PRERACE

RESEARCH PACKET **Rev. 1.4 June 2007**

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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

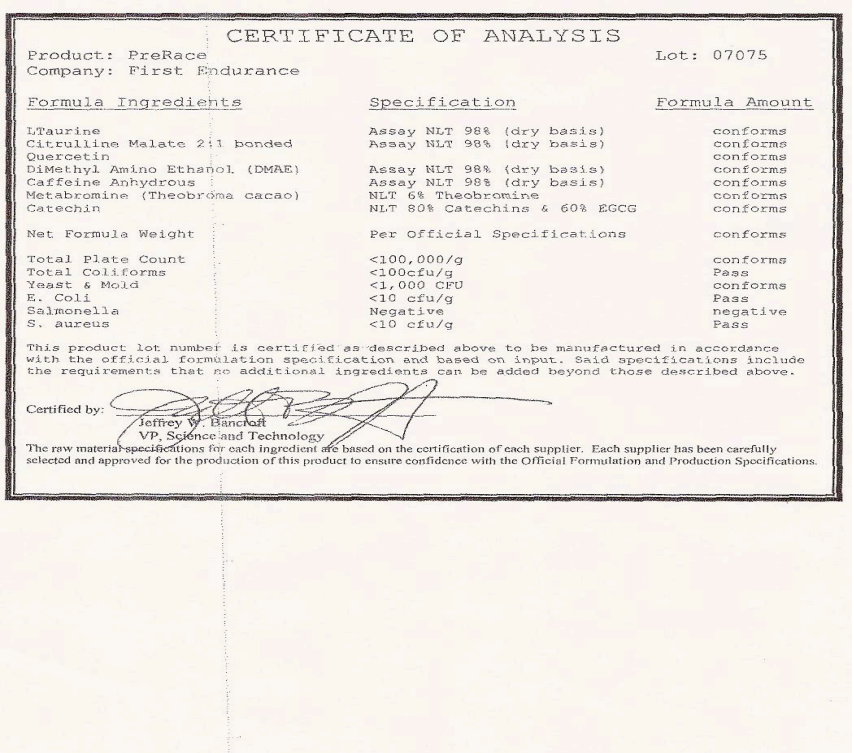
Research is the most important value at First Endurance. We are driven by a desire to ensure our products are proven to enhance endurance performance and have scientific validation. At First Endurance, we refuse to reduce costs by using "pixie dust" amounts of ingredients just to dress up the label. 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. *PreRace* 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 *PreRace* formulation.



CERTIFICATE OF ANALYSIS

Product: PreRace — Lot: 07075
Company: First Endurance

Formula Ingredients	Specification	Formula Amount
LTaurine	Assay NLT 98% (dry basis)	conforms
Citrulline Malate 2:1 bonded	Assay NLT 98% (dry basis)	conforms
Quercetin		conforms
DiMethyl Amino Ethanol (DMAE)	Assay NLT 98% (dry basis)	conforms
Caffeine Anhydrous	Assay NLT 98% (dry basis)	conforms
Metabromine (Theobroma cacao)	NLT 6% Theobromine	conforms
Catechin	NLT 80% Catechins & 60% EGCG	conforms
Net Formula Weight	Per Official Specifications	conforms
Total Plate Count	<100,000/g	conforms
Total Coliforms	<100cfu/g	Pass
Yeast & Mold	<1,000 CFU	conforms
E. Coli	<10 cfu/g	Pass
Salmonella	Negative	negative
S. aureus	<10 cfu/g	Pass

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 requirements that no additional ingredients can be added beyond those described above.

Certified by:
Jeffrey V. Bancroft
VP, Science and Technology

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

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

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

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

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

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

UCI Banned Substance List
WADA
USADA

Use Directions: Mix one heaping scoop into EFS or your favorite pre-exercise drink. Consume 30 to 45 minutes before exercise. Begin use with one half the recommended dose to assess your tolerance. Improper use may be hazardous to a person's health.

Supplement Facts
Serving Size: 1 scoop (4800mg) or 1.5 tsp or 6cc or 6ml
Servings per Container: n/a

Supplement Facts Serving size	Amount Per Serving	%DV*
L-Taurine	3000mg	
Citrulline Malate bonded 2:1	1000mg	
Quercetin	350mg	
Neuro Stimulant Proprietary Blend: DiMethyl Amino Ethanol, Caffeine Anhydrous†, Metabromine, Catechin	570mg	
Malic Acid (from Citrulline Malate)	300mg	

*Daily Value Not Established
**Percent Daily Values are based on a 2,000 calorie diet.

† Provides 200mg Caffeine

About *PreRace* Pre-Exercise Supplement

PreRace is designed to help endurance athletes improve performance. This revolutionary pre-exercise supplement is formulated with a mental acuity component comprised of DiMethyl Amino Ethanol (DMAE), metabromine and catechin, which combine to deliver a clear mental focus prior to exercise. Citrulline Malate and L-Taurine improve cardiac output, stimulate the nitric oxide (NO) system and clear lactate. The proprietary formula works synergistically with quercetin (a powerful antioxidant that improves time to exhaustion in endurance athletes) and 200mg of caffeine. *PreRace* comes as a flavor-free powder which can be added to any pre-exercise or during exercise drink, like EFS.

Physiological Adaptations

1) Enhances oxygenation of muscles
2) Increases muscle stamina
3) Increases nutrient absorption by blood
4) Improves time to exhaustion
5) Increases maximal workload
6) Improves oxidative ATP

Biochemical Processes

1) Enables significantly enhanced production of nitric oxide
2) Improves cardiac output
3) Augments vasodilation
4) Improves mitochondrial respiration
5) Stimulates removal of metabolic toxins (lactic acid, ammonia)

Citrulline Malate (2:1 Bonded)

CM is a mixture of citrulline, an amino acid involved in the urea cycle, and malate, a tricarboxylic acid cycle intermediate. Circulating levels of citrulline is directly related to endogenous argininie synthesis, possibly to an even greater degree than supplementing with straight argininie. Citrulline malate has been shown to significantly increase aerobic capacity, ATP production and PhosphoCreatine recovery after training, therefore reducing lactate and providing substrate for the aerobic energy production pathway. Early studies have also shown an antiaesthenic (resistance to muscle fatigue) effect.

Studies indicate that CM is involved in three physiological roles: 1) stimulates nitric oxide; 2) removes toxins; and 3) reduces lactic acid and ammonia. Therefore, citrulline malate may be useful for all athletes in maintaining energy levels, improving recovery, enhancing exercise performance and fatigue resistance.

Stimulates Nitric Oxide

In the body, nitric oxide (NO) serves several roles, mainly involving small blood vessels. Nitric oxide is synthesized from L-arginine and oxygen by various nitric oxide synthase (NOS) enzymes. The compounds are converted to nitric oxide, which in turn dilates the coronary artery thereby increasing its blood supply. Nitric oxide also serves as a neurotransmitter between nerve cells. Unlike most other neurotransmitters that only transmit information from a presynaptic to a postsynaptic neuron, the small nitric oxide molecule can diffuse all over and can thereby act on several nearby neurons, even on those not connected by a synapse. Nitric oxide is an important non-adrenergic, non-cholinergic (NANC) neurotransmitter in various parts of the gastrointestinal tract. In the stomach, it increases the capacity to store food and fluids.

The fact that nitric oxide increases blood flow should make it of interest to endurance athletes, as increased blood flow will serve to deliver more nutrients to muscles, thus helping muscles become more resistant to stress. The stimulation of NO has also been found to increase glucose transport in skeletal muscle significantly (Balon et al., 1997). The fact that nitric oxide acts to reduce inflammation should also make it of interest to endurance athletes as it has the potential to reduce the pain associated with subjecting muscles to extreme stress.

Removes Toxins

Citrulline acts to remove endotoxins such as lactic acid build up and ammonia by acting as an intermediary in the urea cycle. These endotoxins impair overall exercise performance and are produced by the body in response to intense physical exercise, protein metabolism and catabolic states.

Citrulline supplementation rapidly speeds up the removal of lactic acid and ammonia (waste products) from working muscles, resulting in better performance from the working muscle tissue. Ultimately, athletes can train harder and recover faster with each and every workout (Goubel F et al., 1997).

Reduces Lactic Acid and Ammonia

Research has demonstrated that citrulline malate has a protective effect against increased blood acidity and protects against ammonia poisoning. This study showed CM significantly increased bicarbonate (an acid buffer that soaks up lactic acid molecules), which allows exercise at a higher level before the negative effects of acidity affect exercise performance (Callis et al., 1991). Further studies showed supplementation with citrulline malate increases the rate of ammonia clearance without affecting ammonia accumulation during bicycle exercise (Vanuxem et al., 1990). This is because citrulline is involved in the urea cycle and therefore plays a role in the detoxification of ammonia.

CM positively influences the lactic acid metabolism leading to improved endurance performance. Healthy male subjects participated in a cycle ergometer study designed to determine CM's effect on a) aerobic-anaerobic threshold; b) blood lactate accumulation; and c) 30 minute post-exercise blood lactate recovery.

Two maximal cycling tests were performed with one group ingesting CM and another group ingesting a placebo. Aerobic-Anaerobic threshold was significantly higher in the CM group and 27% of subjects were able to achieve a higher maximal workload on the second test. (Janeira MA, 2006).

The human study done by Benedahan et al., 2002, demonstrated the great potential of citrulline malate supplementation to enhance aerobic performance. The most important finding of their research was significantly more energy produced aerobically (34% increase). But they also found a significant reduction in the sensations of fatigue and that rate of recovery, as measured by the rate of phospho-creatine recovery, improved by 20%. The researchers concluded that the increased aerobic ATP production, together with a reduced proportion of anaerobic energy supply, may contribute to the lower levels of fatigue experienced by the subjects (Benedahan et al., 2002).

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L-Taurine

Taurine in the pharmaceutical and lab setting is synthesized through a combination of cysteine, methionine and vitamin E. It is naturally produced in testicles of many mammals. The major pathway for taurine synthesis occurs in the liver via the cysteine sulfinic acid pathway, which then acts as a metabolic transmitter, has a detoxifying effect and strengthens cardiac contractility. Taurine is defined as a non-essential amino acid and is found in high concentrations in the white blood cells, skeletal muscles, central nervous system as well as the heart muscles. In adults, but not children, this nutrient can be manufactured from methionine in the body and from cysteine in the liver.

This sulfur-containing amino acid functions with glycine and gamma-aminobutyric acid as a neuroinhibitory transmitter. At times of extreme physical exertion, the body no longer produces the required amounts of taurine and a relative deficiency results – essentially, in long exhaustive exercise taurine concentrations are significantly reduced. These reductions in taurine concentration can lead to decreased physiological parameters and performance (Manabe et al. 2003).

Through its cardio and oxidative protective roles, oral administration of taurine can improve exercise performance significantly. Furthermore, pre-exercise taurine administration can reduce muscle damage caused by endurance training. Researchers also theorize that it is through the cellular protective properties that taurine attenuates exercise-induced DNA damage and enhances the capacity of exercise.

In a study performed by Zhange et al, 11 healthy-aged men participated in two separate cycle ergometer tests supplementing orally with taurine prior to exercise. The study results showed significant increases in VO2max, exercise time to exhaustion and maximal workload. Following exercise, the increase in taurine concentration correlated positively with exercise time to exhaustion and maximal workload (Zhang et al, 2004).

Endurance-trained subjects performed an exhaustive bout of endurance exercise at three different times. Subjects were placed into three groups: caffeine and taurine, caffeine with no taurine, and a placebo. In this double-blind placebo-controlled study, the subjects ingesting the caffeine and taurine drink showed improved cardiovascular stroke volume (Baum M Weiss M, 2001). The authors of this study claim this was due to a reduced endystolic diameter and volume.

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Malic Acid

Malic acid is the only metabolite of the Krebs Cycle which falls in concentration during exhaustive physical activity. Malic acid is involved in the production of energy in the body under both aerobic and anaerobic conditions. During anaerobic conditions, malic acid has an ability to remove the accumulation of reducing equivalents. Human studies have shown that after endurance training, athletes' muscles were characterized by a 50% increase in the malate-aspartate redox shuttle enzymes. In both animals and humans, when there is an increased demand for ATP there is an additional demand and utilization of malic acid. Malic acid stimulates oxygen consumption by increasing mitochondrial uptake of other substrates. It also stimulates the removal of components that build up under hypoxic conditions and inhibit ATP production (Wu J et al 2006).

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Neuro-Stimulant: Metabromine-Caffeine-Catechin-DMAE

This proprietary combination is designed to enhance performance through a neurological stimulus improving clarity, focus and concentration. The combination of theobromine, caffeine, and catechin (from green tea and DMAE) works synergistically to elevate mood and enhance performance.

Metabromine

Metabromine, derived from the seed of the cacao tree (*Theobroma cacao*), contains procyanidins, theobromine and caffeine – which are natural methylxanthines. Metabromine's mechanism of action results from the combination of caffeine, theobromine and procyanidins. The standardized levels of theobromine and caffeine produce a mild stimulating effect without over-stimulation of the central nervous system. Theobromine is the primary alkaloid found in cocoa and chocolate, and is one of the causes of chocolate's mood-elevating effects. Research indicates a possible interaction of the methylxanthines with the procyanidins which promote a sustained energizing effect.

Theobromine is well documented as a vasodilator as well as having mild stimulant effects (Mumford, 1994). It is extremely well tolerated in humans at doses as high as 0.8 to 1.5 g of the pure compound (IARC monographs). Theobromine has very different effects than caffeine on the human body; it is a mild, lasting stimulant with a mood improving effect, whereas caffeine has a strong, immediate effect and increases awareness. Simultaneous increases in lipid and carbohydrate oxidation is believed to mediate the caffeine-induced stimulation of energy expenditure (Bracco, et al, 1995). Research has also shown that caffeine decreases the reliance of glycogen during exercise and increases endurance, possibly by a direct effect on adipose tissue and active muscle.

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Caffeine

Caffeine stimulates the central nervous system (CNS), increases the release of adrenaline, increases the use of body fat as fuel and spares glycogen. Adrenaline release is accomplished through caffeine's effect on epinephrine and nor-epinephrine. Many athletes seek this CNS excitatory response to increase alertness and to give them the extra 'energy' needed for their workouts. More importantly, caffeine mobilizes free fatty acids (FFA) in the blood. Increased FFA in the blood allows the body to use fat as a fuel source. The use of fat as fuel allows the body to spare glycogen (carbohydrates) for later use in exercise.

Kovacs et al. (1998) studied well-trained cyclists. The results of this study support the use of caffeine during competition to improve performance. In this study, 15 cyclists ingested different levels of caffeine in addition to a carbohydrate-electrolyte drink during a time trial. The highest caffeine doses (225 and 320 mg) resulted in a 5% increase in power relative to control trials without caffeine (308 + 9 W and 309 + 10W versus 295 + 9W, respectively). The amount of caffeine ingested during this study was relatively small, and yielded caffeine concentrations in the urine of less than 5 mg/L for the participants.

Another recent study by Cox et al. (2002) supported the use of caffeine both before and during cycling performance. This study involved a cycling time trial which occurred after 2 hours of steady state cycling at 70% of VO_2max. Several different patterns of caffeine ingestion were utilized, including different levels before and during the trial. None of the methods caused an increase in caffeine concentration in the urine to exceed 12ug/ml. These results also demonstrate that ingestion of 1-3 mg/kg of caffeine produced the same level of performance enhancement (~3%) as did the higher levels of caffeine intake (6 mg/kg).

Yeo et al. (2005) published a recent study that looked at the effects of caffeine ingestion on carbohydrate oxidation. Eight male cyclists exercised for 120 minutes on three separate occasions. During exercise, cyclists ingested either a 5.8% glucose solution (Glu; 48 g/h), 5.8% glucose solution with caffeine (Glu+Caf, 48 g/h + 5 mg·kg·h^{-1}), or plain water (Wat). Average exogenous CHO oxidation over the 90- to 120-min period was 26% higher ($p < 0.05$) in Glu+Caf (0.72 +/- 0.04 g/min) compared with Glu (0.57 +/- 0.04 g/min). Total CHO oxidation rates were higher ($p < 0.05$) in the CHO ingestion trials compared with Wat, but they were highest when Glu+Caf was ingested (1.21 +/- 0.37, 1.84 +/- 0.14, and 2.47 +/- 0.23 g/min for Wat, Glu, and Glu+Caf, respectively; $p < 0.05$). There was also a trend ($P = 0.082$) toward an increased endogenous CHO oxidation with Glu+Caf (1.81 +/- 0.22 g/min vs. 1.27 +/- 0.13 g/min for Glu and 1.12 +/- 0.37 g/min for Wat). In conclusion, compared with glucose alone, 5 mg/kg caffeine

(approximately 350mg caffeine for a 150lb athlete) co-ingested with glucose increases exogenous CHO oxidation, possibly as a result of an enhanced intestinal absorption.

Doherty et al, (2005) recent meta-analysis of the use of caffeine ingestion on rate of perceived exertion (RPE) supports the use of caffeine as an ergogenic aid. Twenty-one studies were reviewed. In comparison to placebo, caffeine reduced RPE during exercise by 5.6% (95% CI). These values were significantly greater (p<0.05) than RPE obtained at the end of exercise (RPE % change, 0.01%; 95%). In addition, caffeine improved exercise performance by 11.2% (95% CI; 4.6−17.8%). Regression analysis revealed that RPE obtained during exercise could account for ~29% of the variance in the improvement in exercise performance. These results demonstrate that caffeine reduces RPE during exercise, which may partly explain the subsequent ergogenic effects of caffeine on performance.

In a 2004 study, Doherty et al. investigated the effects of caffeine ingestion on a 'preloaded' protocol that involved cycling for 2 min at a constant rate of 100% maximal power output immediately followed by a 1-min 'all-out' effort. Eleven male cyclists completed a ramp test to measure maximal power output. On two other occasions, the participants ingested caffeine (5 mg·kg) or placebo. Ratings of perceived exertion (RPE; 6-20 Borg scale) were lower in the caffeine trial by approximately 1 RPE point at 30, 60 and 120 s during the constant rate phase of the preloaded test ($p < 0.05$). The mean power output during the all-out effort was increased following caffeine ingestion compared with placebo (794+/-164 vs. 750+/-163 W; $p = 0.05$). Blood lactate concentration 4, 5 and 6 min after exercise was also significantly higher by approximately 1 mmol. in the caffeine trial ($p < 0.05$). These results suggest that high-intensity cycling performance can be increased following moderate caffeine ingestion and that this improvement may be related to a reduction in RPE and an elevation in blood lactate concentration.

McClellan and Bell (2004) looked at the ergogenic role of ingesting coffee (COF) prior to the subsequent ingestion of anhydrous caffeine (CAF). Thirteen subjects performed 6 rides to exhaustion at 80 % VO_2max 1.5 h after ingesting combinations of COF, decaffeinated coffee (DECOF), CAF, or placebo. Time to exhaustion was significantly greater for all trials with CAF compared to placebo. In conclusion, the prior consumption of COF did not alter the ergogenic effect of the subsequent ingestion of anhydrous CAF.

Brinbaum et al. (2004) observed the physiological effects of caffeine on cross-country runners during submaximal exercise. Ten college-age subjects (5 women; 5 men) volunteered to participate in this study. After completing a VO_2max test, each subject completed 2 30-minute runs at 70% VO_2max on the treadmill, 1 after ingesting caffeine and the other after ingesting a placebo. Tidal volume (TV), alveolar ventilation (VA), and rating of perceived exertion (RPE) were significantly different ($p < 0.05$) between treatment and control groups. The results suggest that the ingestion of caffeine at 7 mg·kg of body weight prior to submaximal running might provide a modest ergogenic effect via improved respiratory efficiency and psychological lift.

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World Anti-Doping Association http://www.wada-ama.org

Caffeine Drug Info: http://www.nlm.nih.gov/medlineplus/druginfo/uspdi/202105.html

Catechin

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

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

In a new Korean study, published on-line in the journal *Life Sciences* (doi: 10.1016/j.lfs.2005.11.001), the effect of EGCG on hypoxia-induced apoptosis for human haematoma cells was examined. This study found Epigallocatechin gallate (EGCG), the main extract from green tea, improves oxygen flow to tissues deprived of adequate supply.

Hypoxia occurs when oxygen supply to tissue or the whole body is restricted. If cells are denied oxygen for

too long, they die – a process called apoptosis. The most well known form of hypoxia is altitude sickness, which can occur when travelers go above an altitude of 6,000 – 8,000 feet (1,829 to 2,438 meters). Cells were exposed to varying concentrations of the tea extract (12.5, 25, 50, 100 micromoles) and the number of live cells tested. In the control cell culture, 40 per cent of cells died due to lack of oxygen. In the test groups, although cell death was decreased for all EGCG concentrations, exposure to 12.5 micromoles of EGCG reduced cell death by 10%. All cells were still alive after exposure to 100 micromoles of EGCG. The mechanism was theorized to result from green tea preventing the expression of a certain enzyme called caspase 3, which plays an important role in programmed cell death.

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Murase T; Haramizu S; Shimotoyodome A; Nagasawa A; Tokimitsu., Green tea extract improves endurance capacity and increases muscle lipid oxidation in mice. Am J Physiol Regul Integr Comp Physiol 2005 Mar; 288(3):R708-5 I Biological Science Laboratories, Kao Corporation, 2606 Akabane, Ichikai-machi, Haga-gun, Tochigi 321-3497, Japan.

DMAE

Dimethylaminoethanol (DMAE), related to choline and a biochemical precursor to the neurotransmitter acetylcholine, is found naturally in fishes like sardines and anchovies. It is reported to have nootropic effects. DMAE, also known as dimethylethanolamine or Dimethylaminoethanol, can be interpreted to induce a psychophysiological state of better feeling or well-being on both levels of analysis – mood and electrical pattern of brain activity.

It is believed that dimethylaminoethanol is methylated to produce choline in the brain. It is known that dimethylaminoethanol is processed by the liver into choline; however, the choline molecule is charged and cannot pass the blood-brain barrier. Short term studies show an increase in vigilance and alertness, with a positive influence on mood. (Pfeiffer, 1957)

Pfeiffer C, et al. Stimulant effect of 2-dimethylaminoethanol; possible precursor of brain acetylcholine. Science 126(3274):610-611, 1957. [1]

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Quercetin

Quercetin is a flavonoid and, more specifically, a flavonol. It is the aglycone form of a number of other flavonoid glycosides, such as rutin and quercitrin found in citrus fruit. Quercetin is found to be the most active of the flavonoids in studies, and many medicinal plants owe much of their activity to their high quercetin content. Quercetin works to potentiate the effects of both caffeine and nitric oxide.

This flavonol has demonstrated significant anti-inflammatory activity because of direct inhibition of several initial processes of inflammation. For example, it inhibits both the manufacture and release of histamine and other allergic/inflammatory mediators. In addition, it exerts potent antioxidant activity and vitamin C-sparing action. *In vitro* and animal studies suggest that quercetin inhibits tyrosine kinase and nitric oxide synthase and that it modulates the activity of the inflammatory mediator, NF-kappaB.

More importantly to endurance athletes, Quercetin acts to potentate the effects of caffeine. Quercetin is reported to help control cyclo-oxygenase activity. Cyclo-oxygenase activity increases in the body during periods of high physical stress (Garcia-Mediavilla V et al.). Studies indicate this powerful flavanoid works synergistically with theobromine and caffeine to further extend the CNS stimulant effects.

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