QUANTUM ENERGY SQUARES

The Scientific Rationale Behind Combining Caffeine + Macronutrients for Sustained Energy Delivery Required in Endurance Sports

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Product Description

Quantum Energy Squares are coffee-infused energy bars available in four flavors: Dark Chocolate Almond, Crunchy Peanut Butter, Caffe Mocha Macchiato, and Coconut. Each 1.69-oz (48-g) bar contains 200-220 kcal, 19-21 grams carbohydrate (including 11 grams sugar), 10 grams protein, 10-12 grams fat, 26-47 milligrams calcium, 1-3 mg iron, 205-239 milligrams potassium, and 100 milligrams of caffeine from organic green coffee beans (similar to the caffeine content of one cup of coffee). In addition, the products are vegan, verified non-GMO, certified gluten-free, dairy-free and soy-free.

Quantum Energy Squares are formulated by combining organic green coffee (natural caffeine derived from raw, unroasted coffee beans) with macronutrients from fruits, nuts , grains, and seeds to provide a slow, long-lasting energy boost and appetite suppression, along with natural antioxidants, vitamins, and minerals from real food ingredients such as almonds, pea protein, pumpkin seeds, quinoa, chia seeds, dates, dark chocolate, and monk fruit.

Each Quantum Energy Squares bar is comprised of approximately 35-42% energy (kcal) from carbohydrate, 18-20% energy from protein, 40-50% energy from fat, and 4 grams of dietary fiber. (Values vary depending on product flavor.)

Product Attributes

Natural energy from organic green coffee. Caffeine and its metabolites (theobromine, theophylline, paraxanthine) stimulate neurotransmitter release from nerve cells throughout the body,[1] especially in the brain, contributing to an increased sense of energy, focus, and

alertness.[1,2] Caffeine also increases the contractile capacity of skeletal muscles[3,4] and reduces the perception of pain, discomfort, and perceived exertion.[5] Urine production is also increased by caffeine,[6] but that is a modest effect, particularly in regular caffeine users and has no impact on daily hydration status or exercise performance.[7] Green coffee beans contain a variety of natural compounds that include polyphenols such as chlorogenic acid (CGA). Some studies of daily CGA consumption in humans have reported benefits to weight loss, blood sugar control, inflammation, and blood pressure.

Within 15 minutes after ingestion, caffeine appears in the bloodstream and its concentration usually peaks after 45 to 60 minutes,[1] depending upon the amount and form of caffeine intake.[1] The half-life of caffeine—the time it takes for half of the ingested dose to be removed from the bloodstream—can be 3 to 10 hours, depending on the individual.[1] Caffeine is removed from the blood by the liver, relying on cytochrome P450 1A2, the liver enzyme responsible for over 90% of caffeine metabolism.[1] P450 metabolizes caffeine into paraxanthine, theophylline, and theobromine, all of which also have stimulatory effects.[1] Some people have the fast genetic variant of this enzyme, while others have the slower version. Those with the fast variant seem to have a greater sensitivity to the performance-enhancing (ergogenic) benefits of caffeine, suggesting that caffeine metabolites play an important role in improved performance.[8-9] There may also be genetic variations in adenosine receptors that contribute to the ergogenicity of caffeine. The same may be true for caffeine's other mechanisms of action (e.g., adrenalin release, neural firing rates, muscle contraction, etc.)[1]

Caffeine temporarily relieves drowsiness by competing with adenosine molecules on various adenosine receptors (A_1, A_{2a}, A_{2b}, A_3) on nerves in the brain (and in other tissues such as skeletal muscle).[1,8-10] Adenosine is a naturally produced molecule that accumulates throughout the day; too much adenosine activates adenosine receptors, producing drowsiness. Caffeine has a molecular structure similar to adenosine and reduces the effects of adenosine by temporarily binding to the same receptors without activating them.[1,8,9,11] Interestingly, the caffeine content one cup of coffee or one Quantum Energy Squares bar (100 mg) affects less than 20% of the total adenosine receptors.[1]

Research has shown that caffeine increases feelings of energy, alertness, and mental focus and there is evidence that physical performance can be improved with caffeine doses as low as 100 mg (e.g., 0.7 mg caffeine/lb body weight).[1,13,14] There is a large variability among people in their responses to caffeine ingestion; however, it is abundantly clear that caffeine ingestion is associated with ergogenic benefits in most people.[1,13,14]

Caffeine is associated with improved physical and mental performance responses when consumed before exercise as well as during exercise.[1,13,14] Research suggests that for a performance benefit to occur, higher blood caffeine levels are required to be achieved before exercise compared to during exercise when lower blood caffeine levels appear to effectively enhance performance, possibly because exercise increases the sensitivity of adenosine receptors to caffeine.[1,13]

In summary, the scientific literature confirms that consuming caffeine in amounts similar to that found in Quantum Energy Squares (100 mg) is associated with improved mental and physical function when ingested before and/or during demanding exercise. A unique attribute of Quantum Energy Squares is the intent that caffeine delivery into the bloodstream be prolonged as a result of the macronutrient content of the bars (complex carbohydrates, healthy fats and plant proteins), ensuring that plasma caffeine concentrations are maintained for a longer time, a

benefit that could be described as "sustained energy by design." When caffeine is consumed in a liquid, or in a capsule, or in chewing gum, there is a rapid rise in blood caffeine levels, followed by gradual clearance from the blood.[1,15] The intent of Quantum Energy Squares is to prolong the positive effects of caffeine on focus, alertness, and performance by slowing its entry into the blood.

A long-lasting boost with healthy fats from nuts, grains, and seeds. Quantum Energy Squares contain almonds, peanuts, organic quinoa (depending on flavor), chia seeds, pumpkin seeds, and coconut, all of which contribute healthy fats to the product. Fats in the diet are classified by their molecular structure, specifically by the number and position of unsaturated bonds between carbon molecules. Fats—more accurately the fatty acids that comprise fats—are long chains of carbon molecules, varying in length from 12 to 22 carbons for the most common fatty acids found in the diet. Saturated fatty acids contain no double bonds between any of the carbon molecules; in other words, their carbon chains are fully saturated. Monounsaturated fatty acids contain one double bond and polyunsaturated fatty acids contain more than one double bond.

To optimize cardiovascular health and body weight, current recommendations from a variety of professional and governmental organizations such as the Academy of Nutrition and Dietetics, American Heart Association, and the U.S. Institute of Medicine are to minimize the consumption of saturated fats and increase the consumption of mono- and polyunsaturated fats (such as alpha-linoleic acid [ALA], linoleic acid [LA], eicosapentaenoic acid [EPA], docosapentaenoic acid [DPA], docosahexaenoic acid [DHA]) from fish, vegetables, grains, nuts, and seeds.[16] The nuts, grains, and seeds in Quantum Energy Squares provide these healthy fatty acids.

The fat we consume in our diets is an important energy source at rest and during exercise. Fatty acids from the foods we eat and from the fat we store is metabolized (oxidized) by active muscles to provide the fuel (ATP) required to sustain muscle contractions.[17] Physically active people have increased energy (calorie) needs and fats in the diet contribute to meeting that need. The healthy-fat content of Quantum Energy Squares helps active individuals meet their increased daily energy needs and likely helps slow the entry of caffeine into the bloodstream[18] and extend the benefits of caffeine on mental and physical performance.

Plant proteins for recovery and adaptation. Active bodies use the amino acids provided by dietary proteins to support the repair and remodeling of muscle tissue after hard workouts and competitions.[19] Proteins in the diet are supplied by animal and plant sources such as beef, poultry, pork, fish, dairy, grains, beans, nuts, and seeds. Dietary proteins are digested into the individual amino acids that are used as the building blocks for the hundreds of thousands of different proteins in the body (e.g., structural proteins, enzymes, contractile proteins, regulatory proteins, etc.) There are only 20 amino acids and nine of those are referred to as essential amino acids that must be supplied by the diet; the other amino acids—the nonessential amino acids—can be produced in body cells.[20] Under normal circumstances, our diets contain sufficient plant and animal proteins to meet our daily needs for the essential amino acids critical for muscle repair and remodeling.

The 10 grams of plant protein in Quantum Energy Squares are from peas, pumpkin seeds, almonds, peanuts, chia seeds, and quinoa (plant-protein mix varies among flavors). Research suggests that combinations of various plant proteins can deliver an amino-acid profile that contains sufficient essential amino acids—leucine being of particular importance—to stimulate

muscle protein synthesis.[21,22] In this regard, consuming Quantum Energy Squares soon after exercise will provide proteins that will stimulate muscle protein synthesis, consistent with current dietary recommendations for active individuals.[23]

Wholesome carbohydrates to energize muscles. Active muscles rely on carbohydrate to produce the energy required to sustain muscle contraction; the greater the intensity of exercise, the more muscles depend on carbohydrate as fuel.[23-25] The carbohydrate content of Quantum Energy Squares (about 20 g/bar) is derived from organic quinoa, dates, chia seeds, monk fruit, organic agave syrup, tapioca syrup, and organic dark chocolate chips, as well as carbohydrate provided by other nuts, grains, and seeds found in the products.

The carbohydrate in Quantum Energy Squares is a combination of complex and simple carbohydrates found in most diets. Dietary carbohydrates include simple sugars (e.g., mono- and disaccharides such as glucose, sucrose, fructose), starches (e.g., amylose and amylopectin), and non-digestible fibers.[25] All of the different types of carbohydrates found in the diet—with the exception of non-digestible fibers—are digested in the small intestine and absorbed into the bloodstream as monosaccharides (e.g., glucose, fructose, galactose). Virtually all of the fructose and galactose molecules are converted by the liver into glucose molecules, the sugar used by cells throughout the body to produce the ATP energy required for cell function. Glucose is especially important for the function of the brain and is the preferred fuel for active muscles, either as glucose taken up from the bloodstream or as glucose molecules derived from muscle glycogen.[26,27]

The simple sugars in Quantum Energy Squares provide a source of rapidly absorbed carbohydrate to help maintain blood glucose concentration during intense and prolonged exercise, while the complex carbohydrates are digested and absorbed more slowly to provide a metered entry of glucose into the bloodstream. Such a combination of low-glycemic (complex carbohydrates) and high-glycemic (simple sugars) carbohydrates can deliver the glycemic, metabolic, and hormonal benefits associated with both rapid and prolonged carbohydrate absorption.[28-31]

Consuming carbohydrates before and during demanding exercise is associated with improved mental and physical performance,[23-25] a benefit that compliments the ergogenic effects of ingesting modest amounts of caffeine.[32-35] Quantum Energy Squares bars take advantage of that well-established science to deliver palatable and effective nutritional support to individuals wanting to get the most from their bodies during training and competition.

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