

## **Improve Your Energy and Endurance, Reduce Oxidative Damage and Inflammation**

*Karen Falbo, CN*

Aside from training, nutrition may be the most important influence on athletic performance.<sup>1</sup> It is the position of the American Dietetic Association, and the American College of Sports Medicine that physical activity, athletic performance, and recovery from exercise are enhanced by optimal nutrition.

An athlete's diet needs to support the maintenance of a healthy body weight, the replenishment of glycogen stores, and provide adequate nutrition for building and repair of tissues and biochemical's such as hormones, brain chemicals, metabolic enzymes, white blood cells, etc.

### **Calorie requirements for athletes depend on the intensity of their training and performance.**

- Under eating caloric needs may result in chronic fatigue, sleep disturbances, reduced performance, impaired ability for intensive training, and increased vulnerability to illness and injury.<sup>2</sup>
- **Regardless of the amount of calories, a whole foods diet needs to be emphasized.** This involves eating foods in their natural, whole form, or eating foods as close to how they occur in nature as possible.

**Carbohydrates are fuel for energy production.** The goal of finding the appropriate amount of carbohydrate before, during and after exercise is to optimize the availability of muscle and liver glycogen and blood glucose, with the intent to maintaining carbohydrate availability and oxidation during exercise. During intense training, the carbohydrate requirements of athletes may be as high as 8 to 10 g/kg bodyweight or 60 to 70% of total energy intake. During average training athletes require up to 4.5 grams of carbohydrates per day per pound of body weight or 50–70% of total dietary calories from carbohydrates, whichever is greater.<sup>3,4</sup> This translates into 175 lb man consuming approx. 787.5 grams of carbohydrate per day equaling about 3,150 calories.

**Muscle glycogen resynthesis is critical.** Factors influencing the rate of muscle glycogen resynthesis include the timing, amount and type of carbohydrate ingested and muscle damage. There is a two-hour optimal window immediately after the cessation of exercise for the administration of carbohydrate. Simple carbohydrates appear to be the preferred replacement during this replenishment period. Studies repeatedly show that when carbohydrates are not eaten soon after exercise, very little muscle glycogen synthesis occurs.<sup>25</sup>

- The replacement of body carbohydrate stores can be achieved most rapidly if 80–150 grams of carbohydrate are consumed right after exercise (within 30 minutes), repeating this intake every hour for at least five hours after the event or heavy training session.<sup>5</sup>

**Protein requirements are often higher for both strength and endurance athletes;** however, the increased food intake needed to supply necessary calories and carbohydrates also supplies extra protein. As long as the diet contains at least the typical 15–30% of calories as protein, or up to 0.75 grams per day per pound of body weight, protein supplements are neither necessary nor likely to be of benefit.<sup>6,7</sup>

**Quality fat is an essential nutrient for athletes.** In general, high-fat diets have not been found to consistently improve performance.<sup>8,9</sup> However some studies show that higher fat (up to 42%) may be beneficial to some endurance athletes. One study showed that runners who increased fat intake to 42% further raised HDL cholesterol (the beneficial cholesterol) without adversely affecting other lipoproteins. In conclusion, a 42% fat diet maintained favorable cardiovascular disease risk factors (CHD risk) in female and male runners whereas a 16% fat diet lowered Apo

A1 (a marker for CHD) and HDL cholesterol and raised the Triglycerides to HDL cholesterol ratio.<sup>10</sup> The percentage of an athlete's diet that should come from fat may be biochemically individual, and in general should fall between 15% to 30%. Healthy fats sources include organic extra-virgin olive oil, sesame oil, avocado, olives, raw nuts and seeds, cold-water fish, fish oils, organic butter, nest-fresh eggs, unrefined coconut oil, and palm oil.

- Medium-chain triglycerides (MCT) are a class of fatty acids. Their chemical composition is of a shorter length than the long-chain fatty acids present in most other fats and oils. They are also different from other fats in that they have a slightly lower calorie content<sup>11</sup> and they are more rapidly absorbed and burned as energy, resembling carbohydrate more than fat.<sup>12</sup> Medium chain triglycerides are found in coconut oil, palm kernel oil, and butter. MCT are also available as a supplement.
- **Coconut oil** and **olive oil** suppress the production of the inflammatory interleukin 1. **Coconut oil** also promotes the production of anti-inflammatory prostaglandins.<sup>13</sup>

**Water is the most abundant substance in the human body and is essential for normal physiological function.** Water loss due to sweating during exercise (even a 1% drop) can result in decreased performance and other symptoms such as headaches, fatigue, loss of appetite, and sleepiness.

Electrolyte replacement is not as important as water intake in most athletic endeavors. It usually takes several hours of exercise in warm climates before sodium depletion becomes significant and even longer for potassium, chloride, and magnesium.<sup>14</sup> However, the presence of sodium in fluids will often make it easier to drink as well as retain more fluid.<sup>15</sup> Some healthy products to consider are *Recharge*, *Ultrafuel*, *Hydrofuel*, *Smart Water*, and *Emergen-C* powder (that is mixed in water). These products can provide added carbohydrates and electrolytes when needed.

**Herbs and spices** have powerful anti-inflammatory actions. The culinary spices **turmeric**, **rosemary**, and **ginger** contain strong anti-inflammatory actions.

**Green tea** contains 51 anti-inflammatory compounds, meaning it works on inflammation from multiple directions.<sup>16</sup>

**Strenuous exercise increases production of harmful substances called *free radicals*, which can cause oxidative damage to muscle tissue and result in inflammation and muscle soreness.**

Antioxidants, including vitamin C and vitamin E, neutralize free radicals before they can damage the body. Therefore, antioxidants may aid in exercise recovery.<sup>17</sup> The best place to find these powerful nutrients are in brightly colored, fresh fruits, vegetables, whole grains, fish, nuts, and seeds. Some examples of powerful antioxidant-rich food sources include:

**Beta-carotene:** yellow and orange fruits and vegetables and dark leafy green vegetables.

**Vitamin C:** peppers (red and green), broccoli, cabbage, collard greens, tomatoes, cantaloupe, grapefruit, kiwi, and strawberries. **Vitamin C** reduces pain and speeds up muscle strength recovery after intense exercise.<sup>18</sup> 400–3,000 mg (*Total dose including multiple vitamin*)

**Vitamin E:** vegetable oils, sunflower seeds, wheat germ, nuts, avocados, and whole-grains. Research shows athletes have less cellular damage when they ingest more vitamin E.<sup>19</sup> 400 to 800 IU per day, endurance athletes especially (*Total dose including multiple vitamin*)<sup>20</sup>

**Selenium:** salmon, tuna, sunflower seeds, and whole grains.

**Zinc and Copper** reduces evidence of post-exercise free radical activity.<sup>21</sup> 50 mg per day of zinc and 3 mg per day of copper.

**Magnesium** deficiency can reduce exercise performance and contribute to muscle cramps.<sup>22</sup> 500 to 800 mg daily is suggested for endurance athletes<sup>23</sup>

**B vitamin complex** needed to produce energy from carbohydrates, particularly vitamin B2, vitamin B5, and vitamin B6.<sup>24</sup> A B-complex supplement in addition to the multiple will provide adequate amounts.

**Ribose** is a simple sugar that occurs naturally in all living cells. The body produces ribose through a series of metabolic reactions that begin with glucose, another simple sugar. As food is digested, certain portions are used to manufacture protein, essential fatty acids and other compounds. Some of the food is converted to glycogen and stored away. When glucose in food is metabolized, part of it goes directly to energy production, while some is directed to the production of ATP. Ribose is also made at this point and directed to ATP production. In addition to forming the carbohydrate portion of DNA and RNA, ribose begins the metabolic process for production of adenine triphosphate (ATP), the energy source that drives muscle contraction during exercise. Without ribose, the body can't generate ATP. Available data suggest that ribose may have utility in athletic performance, including strength, power, and high-intensity activities. To keep cellular ATP levels at their highest and ensure adequate restoration of ATP, 2-5 g of ribose are recommended daily before and/or after hard training.<sup>25,26</sup> Keep in mind, ribose needs to be present when the body's muscles and cells will use it to salvage ATP, which is during or immediately after exercise. During long-term, high-intensity exercise, 3-5 grams can be taken every hour with a sports drink.<sup>27</sup>

**Eleuthero** (*Eleutherococcus senticosus*), also known as Siberian ginseng, has also been investigated as an herb that may improve athletic performance and improve concentration. Research from Russia indicates it may be effective for this purpose.<sup>28</sup> Siberian ginseng, as well as Panax ginseng, also have well-proven adaptogenic properties, which help the body cope with general stress and physical stress of intense training.<sup>29</sup>

**Branched chain amino acids (BCAA)** include L-valine, L-leucine, and L-isoleucine. They are needed for the maintenance of muscle tissue and appear to preserve muscle glycogen stores<sup>30</sup> and help prevent muscle protein breakdown during exercise.<sup>31</sup> These aminos are used rapidly during exercise and the more intense the exercise, the greater the loss. An excess loss of BCAAs during exercise decreases optimal muscle synthesis and if a deficiency is allowed to develop it may result in a breakdown of muscle. Studies show that oral BCAA supplements are absorbed and can be used as sensible "insurance" to prevent muscle loss and promote muscle growth.<sup>32</sup>

**Fish Oils** containing EPA and DHA have anti-inflammatory activity and inhibit COX2.<sup>33</sup> They also help strengthen the immune system. Some studies have noted a decrease in morning stiffness and at least two clinical trials concluded that arthritis patients who took fish oils could eliminate or sharply reduce their use of NSAIDs and other arthritis drugs.<sup>34,35,36,37,38</sup> General dose for keeping inflammation down is 3 to 6 grams of EPA with DHA<sup>39</sup>

**Glucosamine** is a naturally occurring compound found in the body. Without glucosamine, cartilage synthesis is hampered. It enhances production of hyaluronic acid, the compound primarily responsible for the lubricating and shock absorbing properties of the fluid that bathes the joints.

**Chondroitin** is a substance found throughout the body, especially in skin, bone, arterial walls, and cartilage. It plays a role in cartilage synthesis and aids shock absorption and acts as a "water magnet." Water is the primary medium in the spaces between joints, it aids shock absorption and transports nutrients into cartilage.

**Enzymes** improve circulation to bone, cartilage, tendons, ligaments, and muscles. Enzymes can break through stagnation and improve blood flow to damaged areas. They also have an anti-inflammatory natural of their own, reducing swelling and inflammation.<sup>40</sup>