POST-TRAINING NUTRITION

Most athletes and coaches do not realize the benefit of proper nutrition between training sessions. All forms of exercise are body stressors. Stress from a strict interpretation of response, is a mechanism of energy preparation; chemical primers facilitate response to "fight or flight". Unlike distress induced by a serious injury or emotional stress, exercise is a positive stress (eustress) which means that the acute damaging "stressor" results in a positive adaptation. For example, after lifting weights your muscle proteins are being damaged and disposed of via cellular protein degradation, inflammatory mediators and proteolytic enzymes which digest these proteins. In response the inflammation leads to muscle remodeling through protein synthesis and the myofilaments are repaired. Prolonged exposure to appropriate doses of stress with proper recovery leads to physiological enhancements specific to the training.

When the body is placed under the demands of physical stress calories are consumed at a rate equal to the work demand. Protein degradation and glycogen depletion is highest immediately following the workout. Glycogen needs to be replenished quickly, especially in the liver so that blood glucose can be maintained within the physiological homeostatic limits. If an athlete or exerciser neglects to eat carbohydrates soon after a workout, protein degradation increases. This occurs because the deficit created by glycogen depletion is met by the production of glucose from amino acids through a mechanism called gluconeogenesis in the liver. The body's demand for sugar is met by the conversion of metabolic remnants of the degredated proteins (amino acids) which are sent to the liver and converted to sugar.

In contrast, eating carbohydrate and some protein soon after the workout (within 30 minutes) will reduce muscle protein degradation because the hormonal response (insulin) to carbohydrates will facilitate muscle and liver uptake of carbohydrates via increased glucose uptake and glycogen re-synthesis. The anatomical position of the liver is ideal for its role in the regulation of blood glucose. It is positioned just downstream from the gut and pancreas so that it can efficiently extract digested glucose while under the influences of pancreatic hormones involved in blood sugar regulation (insulin and glucagon). Glycogen is stored with approximately 3 grams of water which restores post-workout cellular volume (osmotic pressure), and increases cellular uptake of amino acids potentially leading to increased protein synthesis.

Although it sounds very scientific, these effects can be analyzed easily in a more practical scenario….If an athlete performs an intense workout on Monday, and then doesn't eat soon after the workout, he/she will not be able to perform the workout at the same intensity the next day. Similarly, muscle size will not increase and may actually atrophy in response to the training. This explains why many exercisers have variations in their

workouts related to total Watts produced. They simply do not have the energy stores to meet the intended demand. It would be like driving a car 100 miles on 10 gallons of fuel and only getting 8 gallons of fuel for your ride back. The same distance would not be accomplished and you would come up short on your return. Essentially the same thing happens with subsequent exercise bouts. Granted sleep and hydration play a role but energy is the primary determinant of output capabilities when the rest of the body is homeostatically balanced.

If a high carbohydrate diet with some protein is consumed, especially within the half hour following a workout, a workout of similar intensity can be performed on consecutive days. It has been recommended that 1.2 grams of carbohydrate per kilogram of body weight be ingested immediately following heavy or prolonged training. The same amount should be consumed each hour for the next four hours (1.2g/kg/hr). When this amount of carbohydrate is consumed, the muscle glycogen synthesis rate is maximal and does not require the increased insulin that is associated with combined protein intake. However, the increased insulin activity in response to protein ingestion may increase the rate of hepatic glycogen synthesis. Additionally, if some protein is consumed with carbohydrate during the hours after training, only 0.8g/kg/hr of carbohydrate is required in the immediate post exercise meal and subsequent feedings over the next 4 hours post-exercise.

The protein with carbohydrate combination has also been shown to reduce soreness following exercise greater than carbohydrate alone. Athletes engaged in heavy training who risk overtraining and compromised immune systems may benefit from protein and carbohydrate combinations in order to increase glutamine levels, an amino acid which is a source of fuel for immune cells, and to restore nitrogen balance which can decrease in response to high levels of the stress hormone cortisol.

Inadequate caloric intake during training is one of the most common mistakes weight lifters commit when attempting to increase muscle mass. Just like reducing caloric intake leads to weight loss, increasing caloric intake is required to gain weight. Training for a hypertrophic response requires adequate caloric intake to build muscle. In endurance athletes, reduced caloric intake can actually increase their body fat percentage. This paradox may be due, in part, to increased muscle degradation following training to restore blood glucose. It is essentially an inverted relationship because a loss of muscle equals a greater percentage of body fat. In vigorously trained exercisers and athletes contributions to energy can be three times the protein metabolism of the average person. This suggests not only adequate calories but the right calories are very important for well trained individuals.

Carbohydrate and protein after a workout are obviously important but different food choices can affect the absorption rate. For example: an orange and a protein bar, a peanut butter and jelly sandwich, or glass of milk and a banana, etc. soon after a workout are easy combinations. Higher glycemic foods do not have the same negative impact following exercise as the do during the rest of the day, but refined sugars should be avoided. Also, be sure to eat complex carbohydrates in small meals throughout the day

during periods of heavy training to maximize glycogen storage and prevent the blood glucose surges associated with refined carbohydrates. It is usually a good idea to consume some protein every time you eat carbohydrates. Carrying some food with you during the day, like peanuts, trail mix, cherries or cranberries, etc…is an easy way to achieve this. Hunger, especially in the hours after exercise, often correlates with the release of amino acids and lactate from muscle (unexercised-resting muscle) to restore glycogen stores in the liver and stores of depleted muscles post-exercise. Thus, grazing throughout the day will prevent you from over-using muscle as a fuel reservoir.