

SPORTS AND ENZYME THERAPY

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Mission Statement: Transformation uses every available resource to stay on the leading edge of clinical nutritional science by providing the health care community with the highest quality products, protocol, and research. The services that Transformation provides to the practitioner are better than and cost less than those that the practitioner could otherwise obtain.

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Sports are characterized by increased physiological and biochemical demands on the human body. Depending on the nature of the sport activity, some physio-anatomical systems are more affected than others. In general, any sport will impact the musculoskeletal system. However, some types of sports will impact the muscles most, whereas other forms of sports will have larger impact on the tendons and ligaments. In addition to the biomechanics and physiology of the musculoskeletal system, sports activities affect other systems, such as digestion, the immune system, circulation, endocrinology, and respiration. The degree of impact on the overall system will depend on the level of training, physical conditioning, nutrition, and oxidative stress damage.

Sports in general can induce injury or inflammation. For instance, jogging or bicycling can overstretch and/or tear muscles. Boxing may cause edema, hematoma, and fractures. However, whether an injury is caused by an accident or by a particular sport, the physiological and biochemical processes taking place in the body are the same. These processes are collectively referred to as inflammation.

In any athletic, sports, or workout activity, one needs to focus on these four things:

- increased vascularization and oxygen supply to muscle
- alleviation and control of pain
- adequate supply to provide nutrients for energy and biosynthetic pathways
- minimization of free radicals in the system

Increased Blood Flow

Oxygen, which is needed by the body to generate ATP, the ultimate energy currency, must be carried to the tissues (especially the muscles) in order to increase performance and reduce the onset of lactic acid production. Lack of an oxygen supply and accumulation of lactic acid into muscles will lead to fatigue, pain and poor performance. As oxygen is inhaled, it needs to bind to the hemoglobin contained in the red blood cells and get carried to the tissues. The red cells travel throughout the blood vessels to deliver oxygen and carry away the carbon dioxide that results from tissue metabolic activities.

Any condition that impedes the flow of blood (i.e., the free circulation of the red cells) will affect athletic performance. This is because an inadequate supply of oxygen and the accumulation

of carbon dioxide and lactic acid will acidify the tissues. Acidification of the tissues increases the sensation of pain and triggers the onset of inflammatory processes. Proteolytic enzymes, when taken on an empty stomach, are absorbed into the blood stream and help to break down blood clots, free red cells from aggregation to each other, and improve blood rheology even in the small capillaries that supply the muscle tissues.

Bad diet, stress, free radicals, and excess cholesterol are some of the few conditions that favor the formation of red blood cell aggregation, plaque, and thrombus within the blood vessels. Any of these conditions will block the flow of blood to and from tissues, thus reducing performance and promoting the early onset of fatigue.

Pain Control and Management

Pain is the body's sensory response that reflexively causes the individual to remove the stimulus of the pain. It is a part of the athlete's training goals to increase the threshold of the stimulus at which muscles will fatigue and experience pain. In many sports, competitive training causes some microtraumas that result in various (albeit small) tissue injuries that irritate, causing edema and sometimes hematomas. Muscle soreness is often the result of edematous swelling, which exerts pressures on nerve endings. As edema blocks circulation and promotes tissue acidification, it also forms pain mediators such as histamine and bradykinin. Additionally, substance P is secreted and stimulates the nerve endings for pain.

There are other biochemical consequences resulting from the inflammatory aspect of pain, such as T cell activation and increased cytokine production. In fact, studies have shown that the serum of some athletes soon after training contains myoglobin, the oxygen-carrying protein in muscles whose presence in the serum indicates some degree of muscle injury. This released myoglobin stimulates the

activation of T cells, which is not physiologically normal under these conditions and thereby initiates a series of immune reactions that will impact the body.

Oral proteolytic enzymes are immunomodulatory and regulate cytokine production. Several studies have shown that oral proteolytic enzymes used along with potent antioxidants help alleviate these problems. In fact, the microtraumatic muscle lesions that lead to several of the physiological and biochemical pain processes during training (as mentioned above) are suppressed when enzyme therapy is used. More specifically, there is reduced myoglobin release, which halts unnecessary T cell activation and, in turn, halts increased cytokine.

Another area where proteolytic enzymes have shown great benefits is the reduction of edema and swelling. Blonstein (1969) reported that boxers who had suffered injuries around the eyes that had to be sutured actually healed within 2 weeks when treated with enzymes. In contrast, the boxers in the study who were not treated with enzymes required 4 weeks for healing. Rathberger (1971) reported that, following bruises in sports activities, the average time to recover when on enzyme therapy is about 8.5 days, whereas the time was 17 days for the subjects who were treated with placebo.

It should be noted that the enzymes used here were not analgesics, unlike many drugs used in sport medicine and other pain management programs. Rather, they reduce pain by reducing the swelling, thus treating the cause and not the symptom. *Furthermore, contrary to the use of pain killers that often leave residues very similar to "prohibited" drugs and thus create major concerns in competition, enzymes do not leave such residues and are natural, safe products.* The use of enzyme therapy in enhancing performance and managing pain through improved circulation is gaining wider acceptance as research gathers more data.

Free Radicals

Free radicals are integral parts of the body's intermediate metabolites. In fact, they are necessary for the body's ability to mount an immune system response and to perform several other biochemical functions, including energy production through the oxidative phosphorylation mechanism. For instance, between 2 and 5 percent of the oxygen used to produce energy in the mitochondria actually forms free radicals. As someone exercises, they inhale more oxygen, thus increasing the amount of free radicals generated by the body. Additionally, cells are equipped with enzymes to counteract free radical damage. *Thus, it is not the presence of free radicals that constitutes a health concern. Rather, it is the concentration of free radicals in relation to the antioxidative mechanism in the system.* The more the body is exposed to these free radicals early in life, the sooner the body's defense, ability to perform well in athletic sports, and ability to heal and manage stress will be overwhelmed.

In physical activities, because of the high-energy output demand on the oxidative phosphorylation, more free radicals will be formed. Thus, anyone who works out or performs physical activities needs to take more antioxidants as a function of their diet, age, exposure to environmental pollutants, and/or poor lifestyle (smoking, alcohol, etc).

Good Digestion

Physical activities like sports and workouts require an ample and adequate supply of good nutrients. As activities increase, the rates of catabolism and anabolism increase. The body has to be supplied with nutrients such as amino acids, carbohydrates, fatty acids, vitamins, and minerals. These nutrients are essential for the body to rebuild itself and provide energy to the cells. However, all these processes that make nutrients available to cells and use them appropriately primarily depend on digestive hydrolytic enzymes. It is important that proper diet and thorough

digestion be part of any physical activity. Supplemental digestive enzymes will help ensure the availability of nutrients in foods.

Recent studies have shown that intense physical or athletic workouts may increase intestinal permeability. This is a condition where large molecules or bacteria may pass freely into the blood stream without being digested. This condition further requires the administration of oral digestive enzymes so that undigested molecules do not pass freely into the blood system. This is a serious condition, as it creates symptoms such as those found in celiac disease, Crohn's disease, colitis, or food allergies. Digestive enzyme supplementation therefore needs to be an important part of any health and wellness preventative program for the following reasons:

- Endogenous digestive enzymes are very likely to be limiting due to the uncontrolled death of digestive organ cells (by oxidative stress on DNA and other molecules) and the reduced concentration of active enzymes through oxidation
- The diet of many people is comprised of poorly digestible and less nutritious foods
- The impact of free radicals in the body due to today's lifestyle is becoming more prevalent
- The food chain at one point or another is contaminated with environmental pollutants

In summary, an athletic person needs to do the following:

- Maintain a good cardiovascular system and oxygen supply
- Supply the body with adequate nutrients
- Help the gastrointestinal flora, since an inadequate flora creates toxins and high-acid by-products that impede performance and health
- Have an adequate supply of supplements that address the aqueous and lipid-prone free radical damage areas
- Maintain adequate energy metabolites through proper supplementation.