

Electrolytes and Hydration

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The Importance of Electrolytes in Hydration

Key Points:

- Electrolytes are vital to physiologic function and athletic performance
- High or low levels of electrolytes are detrimental to performance and health
- The majority of foods and beverages contain an overabundance of sodium and low potassium in relation to the standard American diet

The term “electrolyte” is the medical word for the electrically charged minerals in the body. Electrolytes are vital to health and act as chemical messengers in the body carrying electrical impulses from the nerves to control all tissue function and movement.

An imbalance of any of the electrolytes can lead to serious disruptions in physiologic function. Many bodily processes are highly dependent on electrolytes, primarily heart and nerve function, muscle coordination and control, and maintenance of the body’s fluid levels.

Electrolytes are found throughout body tissues. Blood, plasma (the acellular portion of blood) and the fluid that bathes the cells are high in sodium (Na^+) and chloride (Cl^-), which is similar to sodium chloride (Na^+Cl^-) - otherwise known as common table salt. In other areas of the body (such as cells that make up organs), the electrolytes potassium (K^+), chloride (Cl^-), calcium (Ca^{2+}) and magnesium (Mg^{2+}) are prevalent.

Electrolyte levels are tightly controlled by several hormones and by the kidneys, which are primarily responsible for keeping electrolytes in a constant state of balance, retaining and removing them as necessary.

An electrolyte imbalance can lead to serious health issues, including eventual death, if not corrected. The most common imbalances occur with sodium and potassium. An excessive blood level of sodium is known as *hyponatremia*, while an insufficient level is known as *hypernatremia*. Excessive blood levels of potassium are known as *hyperkalemia*, and insufficient levels are known as *hypokalemia*.

Sodium

Key Points:

- Sodium is found in high amounts in the typical American diet
- Too much sodium leads to increased thirst and bloating
- Extra amounts of sodium are rarely necessary

Sodium is extremely important for the regulation of fluid levels outside the cells in the body. It is an essential factor in hydration, as it “holds” water in the cells. While sodium is highly important as an electrolyte, it is found at excessively high levels in many foods and drinks.

The minimum physiological requirement for sodium is 500 milligrams per day. For comparison, the average American diet contains roughly 3,000 to 5,000 milligrams of sodium per day, far exceeding the minimal requirement.

For optimal health, it is recommended that one consume less than 2,400 milligrams of sodium per day. Excessive intake of sodium is associated with hypertension (high blood pressure) and swelling in the tissues.¹ High sodium levels are also associated with osteoporosis (thinning of the bones) due to sodium’s effect of increasing urinary loss of calcium.²

Despite the widespread prevalence of sodium in the American diet, many sports drinks continue to add high amounts of sodium into their formulations. This is done primarily for flavor enhancement, rather than to address the incorrect claim that people need extra amounts of sodium.

With 50 milligrams of sodium per serving, Glukos contains approximately half the sodium of other sports drinks, providing more hydration and electrolyte enhancement, rather than going overboard with excessive amounts of a nutrient already widely found in the average diet.

Hypernatremia

Defined as excessive blood levels of sodium, hypernatremia is a common occurrence due to the high amounts of sodium found in foods and beverages. Too much sodium may lead to increased thirst, resulting in more water intake, causing swelling in the hands, feet and face. Excess sodium will also pull water into the gut, leading to bloating, cramping and frequent “pit stops.” Hypernatremia also contributes to high blood pressure, as the sodium pulls more water into the bloodstream, raising the pressure in the cardiovascular system.

Hyponatremia

Low blood sodium levels, known as hyponatremia, occur when the blood volume is diluted with excessive water. This can occur when an athlete replaces lost fluid with plain water. Hyponatremia has become a widespread concern, as the message to drink plenty of fluids is prevalent in the athletic community. Hyponatremia can

cause swelling, wheezing, nausea and vomiting, dizziness, and eventual coma and death if untreated. Consumption of a sodium-containing beverage instead of plain water will prevent this condition.

Potassium

Key Points:

- Potassium is an important electrolyte that works alongside sodium in the body
- Potassium is typically found in low amounts in the standard American diet
- Potassium needs to be replaced during and after exercise

Potassium is integral to maintaining the body's fluid balance with sodium. Along with sodium, it is one of the main electrolytes consistently lost in sweat. Potassium is the most abundant electrolyte found inside the cells of the body and is essential for many physiologic processes, including nerve impulse transmission, heart and skeletal muscle contraction, and processing of carbohydrates (energy production).³

The daily recommended allowance of potassium is roughly 3,500 milligrams. Potassium is found in many fresh fruits and vegetables, although the potassium found in vegetables is often lost through steaming and other forms of processing.

The standard American diet contains roughly 2,000 to 6,000 milligrams of potassium per day; levels tend to be lower in people who sweat heavily, take certain prescription medications, drink coffee and/or alcohol and consume a high-salt diet. People who follow low-calorie or fad diets, off-again, on-again dieting regimens or consume diet pills, diuretics (blood pressure medications) or laxatives may also be susceptible to low levels of potassium.

Potassium is typically found in low levels in many sports beverages and has a taste similar to sodium. Glukos contains more potassium than sodium, with 230 milligrams of potassium per serving, an amount three times that typically found in other beverages, because the diet and exercise regimens of athletes require extra potassium. A single serving of Glukos contains 1.5 times the amount of potassium the standard over-the-counter potassium-replacement tablets do, making it a convenient way to maintain potassium stores in working athletes, while also providing hydration.

Levels of potassium that are either very high (hyperkalemia) or very low (hypokalemia) can be life threatening.

Hypokalemia

Low potassium levels may occur for a number of reasons, although those listed above are typical causes. The most common symptoms of hypokalemia are fatigue and weakness. Other signs are low blood pressure and decreased heart rate. Advanced cases of hypokalemia can result in irregular heart rhythms (dysrhythmia) and, if untreated, death.

Hyperkalemia

Elevated potassium levels occur more rarely; typically, this happens in people who have reduced kidney function, protein-breakdown diseases or severe infections. Some medications may also predispose a person to hyperkalemia.

Summary

Electrolytes are vital to physiologic function, and to athletic performance at a higher level. The body constantly maintains electrolyte balance, as variations in either high or low levels are detrimental to performance and health. The majority of sports beverages contain an overabundance of sodium and low potassium in relation to the standard American diet. Glukos sports performance beverage provides the optimal amount of electrolytes for the active person, with 230 milligrams of potassium and 50 milligrams of sodium per serving.

¹ O'shaughnessy, K. Karet, F. (2006). Salt Handling and Hypertension. *Annual Review of Nutrition*, 26, 343-365.

² Carbone, L. Barrow, K. Bush, A. Boatright, M. Michelson, J. Pitts, K. Pintea, V. Kang, A. Watsky, M. (2005). Effects of a low sodium diet on bone metabolism. *Journal of Bone and Mineral Metabolism*, 23(6), 506-513.

³ McKevooy, G. ed. (1998). AHFS Drug Information. Bethesda, MD: American Society of Health-System Pharmacists.