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A bodybuilding and powerlifting guide :.

Water – nature's ergogenic

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One ergogenic aid impacts major physiological events within the human body – actions distinguishing the difference between record-breaking performance and ultimate failure. This fluid pours as a colorless, tasteless and odorless substance; essential to all known forms of life. Under most circumstances, it's free of charge and widely available. Water's importance in human performance is frequently taken too lightly by athletes, introducing life threatening situations if neglected all together.

There are a lot of suggestions regarding proper water intake, as well as a few rumors about how long someone can survive without it. The fact is: there is no one-size-fits-all solution when it comes to proper hydration. Individual requirements can vary based on body weight, genetic predisposition, heat acclimation and metabolic efficiency. Athletic people are at a great risk for dehydration due to activity levels, environmental changes during exercise and dietary adjustments that can swing cellular hydration levels. Maintaining adequate hydration improves performance.

Euhydration: proper hydration

Water averages around 60 percent of total body mass – with a range of 45 to 75 percent; body composition is the primary influence. Fat-free mass is 70 to 80 percent water. Quite a bit dryer, adipose (fat) tissue maintains a fluid balance of around 10 percent.

Daily water balance is influenced by constant exchanges of water loss and gain. Water gains are easily obtained through general consumption, while water losses occur from respiratory, gastrointestinal, renal and sweat losses. A healthy individual's respiratory water is released in amounts equal to what is produced in the body by cellular metabolism. Gastrointestinal tract losses are small, unless watery bowel movements become frequent. Sweating is the primary avenue of water loss during exercise.

Sodium chloride plays a crucial role in maintaining fluid balance and efficient cellular activity. It is the primary electrolyte in sweat; present in smaller amounts are potassium, calcium and magnesium. Sodium is excreted and subsequently reabsorbed by the sweat glands. This process can be interrupted with heavy clothing. The ability

to reabsorb sodium does not increase with sweat production, so heavy sweating further depletes the body of the important mineral. Heat acclimation does improve the ability to reabsorb sodium and acclimated athletes can have more than 50 percent lower sodium concentrations in their sweat.

Trained athletes, especially bodybuilders and strength athletes, have relatively high water levels due to their above average muscle mass. Dietary swings from carbohydrate loading will further increase total body water amounts depending on the amount of muscle mass and prior depletion periods. Glycogen is the storage form of glucose from carbohydrates. Although inconclusive, a commonly accepted hydration rate for carbohydrate loading is nearly three milliliters of water per gram of glycogen deposited in the muscles and liver. This can cause significant changes in body weight and hydration levels in advanced bodybuilders. Carbohydrate loading without adequate concurrent fluid intake causes dehydration symptoms.

Hypohydration: water dehydration

Altered physiologic function and decreases in performance occur when the body is allowed to dehydrate. Athletes are prone to aggravate proper fluid balance by purposely dehydrating to compete in lower weight classes or for exhibition purposes; some simply for cosmetic gratification – to appear leaner. Furthermore, training twice per day, or for long daily sessions, creates a cumulative affect of fluid losses. This can deplete hydration levels for several days, or weeks, depending on attempts to replenish hydration. Strength athletes do not seem to be affected by dehydration in terms of anaerobic performance; however endurance and cognitive ability decreases are well documented.

Skeletal muscle cramps are often associated with dehydration, electrolyte deficits and muscle fatigue. Muscle cramps are common in hyperthermia cases where an athlete must perform in a hot environment, wearing heavy protective equipment, without prior heat acclimation. People susceptible to them tend to sweat heavily with large sweat sodium losses. The cramps feel like painful spasms – sometimes excruciating – that seem to randomly attack muscle fibers, as one bundle relaxes, an adjacent bundle contracts. Twitches can move between different muscle groups. Most spasms last about one to three minutes but the total series can last six to eight hours. The cramps respond well to rest, prolonged static stretching and ingestion of fluids and electrolytes.

Heat exhaustion normally does not involve excessive hyperthermia but rather a result of fatigue, decreases in body water, electrolyte depletion or systems within the body failing. Physical condition and innate work capacity are personal factors affecting the severity of exhaustion; as well as concurrent medication and dietary supplement intake. Exhaustion is a physiological response during all temperature ranges. Statistically, when surrounding temperatures rise above 68 degrees Fahrenheit, heat stress rises and the time to exhaustion decreases. Energy stores deplete faster in hotter conditions, especially when an athlete is not properly acclimated. Other than heat exhaustion, a post-exercise collapse can also be due to postural hypotension, a sudden fall in blood pressure often causing dizziness.

Hyperhydration: excessive water intake

It is possible to hyperhydrate by drinking too many fluids during exercise. Drinking too many liquids normally stimulates increased urine and sweat production; allowing the body to return to normal hydration levels. However, urine output is reduced during exercise and heat stress. The kidneys regulate water balance by adjusting urine production. This condition can be further aggravated when water is combined with binding agents; such as sugar contained in sports drinks. This presents a risk of delusional hyponatremia, a disorder of fluid and electrolyte balance caused by low sodium levels in the blood.

In general, dehydration is more common, but overdrinking during symptoms of hyponatremia is more dangerous. Healthy individuals are unlikely to ever develop water intoxication from hyperhydration. Nearly all deaths related to water intoxication in healthy individuals occurred after heavily forced intake or exercise-induced drops in electrolyte levels. Competitive water drinking attempts, leading to the consumption of several gallons in a few minutes, can be life threatening. Additionally, water consumed in heavy amounts following long endurance events without any concurrent dietary electrolyte intake creates a serious health condition from electrolyte imbalance.

Hilary Bellamy died competing in the 2002 Marine Corps Marathon from hyponatremia. Her condition was a result of a sodium imbalance from excessive water consumption. Bellamy collapsed nearing the 22-mile mark. In September 1999, an Air Force basic trainee died of heat stroke, severely complicated by water intoxication, two days after becoming seriously ill during an almost six-mile march. The Air Force changed its recruit training procedure following the casualty.

Water and the athlete

Some athletes tolerate dehydration well – seemingly unaffected – while others discontinue activity in relatively less stressful conditions. Regardless of tolerance to symptoms, hyperhydration should begin around four hours prior to exercise to allow normal hydration levels to develop. Pre-cooling the body can also extend the time to exhaustion; athletes tend to terminate exercise from fatigue at a rectal temperature of 104 degrees Fahrenheit. Two hours prior, a hydration assessment can determine further fluid needs. If urine is still dark in color, more fluids should slowly be consumed. Drinking beverages with added salt will help stimulate thirst and retain consumed fluids. During exercise, the goal is to merely replace the fluids being lost. Long events should be augmented with additional sources of salt; for instance, common sports drinks include salt and sugar for enhanced cellular hydration and energy sources. The goal of pre-hydrating is to begin physical activity with normal hydration and electrolyte balance.

Changes in bodyweight during exercise can be used to calculate sweating rates. This approach assumes that one milliliter of sweat loss represents a one gram loss in bodyweight. If possible, changes in bodyweight should be measured undressed, such as right after training but before a shower, since sweat can become trapped in clothing. In general, an individual will feel thirsty after a drop of roughly two percent body mass. Total bodyweight losses of three to five percent create concern for

performance ability. Urine color can be a misleading indicator since the shade will not immediately reflect rehydration attempts. This information should not be considered an accurate rate in all conditions but merely a guide for the current training environment.

During exercise, water and electrolyte balance can become disrupted, negatively impacting performance. With a little knowledge and application, an athlete's body can perform without heat or fluid-related impairment or injury.

Exertional Heat Illness during Training and Competition, Am. College of Sports Medicine Position Stand, March 1, 2007
Exercise and Fluid Replacement, Am. College of Sports Medicine Position Stand, February 1, 2007
Fluid and electrolyte supplementation for exercise heat stress, Am. J. Clinical Nutrition, August 1, 2000

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