumption is effective in increasing blood volume, however there is a consequential dilution of sodium in blood due to the increased blood volume and excessive sodium losses in sweat, so electrolyte replenishment is key. Drinking fluids with added sodium instead of just plain water is the best option, particularly when exercise bouts last longer than one hour.

Potassium

Potassium, the main electrolyte found inside the body's cells (intracellular) and stored in muscle fibers along with glycogen, plays a key role by helping transport glucose into the muscle cell. Potassium also interacts with both sodium and chloride to control fluid and electrolyte balance and assists in the conduction of nerve impulses. When glycogen breaks down to supply energy for your workouts, muscle cells are depleted of potassium. As a result, there is a greater concentration of potassium in blood and greater quantities are lost in the urine. Symptoms of potassium depletion include nausea, slower reflexes, irregular heartbeat, drowsiness, and muscle fatigue and weakness. Although potassium deficiencies are rare, they may occur under certain conditions -- during fasting, diarrhea and when using diuretics. Replenishing potassium after loss during exercise is important, but hyperkalemia (high serum potassium levels) can cause electrical impulse disturbance and possible death. Individuals should never take potassium supplements in large doses without the advice of a physician.

Calcium

An electrolyte that may be overlooked, calcium's major source in the human body is the skeleton. Besides building teeth and bones, calcium is needed by many other cells to perform a variety of functions in the body: contraction and relaxation of muscle, nerve conduction, secretion of hormones, enzymatic reactions, and blood coagulation. Calcium plays a central role in both the synthesis and breakdown of muscle glycogen and liver glycogen. Blood calcium levels are tightly regulated by hormones at the expense of bones. Many do not realize that bones are constantly being broken down and rebuilt thru the processes of resorption and formation. The National Academy of Sciences recommends the following calcium intake levels for different age groups: 500mg for 1-3 year olds, 800mg for 4-8 year olds, 1,300mg for those aged 9-18, 1,000mg for ages 19-50 years, and 1,200mg for those over 50 years of age. Dairy products like milk, cheese and yogurt are excellent sources of dietary calcium because they are also fortified with vitamin D which is necessary for optimal absorption of calcium into the body. Dietary sources of calcium are generally better absorbed than calcium supplements. Unfortunately, many adolescents and athletes tend to avoid dairy products in the pursuit of cutting out fat from their diet. Now there are many non-fat and low fat dairy products available. Low serum levels of calcium can cause a number of problems, including muscular cramping due to an imbalance of calcium in the muscle and surrounding fluids. Muscular contraction and exercise performance in active individuals is also compromised with low serum calcium. In addition to calcium intake, athletes should be aware that weight-bearing exercise is beneficial the maintenance of a healthy skeleton. A common test to assess skeletal health and risk for osteoporosis (a disease of bone loss that increases one's risk for bone fractures) is a bone mineral density (BMD) measurement. Non-weight bearing sports like bicycling and swimming have been associated with bone mass similar to or below that of normal sedentary people

Magnesium

Magnesium is an element found in every cell in the body, with the largest concentrations found in the bones, muscles, and soft tissues. Magnesium forms part of 300+ enzymes involved in nerve impulse transmission, muscle contraction, and ATP (or energy) production. Increased levels of exercise deplete the body's stores of magnesium so it is crucial to replenish what is lost. Magnesium helps regulate the synthesis of protein and other compounds such as 2,3-DPG, which is essential for optimal oxygen metabolism. Investigators suggest that prolonged exercise increases magnesium losses from the body via urine and sweat. Signs of magnesium depletion include dizziness, muscle weakness, fatigue, irritability, and depression.

Resources

www.nationaldairycouncil.org

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How to use Ultragen

The last hour

It is in the last hour of training that performance gains are made. An athlete's ability to push his/her body above and beyond what is comfortable is what causes physiological changes, which result in faster athletes. It is also critical to have the ability to fully recover from these efforts in order to train well the next day. Being deficient in glycogen, glutamine, BCAAs, fluid, and electrolytes during this last hour not only minimizes the level to which the body can be pushed, it also adds considerably to the damaging effects of cortisol. If fueled properly during this "last hour" the body will withstand greater intensity while minimizing the harmful damage that can occur.

1-2 hour workouts

If properly fueled prior to and during the workout or race, use a full serving of Ultragen immediately following an exercise bout. Ultragen delivers fast sugars, easily digested proteins, glutamine, BCAAs, electrolytes and antioxidants to provide full recovery and the ability to train at the same intensity the next day.

3+ hour workouts

During workouts or races longer than 3 hours, there is a significant loss of key recovery nutrients. Glycogen, protein, glutamine, BCAAs, and electrolytes are all diminished considerably and will hinder the body's ability to finish strong and recover. Using a full serving of Ultragen with one hour to go in a workout will not only begin the recovery process, it will allow a stronger finish. Ultragen's highly absorbable formula of high glycemic carbohydrates and low molecular weight proteins, in addition to the high levels of electrolytes, glutamine, BCAAs and antioxidants, provide an easily digestible drink with all the necessary components to sustain through the finish. Take a second serving of Ultragen immediately following the workout.

Ultragen Q & A

Q: How does Ultragen work?

A: Ultragen's many components are designed to work synergistically in order to fully maximize recovery, providing clinically effective doses of the right nutrients to the right place at the right time. Each serving of Ultragen delivers clinically effective doses of the most advanced proteins available, the fastest-acting carbohydrates, glutamine, BCAAs, antioxidants, vitamins, minerals and electrolytes. In addition, Ultragen integrates the latest nutritional technology in order to maximize recovery and provide the right nutrients to the right place during the 30-minute "window of opportunity" following exercise.

Q: What is the 30-minute glycogen "window of opportunity?"

A: Research has shown that there is a critical 30 minute glycogen window (called the "window of opportunity") immediately following exercise when insulin sensitivity is at its highest and exhausted muscles essentially open the door to nutrients. In order to maximize this opportunity it is critical to use fast sugars like dextrose which help shuttle nutrients into the cell. It is equally important to make sure all ingredients are absorbed quickly.

Q: When should I use Ultragen?

A: During the last hour of a workout or race to ensure maximum performance with minimal damage; immediately following a 1-2 hour workout for maximum recovery (provided the body has been properly fueled during the workout); and during the last hour as well as immediately following a workout longer than three hours to ensure a strong finish and solid recovery.

Q: Can I take Ultragen during racing and training?

A: The proteins, glutamine, BCAAs and electrolytes in Ultragen will fuel the body with what it needs to finish strong in long races. The high calories, high glycemic carbs, fast proteins and high levels of all 5 electrolytes make Ultragen the best "during" drink on the market, even though it's designed for post-recovery applications. Everything in Ultragen is absorbed super fast and hence is very easily digested. Too many other drinks are developed as complex carbohydrate mixes that have a number of different sugars and hence are absorbed at different rates. Dextrose is the fastest absorbing sugar available and Ultragen has 100% dextrose as the carbohydrate source. An entire 12 ounce serving can be ingested during a race without resulting in a feeling of fullness during the ride. However, it is recommended that a serving of Ultragen be taken during the second half of a long workout before using it in a race.

Q: Why does Ultragen mix so well compared to other recovery drinks?

A: Ultragen is an advanced formulation with technically superior ingredients. The low molecular weight proteins are engineered using cross-flow micro-filtration, a process that retains all the protein and beneficial microfractions and minimizes any fats and carbohydrates. This technology results in a protein which dissolves better in water. The entire Ultragen formula is manufactured using a process called agglomeration, a process which improves each molecule's ability to dissolve in water, making the powder spoon-mixable. The most important thing to note is that a powder's dissolvability is directly proportional to its ability to be absorbed by the stomach. If it clumps in a glass it will also clump in your stomach. Clumps in the stomach slow down absorption and cause gastric distress. Drinks which are already fully dissolved in a liquid will be more completely absorbed and will minimize any gastric distress.

Q: What kind of proteins are in Ultragen?

A: Ultragen is formulated using a unique time-responsive protein matrix to maximize absorption through the entire spectrum of recovery time. Whey Protein Hydrolysate (WPH) is a pre-digested, small molecular weight complete protein and the fastest protein absorbed due to its small size and pre-digested peptide chains. Ion exchange Whey Protein Isolate (WPI) is also a low molecular weight protein, absorbed more slowly than WPH. Milk Protein Isolate (MPI), fully absorbable due to the unique quality of its isolate (which removes carbohydrates and fats), is absorbed more slowly than both WPH and WPI. Combining these three proteins allows the faster WPH and WPI to be absorbed during that critical first 30 minutes, and the slower MPI to remain and deliver the appropriate building blocks for slower processes. For more detail

on Protein and what it means to endurance athletes, visit the First Endurance Protein Newsletter at <http://www.firstendurance.com/newsletter.html>

Q: Why don't you use soy protein?

A: Though Soy Protein Isolate is a high quality protein, some athletes are weary of isoflavones found in Soy. These isoflavones have some estrogenic activity that concerns some male athletes. Using PER and BV, two measures of a protein's effectiveness, whey scores higher than soy on both marks. For more detail visit the First Endurance Protein Newsletter <http://www.firstendurance.com/newsletter.html>

Q: Does Ultragen contain lactose?

A: Ultragen uses technically advanced proteins which undergo cross-flow micro-filtration in order to remove fats and carbohydrates. Lactose intolerant individuals will be able to consume Ultragen with no problem.

Q: Besides protein, what else is in Ultragen's formula?

A: In addition to clinically effective doses of the most advanced proteins available, each serving of Ultragen delivers the fastest-acting carbohydrates, glutamine, BCAAs, antioxidants, vitamins, minerals and electrolytes.

Q: What does L-Glutamine do?

A: Glutamine is an amino acid that supports glycogen and protein synthesis and increases nitrogen retention. At a clinically effective dose of 6 grams, Glutamine is essential for muscle tissue repair and recovery. For more detail on Glutamine and what it means to endurance athletes visit the First Endurance Glutamine newsletter at <http://www.firstendurance.com/newsletter.html>

Q: Why are BCAAs important for endurance athletes?

A: BCAAs are the building blocks of the body, important for muscle growth & recuperation. In addition to building cells and repairing muscle tissue, BCAAs form antibodies that combat invading bacteria & viruses. The body cannot manufacture its own BCAAs so they must be supplied through diet and a supplementation routine. BCAAs also combat 'central fatigue' brought on by an imbalance in the BCAA-to-Tryptophan ratio. It is this imbalance that results in feeling tired and lethargic following long hard efforts.

Q: I've heard it's important for endurance athletes to have higher levels of antioxidants, vitamins and minerals. Is this true?

A: Absolutely. Athletes, especially endurance athletes, need higher levels of specific vitamins, minerals and electrolytes to help restore energy levels, fight free radicals and maintain a healthy immune system. Keeping in mind that free radicals have one or more unpaired electrons, an antioxidant is a nutrient that offers an electron-rich binding site for these damaging oxidants, giving them a preferential site to bind to and pair up with missing electrons. Even the oxidation damage caused by the air we take in can be overcome with proper antioxidant protection. Supplements like vitamins C & E and selenium also offer sites for antioxidation, thereby reducing the damage from oxidative stress. Oxidative stress is unavoidable as a living human, but of special concern to endurance athletes -- cycling on long roads, running trails and swimming in the open water - is the greater oxygen demand faced, which compounds normal cell damage. For more detail on Antioxidants and what they mean to endurance athletes, visit the First Endurance Antioxidant newsletter at: <http://www.firstendurance.com/newsletter.html>

Q: What are high-glycemic carbohydrates and why are they important?

A: Based on a 50g-portion size, the glycemic index (GI) of a carbohydrate represents the magnitude of the increase in blood sugar that occurs after ingestion of the carbohydrate. What glycemic index does not define is the portion size of the carbohydrate meal ingested (whether the portion size is 5g or 500g, the GI is not affected), but portion size can affect blood sugar. Carbohydrates with a higher GI cause a higher rush of sugar into the blood than carbohydrates with low GI. Elevated blood sugar causes insulin to be secreted to help modulate the sugar and subsequent sugar crash follows. Glycemic Load measures the GI multiplied by the total carbohydrate content giving a more practical and accurate determination of blood sugar response. For more detail on how to use GI for endurance training visit the First Endurance Carbohydrate Newsletter at <http://www.firstendurance.com/newsletter.html>

Q: It seems like the trend these days for “during” drinks is low-glycemic composition. Is that just hype or what?

A: By definition, low-glycemic means there is not a rush of sugar into the blood stream. Low-glycemic foods may work well during a ride if the body is well below its threshold. This steady slow release of sugar into the blood stream may actually slow gastric emptying and cause both gastric distress AND dehydration. As a body’s HR increases further into a ride, the body needs glucose (normally it will take this glucose from stored glycogen). As glycogen is depleted, working muscles are fed glucose directly from what’s in the blood or the body starts burning stored protein and fat. If the body is forced to burn stored protein and fat, exercise capacity will be quickly diminished and lactic acid accumulation will increase. The body must be fed glucose so it is quickly absorbed and quickly available in the blood stream to use as fuel. This is why Ultragen is not recommended for use early in a ride OR on long easy rides where the body’s HR is well below threshold. In the latter part of a ride, or an hour before a sprint finish or hill finish, Ultragen works most effectively. Not only is 100% of the sugar from glucose (dextrose), all the other ingredients including low molecular weight proteins, glutamine, BCAAs and electrolytes are designed to be digested very fast. Not only is needed glucose provided, all the other key nutrients that can diminish your capacity to exercise are being replenished. And, because everything is digested so easily and quickly, there is no gastric distress or heavy feeling in the gut. For more detail on Glycemic index and what it means to endurance athletes, visit the First Endurance Carbohydrate newsletter at: <http://www.firstendurance.com/newsletter.html>

Q: Is there a time when I should consume low-glycemic food?

A: Low glycemic foods are great as a pre-exercise meal, since they have the ability to stabilize blood sugar. For more detail on Glycemic index and what it means to endurance athletes, visit the First Endurance Carbohydrate newsletter at: <http://www.firstendurance.com/newsletter.html>

Q: Is Ultragen legal?

A: First Endurance is committed to developing the most advanced endurance supplements on the market. First Endurance has taken additional measures to ensure that its products are safe, legal and stimulant-free. First Endurance supplements are legal to use in any sporting event governed by the World Anti-Doping Association (WADA), the US anti-doping association (USADA) and by the UCI (Union Cycliste International). One or more of the aforementioned governing bodies govern all US Cycling, International Cycling, US Triathlon and International Triathlon. For more information on Banned Substances, visit the First Endurance Banned Substances newsletter at: <http://www.firstendurance.com/newsletter.html>

Q: How many servings are there in a container of Ultragen?

A: There are 15 servings in each container of Ultragen.

Q: What flavors are available?

A: Ultragen is available in Tropical Punch.