

## Lit-Up™ TECHNICAL INFORMATION

### PRODUCT DESCRIPTION:

**Lit-Up™** is the future of pre-workout supplementation: an innovative product that allows for dramatic increases in testosterone levels, greater neuromuscular strength, mind-muscle connection enhancement and increased libido; all of which lead to improved well-being and **lasting** muscular growth. **Lit-Up™** utilizes the most current scientific research on sports supplementation to provide a cutting-edge formulation that yields *cumulative* results; and is very different from any product in the current pre-workout product segment in that it does not solely rely on powerful stimulants to deliver better workouts.

### PRODUCT CHARACTERISTICS:

- Precision energy delivery for greater neuromuscular strength, muscular endurance and increased focus; no mind-bending over-stimulation that leaves your stomach in knots!
- Strong mood-enhancing effect
- Positive effects on libido and sexual drive
- Exerts positive effects on joint health
- Dramatically increases testosterone to foster an environment favorable for substantial, long-term increases in lean body mass and fat reduction.

### How Lit-Up™ Differs From Other Pre-Workout Products

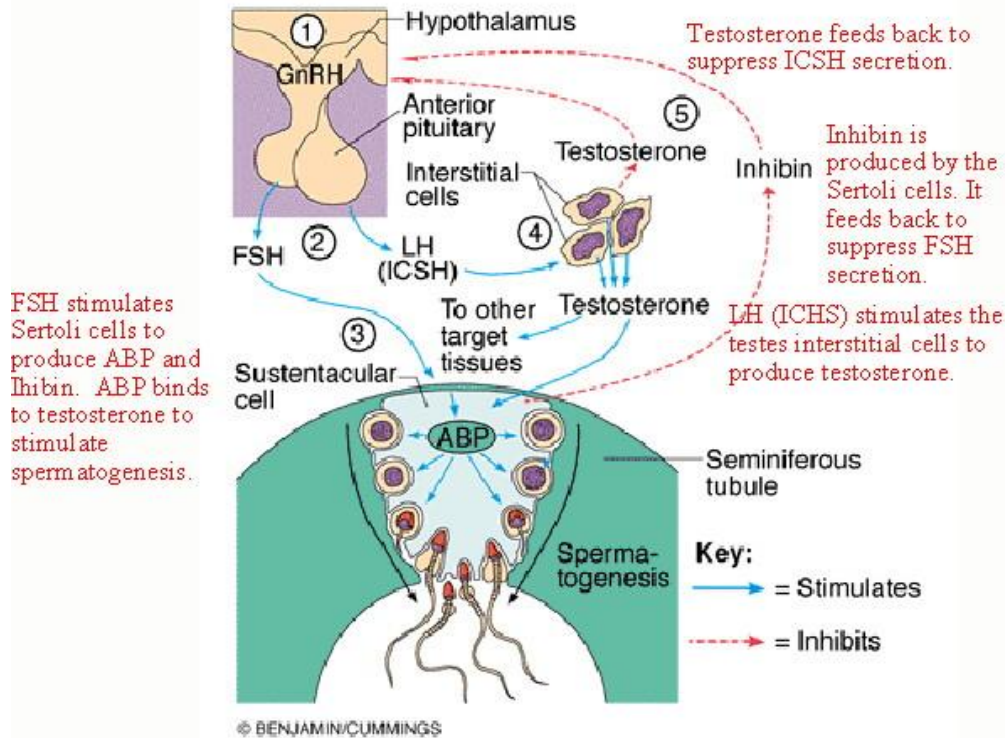
- The sports supplement market has seen a barrage of pre-workout products over the last few years, and all of them share pretty much the same theme: a pump, energy, vasodilation, and short-lived increases in strength. Most draw from the same concept with just a few ingredients and names switched around. (The product names are actually the most significant things that change in many cases!) Furthermore, they lack lasting effects from usage, instead just delivering an acute dose of the aforementioned effects, and then leave the user right back where they started a few hours earlier.
- Formulators of these products have been getting extremely aggressive in both the types and dosages of stimulants used in many popular pre-workout products. The result of this trend is a group of products that ultimately are counterproductive to the user. The over-utilization of stimulants can negate any potential due to anabolic effect brought on from a workout due to appetite suppression during the post-workout nutrient re-uptake window; plus they also often cause the user to “burn out” too quickly during a workout even though they’re still “wired”. This is a situation in which a large amount of energy is utilized during the first 20-30 minutes of a workout, leaving the user tired and lethargic for the rest of the training session. This lack of productivity can de-rail even the best training programs, and ultimately de-motivate even the most hardcore trainers. Enter a completely new angle...
- When the researchers at Applied Nutraceuticals began formulating **Lit-Up™**, they recognized that the pre-workout supplement segment is a highly competitive product category and that another “me too” product would not be successful or really necessary. Just about every company in the sports supplement industry already has their own version of a powdered pre-workout that focuses on pump, energy, vasodilation, and a short-term boost in strength. **The objective when developing Lit-Up™ was to begin with a clean sheet of paper and create a new level of product effectiveness in the pre-workout supplement category without any of the commonly found negative aspects in today’s products.**
- Virtually all commonly available pre-workout products on the market utilize the Nitric Oxide (NO) pathway. This is a viable mechanism, and **Lit-Up™** takes this to a whole new level by utilizing the 3-way synergism between NO, the hydrogen sulfide pathway (H<sup>2</sup>S Pathway), and the S-Adenosyl Methionine (SAM-e) / methylation pathway. This allows for greater stimulation of target androgen receptors, allowing for a dramatically more effective product. The product

also uses a unique nootropic/stimulant blend that allows for more targeted enhancement of the mind-muscle connection, greater neuromuscular strength, and precise timing that does not oversaturate adrenal glands or shut down hunger.

- Consequently, **Lit-Up™** provides a clean stimulant base to the users of the product, allowing them to increase performance without any of the undesirable after-effects common to other pre-workout products. It furthermore helps increase endogenous testosterone production via the stimulation of several different complex pathways that are illustrated below.

**FIGURE 1: The Hypothalamic-Pituitary-Testicular Axis (HPTA)**

## The Brain-Testicular Axis

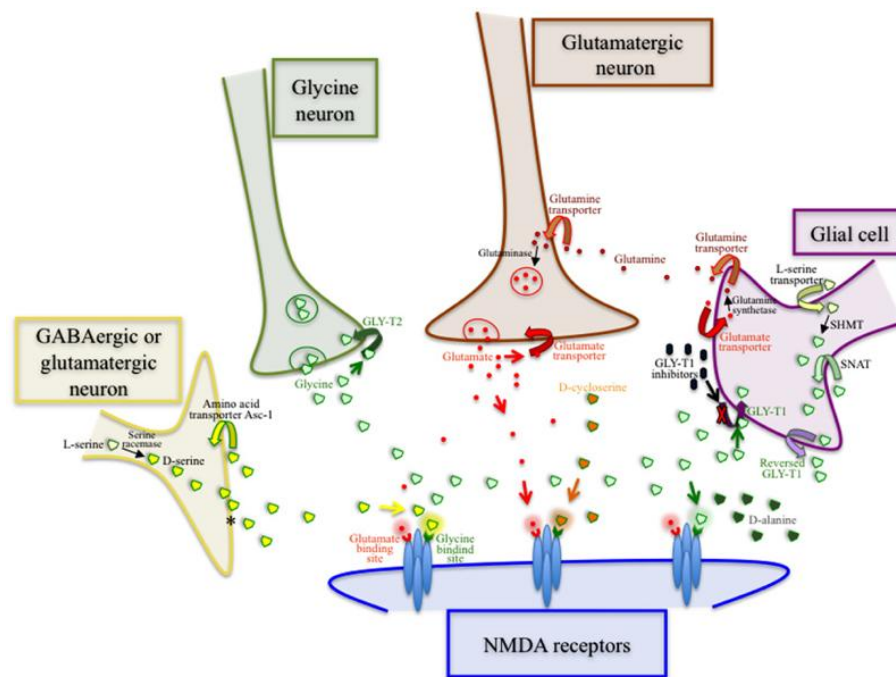


- The main mechanism of action in **Lit-Up™** has to do with three important entities: the NMDA (N-Methyl D-Aspartate) receptor, the biochemical pathway concerning SAM-e production and methylation, and an excitatory component that enhances the mind-muscle connection and primes NMDA receptor stimulation; creating a distinct and complex synergistic effect created by both direct stimulation and interaction of the three.
- NMDA receptors are located in the brain and spinal cord, and are responsible for functions having to do with memory, learning, synaptic function, and (important to this situation) the endocrine system (see structure above). When hypothalamic NMDA receptors are activated, they ultimately allow for initiation of steroidogenesis, which leads to the release of testosterone into the bloodstream.
- The SAM-e / methylation pathway is responsible for a variety of different biochemical reactions in the body. The pathway is also responsible for the formation of dopamine and norepinephrine plus the formation of H<sup>2</sup>S, all of which allow for greater NMDA receptor activity, greater NO activity and ultimately greater initiation of steroidogenesis.

***The SE7-LTG (SAM-e Pathway 7-Lean Tissue Generation) Innovation: Fusion of NMDA receptor Stimulation, Regulation of Intramuscular pH, and the Methylation/SAM-e Pathway for Maximum Lean Tissue Generation***

- This function, and the pathways that it utilizes, makes LIT-Up unique from others. D-Aspartic Acid (DAA) is a fundamental component of this lean tissue-generating group of ingredients. DAA interacts with the NMDA receptors that are found on neurons in the pituitary gland, the hypothalamus, and the testes. DAA then attaches to a specific site located on the NMDA receptor known as the NMDA binding site (4,6).
- The NMDA receptor is fairly complex, in that it requires multiple stimuli, called ligands, which are molecules that act as a trigger on a target receptor to activate a biological process (discussed below). There are two crucial binding sites on NMDA receptors- the NMDA binding site (NR-2), and the glycine binding site (NR-1). The ligand with the strongest affinity (ability to bind to) for the NMDA binding site in the hypothalamus is D-Aspartic Acid, while the ligand with the strongest affinity for the glycine binding site is n-methyl glycine (also known as sarcosine), closely followed by L-Glycine, which is an amino acid. So, in review, the ligand with the strongest ability to bind the NMDA binding site (NR-2) in the hypothalamus, while the ligand with the strongest ability to bind the glycine binding site (NR-1) is n-methyl glycine (1-3,5).

**Figure 2: Modulation/Activation of the NMDA Receptor**

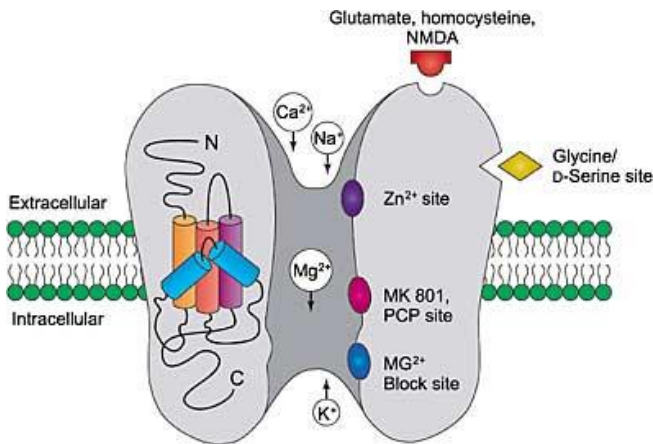


- This is important because the type of ligand that binds to the NR-1 binding site determines the response of the receptor. L-Glycine binds to the site quite well, but is rapidly removed from the binding site by glycine transporter 1 (GT1), a transport protein that regulates the re-uptake of glycine from the synapse (the space between nerve cells). GT1 determines the amount of glycine present between nerve endings; greater GT1 activity allows for less glycine buildup in the synapse, and the more glycine that is removed from the synapse, the less effective it can be as a co-agonist in activating the NMDA receptor. Since NMDA reception must be co-activated by **two** separate ligands, if one is ineffective or removed too quickly there will be little or no activation occurring, which would lead to a less effective product (7-8, 17).
- Therefore, the challenge is to isolate other ligands that can bind the GT1 and block or slow the action of the protein. Blocking or slowing the action of GT1 can allow greater amounts of glycine to build up in the synapse, which will allow greater stimulation of the NR-1 binding site. This, along with the coupling of DAA to the NR-2 binding site, is essential for attaining optimal

activation of the NMDA receptor. D-Serine, D-Alanine, D-Cycloserine, and Sarcosine (N-Methyl Glycine) are compounds that have potential, in that each of these compounds can act as a ligand of the NR-1 binding site. N-Methyl Glycine is most likely the best choice in this situation, in that it limits GT1 action, thus limiting the removal of glycine from the synapse, and also because it is a ligand/co-agonist of the NR-1 binding site. This means that N-Methyl Glycine can also act on the NR-1 glycine receptor as well as GT1, making it a very effective co-agonist to the NMDA receptor. When both NR-1 and NR-2 have been successfully bound with low GT1 activity, optimal stimulation of the NMDA receptor can occur, allowing for a maximal physiological response and optimal product effectiveness (5,7-8,16).

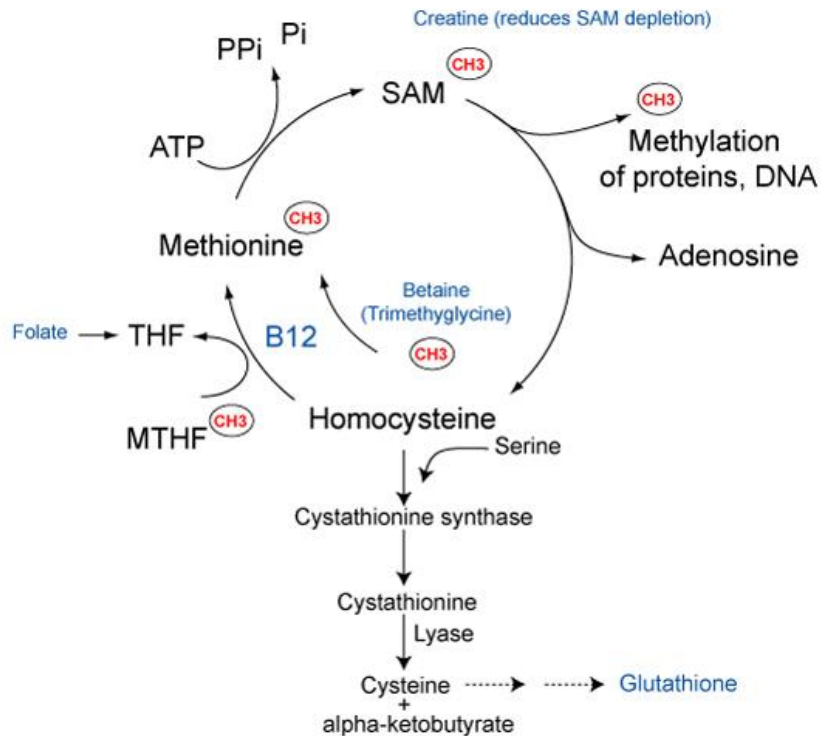
- However, yet another compound, N,N,N-trimethylglycine (TMG) serves a multi-faceted function in a similar way to N-Methyl Glycine, D-Alanine, and D-Serine. TMG can be directly converted by the liver to the NR-1 agonist N-Methyl Glycine, which means that **Lit-Up™** effectively allows for the co-agonist of the NMDA receptor to be present. However, it must first undergo a simple enzymatic conversion, which is accomplished by acting as a methyl donor. (See Figure 4 below). This means that it donates extra methyl groups to other molecules, via the methylation pathway (which enhances product quality) because the methylation pathway is responsible for the production of neurotransmitters, the structure and function of DNA, and the metabolism of fats. The conversion of TMG to N-Methyl Glycine is very efficient, therefore giving the **Lit-Up™** formulation excellent co-ligand enhancement for the NMDA receptor to work in conjunction with the D-Aspartic Acid. TMG has also been shown in recent human studies to have the ability to increase creatine storage within muscle cells (1-5, 16-17,61-63).
- When the NMDA binding sites are triggered in the hypothalamus by DAA and its co-agonist (in this case N-Methyl Glycine), there is an increase in cyclic guanosine monophosphate (cGMP) activity in the pituitary. cGMP is classified as a second messenger, meaning that it exerts its effects by acting in a manner **secondary and in response to** a first messenger signaling molecule. When the first messenger signaling molecules bind to a receptor (in this case, D-Aspartic Acid and its co-agonist bind to NR-1 and NR-2), the secondary pathway is activated that increases cGMP production. The heightened levels of cGMP in the pituitary correspond to an increased production of gonadotropin releasing hormone (GnRH), and growth hormone releasing hormone (GHRH). The resulting increase in GHRH from stimulation of the NMDA receptor also allows increased amounts of growth hormone (GH) to be secreted from the pituitary, while an increase in GnRH subsequently signals the pituitary to release luteinizing hormone (LH), and follicle stimulating hormone (FSH) (see figure 2). This increase in LH and FSH allows for an increase in steroidogenesis in the testes, which subsequently allows for the production of increased amounts of testosterone, as explained below ((1-3,10-13,43,45,59-60,75-77).
- Luteinizing Hormone, via receptors found on the surface of Leydig cells (a type of cell that helps produce testosterone) in the testes, controls the production and secretion of testosterone. The subsequent binding of LH with its receptor on the Leydig cell allows a signal to be sent through the cyclic AMP (another type of second messenger) pathway. Once this signaling occurs, the protein kinase A pathway is then activated, and this ultimately allows for the release of testosterone after 30-60 minutes of LH stimulation (42-43,108-109).
- Similarly, increases in cGMP from **Lit-Up™** also enhance phosphorylation (a fancy word for activation via attachment of a phosphate group) of the steroidogenic acute regulatory protein (StAR), a Leydig cell cholesterol transfer protein that provides the building blocks for testosterone synthesis. This is important for increasing endogenous testosterone production, in that StAR activation is necessary for the stimulation of steroidogenic enzymes involved in the transfer of cholesterol to testosterone. These results suggest that increases in cGMP correlate to increases in basal steroidogenesis in the Leydig cells of the testes through the protein kinase G (PKG, or a type of enzyme that cGMP interacts with)-dependent modification of the StAR protein and interaction with LH. To summarize, **Lit-Up™** increases LH, cGMP, and StAR activity, all of which can significantly up the amount of testosterone produced in the body (42-43,108-109).

**Figure 3: The NMDA receptor**



- Another key factor concerning the effectiveness of **Lit-Up™** has to do with the ability of the product to alter pH balance within skeletal muscle. High pH levels in skeletal muscle (intramuscular acidosis) are associated by decreased muscular function, which is a condition that frequently occurs during high intensity exercise. Recent research has shown that carnosine, a compound synthesized from the amino acids L-Histidine and Beta-Alanine, has the ability to offset muscular acidosis. Beta-Alanine, a key component of **Lit-Up™**, has been shown to dramatically increase muscle carnosine content (even better than administering carnosine itself) and give skeletal muscle a better ability to decrease muscular acidity. Through this mechanism of action, Beta-Alanine has been shown to reduce neuromuscular fatigue, and has been shown to increase anaerobic threshold and time to muscular exhaustion (14-15,79).
- More recent research has also shown that Beta-Alanine has the ability to improve contractile force within skeletal muscle, via improving excitation-contraction coupling. This occurs through to ability of Beta-Alanine/Carnosine to activate the ryanodine receptor (RYR). The RYR is a ligand-gated channel that can be co-activated/modulated by ATP, and when the RYR stimulated/opened, two things occur (84):
  - An Increase in the release of calcium
  - An increase in contractile protein response to calcium
- Therefore, increased carnosine/beta-alanine can allow for a greater release of calcium in skeletal muscle cells, as well as an increase in muscular contraction in response to increased calcium release. This is of note to weight trainers, because increasing muscular contractile function can allow a person performing high-intensity exercise to lift greater amounts of weight due to increased muscle fiber recruitment and increased neural drive. Another benefit of **Lit-Up™** is the ability to buffer hydrogen ions and keep the excitation-contraction coupling mechanism intact, even during extremely strenuous exercise (86-89).
- Excitation-contraction coupling is the process by which an electrical stimulus is turned into mechanical response, and is the main process by which skeletal muscle functions. High pH levels disrupt excitation-coupling in skeletal muscle by allowing for an overabundance of intracellular hydrogen ions (acidosis), and it is this mechanism which causes muscular failure. Beta-Alanine has actually been shown to aid in the transport of hydrogen ions out of the cell; and by improving these factors, Beta-Alanine can allow skeletal muscle to overcome a major barrier to performance. By decreasing acidosis and neuromuscular fatigue, it can allow users of **Lit-Up™** the ability to **increase the number of reps per set with any given weight**, and also to increase the effectiveness and quality of training. This can result in better and more effective workouts and greater athletic performance when added to the other key components of the product (48-50,104-105).

- **Figure 4: The SAM-e/Methylation Pathway**



- As you can see in Figure 4, Trimethylglycine (also known as Betaine), ATP, and SAM-e directly function within the pathway, albeit in different segments and capacities; each of which add to product effectiveness. TMG has been shown have positive effects on muscular strength, as well as having the ability to form sarcosine (an NMDA receptor co-agonist) and act as a methyl donor to fuel SAM-e formation. TMG acts in the following fashion as a methyl donor and in the SAM-e pathway (50-54,64-68,118):
  - TMG donates a methyl group during the formation of SAM-e, and becomes DMG (N-N-dimethylglycine).
  - The donated methyl group can then form SAM-e, or be used for the production of neurotransmitters, the production of DNA, or the metabolism of fats
  - The remaining DMG is then converted readily by the liver to the NR-1 agonist N-Methyl Glycine via glycine N-methyltransferase.

#### **ATP**

- The addition of Adenosine Triphosphate (ATP) is important, in that furthers the production of SAM-e from methionine, and is used by the body to create energy, and can be used as a substrate during the SAM-e cycle.
- Intracellular ATP can be used for the following functions:
  1. It is a key cellular energy source and can regulate cellular proteins
  2. It can act as a donor for adenylyl and phosphate groups and act as an intermediate in biochemical reactions
- ATP ingested orally has been shown to increase ATP levels in the liver, blood plasma, and red blood cells. Some recent studies have shown that ingestion of oral ATP can help fuel several different biochemical reactions that are important in both the SAM-e cycle and cellular health (102-103,106-107,126).

## SAM-e

- SAM-e is a combination of ATP and methionine, and has some pronounced effects in several different areas relevant to increased product effectiveness:
- SAM-e also exerts strong effects on increasing Hydrogen Sulfide (H<sup>2</sup>S) Production, which increases NMDA receptor activity and has been shown to be synergistic with Nitric Oxide (NO) in terms of vasodilation. A great deal of the most recent research on erectile dysfunction drugs is focusing on this pathway.
- The compound has strong mood-enhancing effects via increasing serotonin and dopamine in the brain
- SAM-e has been shown to have some very positive effects on joint health and regeneration (102-103,106-107,126)
  
- The metabolism SAM-e can go one of several directions:
  - It has the ability to form Hydrogen Sulfide (H<sup>2</sup>S) or glutathione via conversion to cysteine, which is then converted to H<sup>2</sup>S via Cystathione Beta Synthase (CBS), where it can be converted into glutathione.
  - The conversion of cysteine to glutathione during the SAM-e cycle is relevant to the product, in that glutathione is a strong testicular anti-oxidant that has been shown to have the ability to increase protein synthesis and detoxify the testes. This results in conditions that are extremely favorable for optimal testosterone production.
  - The formation of H<sup>2</sup>S from cysteine is largely dependent on Vitamin B-6 and SAM-e levels. Both components act to increase CBS activity, allowing for a greater formation of H<sup>2</sup>S. When H<sup>2</sup>S is formed, it allows for intracellular increases in cyclic AMP (cAMP) and increased NMDA receptor activity, both of which are considered strong signals for increasing testosterone levels as well, as discussed earlier.
  - Similarly, due to the inclusion of folic acid and cobalamin (Vitamin B12) in LIT-Up, the formulation has the ability to complete the cycle when SAM-e levels become depleted, allowing the body to re-form methionine. Once methionine is reformed, the cycle can begin again with the substrates provided within **Lit-Up™**.
  - The SAM-e molecule has the ability to complete the cycle when tissue SAM-e levels become depleted, allowing the body to re-form methionine, and restart the cycle (102-103,106-107,126)

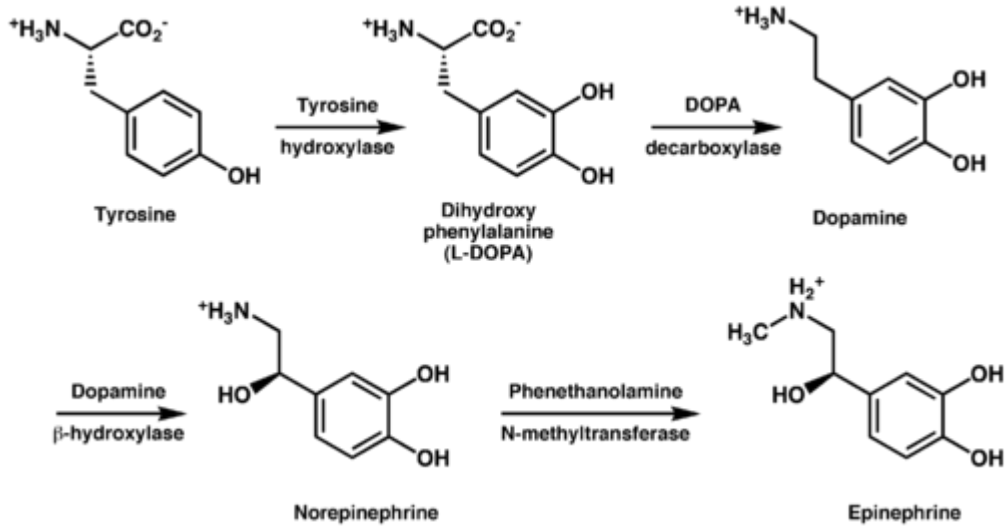
## **Targeted Stimulation: Increasing the Mind/Muscle Connection without Incurring Neural Burnout- The Role of DMAE, Phosphatidylserine, L-Tyrosine, Caffeine, Cocoa Extract, and Various Co-Factors**

- As discussed in the beginning of the article the vast majority of pre-workout products on the market possess similar characteristics. Most of these products contain large doses of stimulants; and while said large dosages can allow for a quick burst of energy after ingestion, many users report feeling a rapid “burnout” 30-45 minutes after its initial onset.
- This burnout occurs for several reasons:
  - An inhibition in norepinephrine (NE) re-uptake without a concurrent inhibition of dopamine (DA) re-uptake can cause a large increase in heart rate, and a decrease in physical performance. Norepinephrine re-uptake inhibitors (NERIs) block the removal of norepinephrine and epinephrine by the norepinephrine transporter, which, among other things, causes an increase in heart rate and contractility due to increased extracellular amounts of norepinephrine. 1,3-Dimethylamylamine (DMAA), a component commonly found in many best-selling pre-workouts, is a strong NERI (31-33,101).
  - NERIs can also increase oxygen demand significantly during exercise, which can result in increased levels of muscular acidity more quickly during exercise. This more rapid

onset of acidosis can result in a quicker time to exhaustion – which is exactly the opposite of the effects triggered by **Lit-Up™** (29-31).

- NERIs can cause peripheral vasopression (vasoconstriction) via acting on alpha-1 receptors, meaning that they can actually decrease blood flow to working tissue. This effect can be partially overcome by beta-2 stimulation (a type of receptor that binds norepinephrine) during exercise, which allows for muscular vasodilation. However, the net effect is one of vasoconstriction, resulting in decreased blood flow and oxygenation to the muscles. Decreased muscle oxygenation can result in decreased exercise performance (29-33).

• **FIGURE 5: The Tyrosine to Epinephrine Pathway**



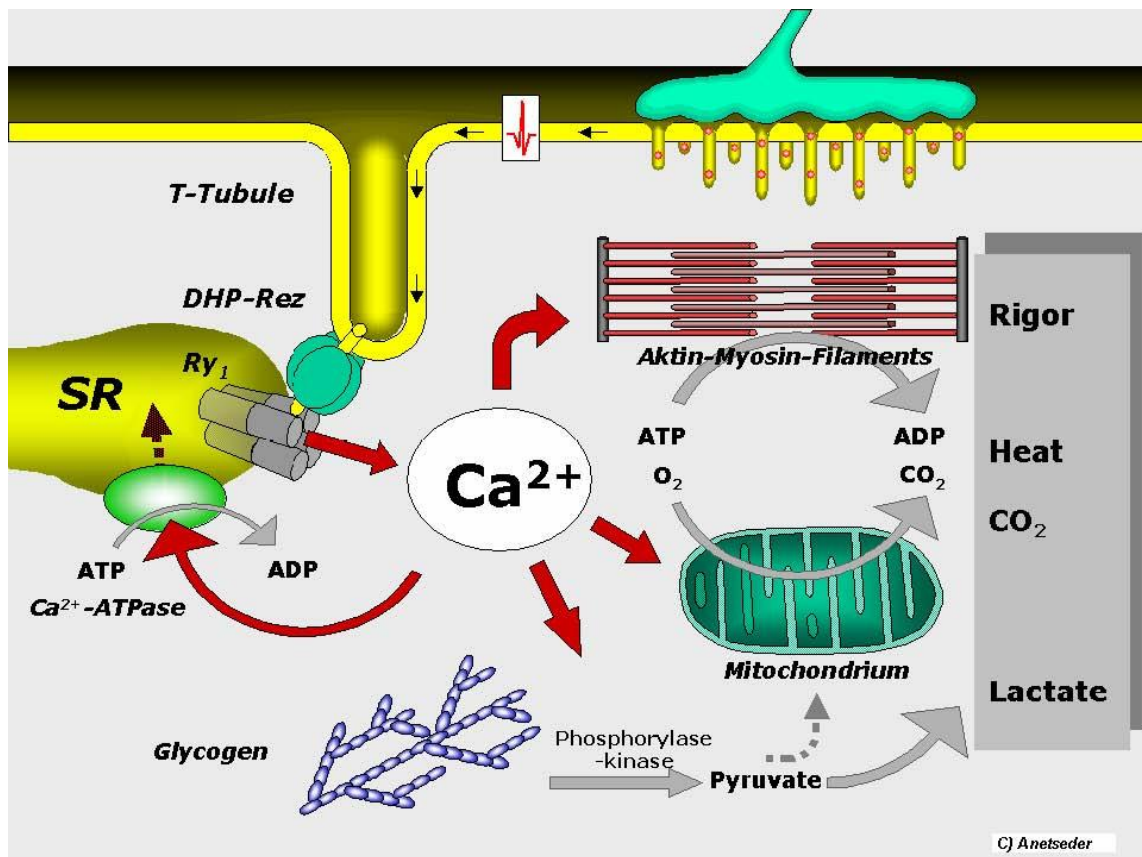
- During the formulation of LIT-Up, researchers looked at the connection between stimulant dosages and stimulant types, nootropics (cognitive enhancers), and how they can positively or negatively affect performance. The goal is to allow for the most powerful mind/muscle linkage possible without the usage of NERIs or other types of potentially counteractive stimulants- a combination of compounds that allows for maximum physical strength and razor-sharp focus. As mentioned above, NERIs such as 1,3-Dimethylamylamine can have deleterious effects; however **Lit-Up™** employs safer blend of complementary ingredients to deliver a strong mind/muscle connection that pushes training to the next level while avoiding the negative attributes of synthetic stimulants. In light of this fact, the formulation of LIT-Up capitalizes on this combination, by the addition of DMAE, Phosphatidylserine, L-Tyrosine, caffeine, cocoa extract, and several additional co-markers that allow for superior product effectiveness and “feel” without any dangerous side effects (22-25,34-35).
- DMAE (or dimethylethanolamine) is a naturally occurring substance that is a precursor to choline and acetylcholine. It has been shown to have a very mild stimulant effect on the brain and can be considered nootropic in nature. The main mechanism of action for DMAE is to increase the synthesis and turnover of acetylcholine in the brain, which can allow for greater activation of the cholinergic system. Greater cholinergic activity have been associated with increases in overall coordination and motor control, both of which are qualities associated with elevations in neuromuscular strength; allowing athletes to become stronger and more coordinated by directly enhancing the mind/muscle connection. Additional research on DMAE has found that:
  - DMAE can directly contribute to functional activation of the higher integrative brain mechanisms that help maintain normal, healthy cortical vigilance;
  - The compound can enhance ependecephalic functional selectivity; this is a fancy term for enhancing intelligence, as nootropics are often referred to as “smart drugs”;

- DMAE has a particular efficiency in restoring deficient higher nervous system activity and improving overall coordination and motor control (44,69-71,73,94-99).
- In a study constructed to look at the impact of DMAE on vigilance and mood, subjects dosed DMAE for 5 days, and then submitted to an EEG and an inter-hemispheric coherence test. These tests are designed to measure brain patterns and communication between hemispheres of the brain. The subjects given DMAE had significantly increased synchronization between the two brain hemispheres, and showed improved neuromotor control, increased verbal memory, had better reaction time, and decreased anxiety problems (94-100, 117).
- DMAE usage has also been shown to elevate IQ and increase attention span in some subjects, as well as improve scholastic ability in some subjects. The compound has also been shown to alleviate insomnia and depression, as well as increase physical energy in many cases. The compound has also been shown to be a strong anti-oxidant, especially in nervous system tissue. Another interesting thing to note about DMAE is that when combined with Phosphatidylserine, it becomes much more effective. This leads us into the inclusion of the next compound in **Lit-Up™**:
- **Phosphatidylserine (PS)** is a phospholipid compound that performs several important functions in the body and brain. Phospholipids are fatty acids that influence the shape and movement of cells. PS is the most prevalent component of neural cell membranes, and has been shown in several studies to increase learning and memory, and to lower cortisol levels. Several key MOAs of PS are as follows:
  - PS has the ability to alter glucose metabolism in the brain, increase acetylcholine release, and to positively change NMDA receptor density and function. The primary mechanism of action of PS seems to be to upregulate cholinergic transmission and increase acetylcholine receptor density. PS increases the function of the cholinergic system by enhancing the activity of activity of Na<sup>+</sup>,K<sup>+</sup>-ATPase and increasing calcium uptake during neurotransmitter release in the brain. As mentioned earlier, increased cholinergic activity is associated with increases in overall coordination and motor control, both of which are qualities associated with elevations in neuromuscular strength- as well as enhancing the mind/muscle connection.
  - In addition to cholinergic mechanisms, PS can increase the turnover of dopamine and/or norepinephrine (NE) in the brain, and increase dopamine release in several different areas of the brain. Chronic elevations in phosphatidylserine also improves NMDA receptor function, and may have a potential additional effect on priming these receptors.
  - PS has also been shown to lower cortisol levels significantly. Cortisol is the most prevalent of the glucocorticoid hormones. It is a corticosteroid produced in the adrenal cortex of the kidney, and is used by the body as a response to stress. The release of cortisol is controlled by adreno-corticotropin-releasing hormone, and the main function of cortisol is to increase blood sugar, but it can also counteract several different anabolic hormones in the body, including insulin and testosterone, thus acting in a catabolic function by tearing down muscle tissue when it is present in excessive amounts. PS alters this catabolism by attenuating the release of adreno-corticotropin releasing hormone and cortisol into the bloodstream; by slowing or stopping the release of ACTH, cortisol levels will remain lower than normal, even in times of stress. By slowing cortisol release, PS can allow for a positive Testosterone: Cortisol (T:C Ratio), which can produce a heightened anabolic state in the human body (108-114,119-120,123-125).
- **L-Tyrosine** (or 4-hydroxyphenylalanine), is an amino acid that is responsible for the synthesis of NE, epinephrine, and DA (See Figure 4 above). Besides increasing blood levels of NE, epinephrine, and DA, L-Tyrosine can also help the body adapt to stress (adaptogenic), and can increase alertness and awareness. It has also been shown to increase exercise performance, possibly due to the aforementioned adaptogenic qualities. Aside from having an acute effect on increasing NE and DA levels, L-Tyrosine can also help to replenish chronically depleted NE and DA levels (adrenal fatigue) (29-32).

## Caffeine

- **Lit-Up™** also utilizes **caffeine** to boost product effectiveness. Caffeine is a metabolic stimulant that heightens mental alertness and focus, while improving muscle contraction and coordination. Caffeine boosts brain dopamine levels, and may act synergistically with L-Dopa and L-Tyrosine in at least some capacity, possibly from the ability to influence NE levels centrally. It has been hypothesized that caffeine may have the ability to increase contractile force in skeletal muscle, via increasing calcium release from the ryanodine (ry1 in diagram below) receptor and increasing neuromuscular function (see Figure 5). This stimulates the neural system to fire muscles into action more effectively via norepinephrine stimulation and by producing changes in calcium activity. By stimulating calcium release from the ryanodine receptor, this allows for greater excitability of the muscle fiber, allowing for a stronger, longer muscle contraction. This combination of increased neuromuscular function and contractile force can allow for the potential of greater muscular strength and quicker recovery between sets (18-21,26-28,36-41).

Figure 5: Muscle Contraction



- **Cocoa Extract** is a specially standardized extract comprised of several different important constituents that enhance mood, cognitive awareness, and muscle contraction. Phenylethylalanine (PEA), tyramine, and L-tyrosine are the most prevalent constituents of cocoa extract, and have the biggest impact on the positive effects of the compound. PEA and tyramine are two more important constituents of cocoa. PEA is a biogenic amine derived from the aminic acid phenylalanine, and it has some effects very similar to amphetamine. It has strong mood-enhancing qualities, along with the ability to increase focus and offset lack of sleep. Tyramine is another biogenic amine found in cocoa extract,

and is responsible for the increased release of NE in the neurons, creating an excitatory effect on the CNS. It has also been shown to increase dopamine levels and increase the generation of cAMP, and also to aid in lipolysis (38-41).

- Various co-factors in the form of vitamins and minerals are also used in LIT-Up to bolster product effectiveness. The product uses the following vitamins and minerals to enhance product action:
  - **Vitamin K<sup>2</sup> (menaquinone)** is a compound involved in bone formation, blood clotting, and neural transmission. It has also been shown to aid in muscular contraction as it is required the initiation of neural impulses (81-82).
  - **Vitamin D<sup>3</sup> (choliciferol)** is actually considered a hormone, and plays a crucial role in the absorption of calcium, which is vital for muscle contraction. Another important note is that high Vitamin D levels have been positively correlated with high testosterone levels in athletes (78,80).
  - **Vitamin B<sup>1</sup> (thiamine)** is included in the product due to the fact that it catalyzes (speeds up) certain reactions that increase acetylcholine formation, and it is important in the production of energy by the body (131-134).
  - **Vitamin B<sup>5</sup> (Pantothenic Acid)** is important in the formation of the Co-enzyme A(Co-A), which is important in transferring acetyl groups during the production of acetylcholine (131-134).
  - **Biotin** is necessary for energy production and has a critical function in amino acid metabolism (131-136).
  - **Copper Orotate** is a highly bioavailable form of copper. Copper is necessary for proper neural transmission and function, and orotates are substances found in human milk that aid in mineral transportation (88).
  - **Chromium Polynicotinate** is a trivalent derivative of the mineral chromium. It has been shown by recent research to have strong effects on mimicking insulin, and can lessen free radical damage (130).

## PRODUCT DOSING

- A 5-On/2-Off or 4-On/3-Off dosing schedule is recommended for LIT-Up, with a once daily dosage.
- D-Aspartic Acid has the ability to accumulate in tissue over time, so once tissue accumulation has begun, it does not require dosing on a daily basis. Human research shows that DAA can remain in testes at supraphysiological levels for at least 3 days, and possibly more.
- A dosage of 1-3 scoops per day is recommended, with or without food, within 1 hour of training. Always start with one scoop and increase until the desired “feel” is obtained. Most subjects obtained ideal results by consuming 2 scoops.
- **Lit-Up™** can be run for much longer periods of time than conventional AAS or PHs, due to its effects on endogenous testosterone, and the fact that it does not directly antagonize the androgen receptor. Instead, the product minimizes the homeostatic mechanisms in your own body that lower testosterone levels, and increases testosterone via secondary mechanisms of anabolism (manipulation of T:E and T:C).
- Research involving blood testing of free and serum testosterone levels in humans indicates heightened levels of testosterone within 6 days of the first dosage, with increases occurring for up to 2-3 weeks before stabilizing at the elevated levels.

## Stacks and Tips to Maximize the Product

- **Stack product with HGH-Up♂ and Free Test;** the products were designed to work in concert, and will make one another even more effective.
- Take Bio-Mend Anti-Oxidant formula
  - High ORAC Value
  - Protects cellular membrane
  - Protects transcriptional factors (mRNA and DNA)
- In general, maintain a healthy diet and lifestyle:
  - Drink Plenty of water; at least 64 oz. per day
  - Ingest at least 1 gram of protein per lb. of body weight daily
  - Sleep at least 7 hours per night
  - Eat lots of fruits and vegetables
  - Eat lots of complex carbs
  - Eat 5-6 smaller protein and carb-rich meals throughout the day
  - Increase calories to at least 500 Kcal/day over your normal intake
  - BCAAs and Creatine will be helpful
  - Avoid alcohol and tobacco

**For more information, you can contact Applied Nutraceuticals at [info@appliednutraceuticals.com](mailto:info@appliednutraceuticals.com).**

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