NATURAL PRODUCTS INSIDER®

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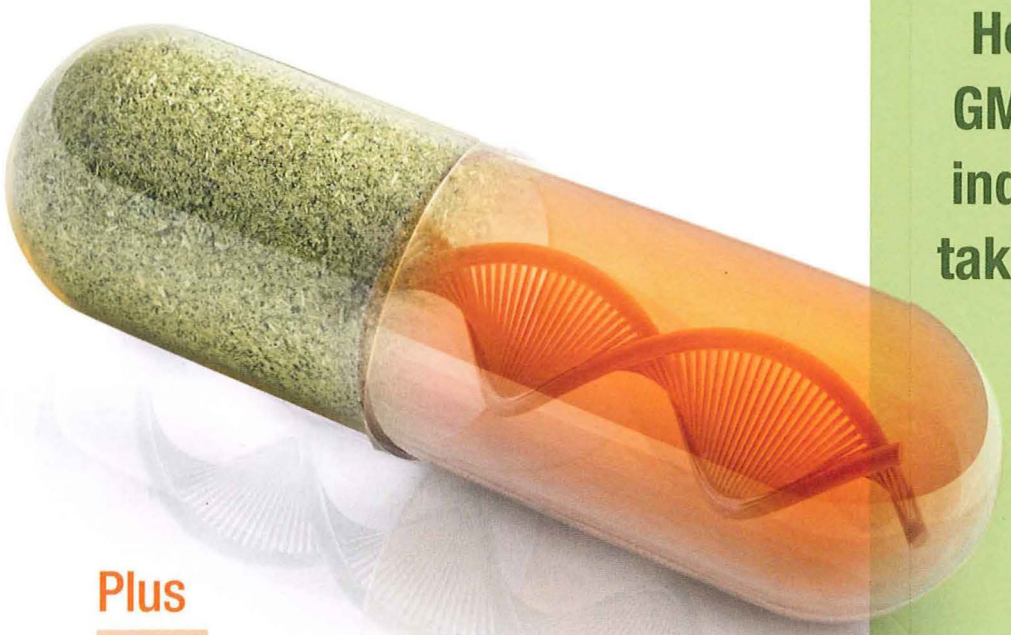
GMO Label Legislation

How to solve the GMO debate when industry members take different sides



Plus

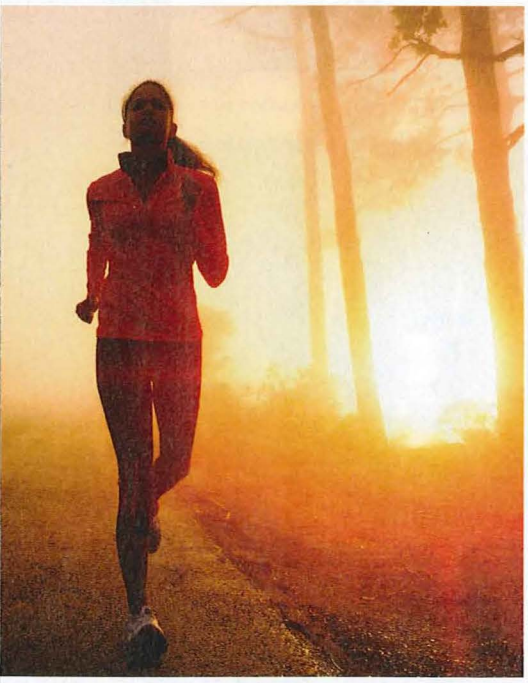
The Sports Nutrition Cycle
Ingredients for Immunity
Functionally Feasting

The Sports Nutrition Cycle

Exercise involves a cascade of bodily events that interconnect and drive new market opportunities

by Steve Myers

Sports nutrition is no longer concentrated in the pages of bodybuilding magazines. Today's sports nutrition consumer is simply an active person looking for help with performance, energy, recovery and body composition. This consumer may be a seasoned athlete, a gym enthusiast, a weekend warrior or any other person trying to improve their health through better nutrition and exercise. Thus, natural ingredients to enhance an active, healthy lifestyle have become more sought after than synthetic and engineered boosts.



Much as athletes in various sports strive to develop into an all-around player, sports nutrition has become a market of many talents. Ingredients and formulas now address multiple areas of activity, from providing enough energy for a workout and strengthening the body for continued performance, to fostering recovery from the rigors of exercise and maintaining a physique that promotes continued activity.

Motivation aside, without the energy to enter into physical activity, most people peter out quickly or just stay on the couch. Today's active consumer wants sustained energy, not just a wham-bam-thank-you-ma'am "boost." Sports nutrition companies are meeting this demand head-on by forgoing stimulants and, instead, targeting the body's energy cycle.

On a cellular level, energy is created within the mitochondria. **Acetyl-L-carnitine** helps bring fatty acids into the mitochondria, where they are broken down and used as a source of energy. This is the primary way fatty acids convert to energy, making L-carnitine a popular energy ingredient. The body makes some carntine, but the resulting amounts are low.

Adosine triphosphate (ATP) is considered the currency of energy in the mitochondria. The phosphate bonds in ATP hold tons of potential energy and are broken down easily into energy. However, the resultant adosine diphosphate (ADP) is like a depleted battery. Enter **ribose**, a component of adosine and crucial factor in restoring ATP, so the energy cycle can start over. As in the case of L-carnitine, the body can make some ribose, but the process is slow. This has opened up a huge opportunity for these two ingredients in the sports supplement marketplace.

Another wrinkle with energy is that energy sources in the body are not used equally or at the same time during exercise. Glucose is used to make ATP early in exertion and then fat is used for energy in later stages of exercise. Before either of those sources are used, the body uses the phosphagen system as its initial source of energy. **Creatine** stored in the muscles is converted to phosphocreatine, which helps restore ADP to ATP more quickly than glucose does. More than half of creatine stored in muscles comes from the diet, made from the amino acids arginine, methionine and glycine. Creatine supplementation has become popular for consumers engaging in short, intense exercise, as creatine can increase muscle contraction time and delay muscle fatigue.

Muscles generate motion from energy via cycles of contraction and relaxation. Used ATP must be restored rapidly for continued muscle operation. As this muscle cycle continues, muscle fibers composed of various proteins are damaged; the body's repair and rebuilding of these damaged fibers is what makes muscles bigger and stronger. The key to muscle growth is protein balance, having more muscle protein synthesis than breakdown.

Protein is comprised of amino acid chains, with the **branched-chain amino acids (BCAAs)** as precursors. Key BCAAs include leucine, isoleucine and valine; these are essential amino acids that are not made in the body and must come from the diet or supplementation.

Protein and amino acids have long been favored by consumers interested in muscle growth, especially bodybuilders, but the proliferation of protein functional foods and beverages has demonstrated the increasing demand for these muscle-development ingredients by all sorts of athletes and active consumers.

INSIDER's Take

- Exercise involves a series of interconnected stages including energy, muscle growth and recovery.
- Demand is increasing in the sports nutrition market for consistent natural ingredients.
- As exercise science learns more about body function and biochemistry during exertion, natural compounds involved in the processes will spur sports nutrition growth.

Sports Nutrition Content Library

The **INSIDER Content Library** includes a section on Sports Nutrition, which houses numerous articles on performance nutrition, energy, recovery and protein.

naturalproductsinsider.com/library/topics/sports-nutrition.aspx

Nutrition bars and functional beverages are two key areas of protein intake in the sports nutrition market. Packaged Facts recently reported U.S. consumer spending on sports drinks and nutrition bars will reach USD $10 billion in 2013. In fact, the market research firm projected sales for sports drinks will hit $7.4 billion in 2013, a 6-percent growth since 2012, and nutrition bars sales will grow 14 percent to reach $2.6 billion in sales by 2013.

Muscles need more than energy and protein to fulfill their contractual magic. Muscle contraction is triggered by electrical impulses carried by neurotransmitters, including acetylcholine. **Alpha glyceryl phosphoryl choline (A-GPC)** has garnered attention as a dietary supplement precursor to acetylcholine. After consumption, A-GPC converts to phosphatidylcholine (PC), a metabolically active form of choline, which then moves to the synaptic nerve endings in the central nervous system where it synthesizes and releases acetylcholine.

Improving blood flow is another critical factor in muscle health and function, increasing the nutrients available to the muscle. The sports nutrition market has focused on the vasodilator nitric oxide (NO) to help widen blood vessels. **Arginine** is a precursor to NO and dominates this sub-segment of the nutrition market, but other natural compounds may also help NO production. **French maritime pine bark extract**, ***Ginkgo biloba***, **ginseng** and fruit **polyphenols** (apple and grape) are botanicals linked to increased NO.

Another consequence of muscle contraction is heat generation. Most of the energy in muscles is used for contraction, but some is released as heat. This is how the body generates its own heat to maintain a healthy temperature.

Generating heat is a factor in improving body composition by promoting more lean muscle and burning more fat—fat tissue tends to slow resting metabolic rate (RMR), while lean muscle raises RMR and burns more energy. Called thermogenics, heat-producing supplements include **green tea**, **fucoxanthin**, **bitter orange** (*Citrus aurantium*) and 3-acetyl-7-oxo-dehydroepiandrosterone (known as 7-oxo-DHEA or **7-keto**).

INSIDER
Supplement Perspectives Highlights

Anthony Almada—"Bigger, Stronger, Fiction"

"With claims of exotic carbohydrates and faster absorption/greater muscle (glycogen) recovery, L-glutamine and increased muscle mass or strength gains, branched chain amino acids and muscle growth, special protein blends leading to anabolic nirvana, manufacturers need to have scientific substantiation."

Sébastien Bornet—"Sports Nutrition: Nourishing Recovery with Antioxidants"

"The sports nutrition market shift toward everyday athletes—and a greater sense of wellness and overall nutrition—has led to a heighted demand for natural ingredients over the engineered and often synthetic 'boosts.' Among the most desired of these ingredients are antioxidants, which are known to combat free radicals and other harmful toxins found in the environment."

Read the full entries at naturalproductsinsider.com/blogs/supplement-perspectives.aspx.

It is important to note these thermogenic ingredients are not stimulants or anabolic steroids, which have become villains in sports and public health. For instance, bitter orange acts on certain beta-adrenoreceptors (beta-3), but not on others (alpha-1 and -2, and beta-1 and -2) that stimulate heart rate and blood pressure. Similarly, 7-keto, which also has no nervous system-stimulating characteristics, is produced in the body from the hormone DHEA (dehydroepiandrosterone), but neither converts back to DHEA in the body nor converts to any other steroids that have anabolic or hormone-related characteristics.

Sports talk is riddled with motivational clichés such as, "If you can't stand the heat, get out of the X," but in the case of body composition, heat really isn't the only factor. **Conjugated linoleic acid (CLA)** inhibits a lipoprotein lipase enzyme that would otherwise promote fat breakdown and storage in the body. CLA also promotes development of lean muscle mass by increasing the activity of an enzyme (carnitine palmitoyltranferase) in skeletal muscle, including transport of fatty acids to the mitochondria for use as energy.

After all the muscle-building, fat-burning and cardio-enhancing exercise is done, it is time for recovery. Nutrients are depleted, muscles are stressed, and soreness and aches are scattered throughout the body.

Replacing what was lost is a good starting point. Electrolytes, including the minerals **magnesium**, **zinc**, **sodium** and **potassium**, are lost during sweating. They perform vital functions in exercise health. Magnesium is intimately involved the ATP cycle and recharging the battery, and the mineral influences nerve function, heart rate, immune function and bone health. Potassium is central in the electrical activity of muscle cells, and deficiency can cause cramps, soreness, fatigue and poor performance. Sports drinks have been the popular format for quickly replenishing these electrolytes.

Amino acid levels go down during exercise and are ideal candidates for recovery products. In muscles,

restoring BCAA levels can help muscle recovery, maintenance and growth. Depletion of **L-glutamine**, another amino acid found in muscles, can affect post-workout immune function. While glutamine is the most abundant naturally occurring amino acid in the body (up to 60 percent in skeletal muscles), replenishing levels quickly after exercise may help stave off any immune suppression.

Supplemental **methylsulfonylmethane (MSM)** may help counter oxidative stress that can contribute to tissue and muscle damage, both which can lead to soreness. Other antioxidants such as vitamin C and beta carotene can also address free radical consequences of exercise.

Omega-3 fatty acids also have antioxidant properties important to recovery, but their biggest contribution may be in countering inflammation. Inflammation can occur in numerous soft tissues, including both muscles and joints, especially after pounding exercise.

Cartilage in the joints can be damaged from vigorous weight-bearing exercise. **Glucosamine**, which is found in living cartilage, is a supplement ingredient popular in the sports market for protecting joints by improving lubrication and strengthening the cartilage tissue. Its fellow glycosaminoglycans (GAGs) source **chondroitin** is also found in cartilage and protects against degeneration. Collagen is found in connective tissue including cartilage, and supplemental collagen from animal sources is a growing area of the sports market for its ability to promote growth of cartilage-forming chondrocytes. It may also counter the negative effects of nonsteroidal anti-inflammatory drugs (NSAIDs). One newer supplement ingredient, **eggshell membrane**, contains many of these joint-health compounds including collagen and GAGs.

Depletion of L-glutamine, an amino acid found in muscles, can affect post-workout immune function.

Sports nutrition is more than a magic muscle pill or shot of energy; it is a robust marketplace offering specific ingredients and products that benefit various stages of the entire exercise cycle. Carefully formulated natural products are targeting energy, strength, performance, body composition and recovery stages with specific mechanisms of action and research-backed ingredients. The continued significant growth of the sports nutrition market will continue to present great opportunities in each of these sub-segments.