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Sports and Energy Drinks: The World's New Elixir

Many hard-working men and women, especially athletes, require energy replacement to maintain physical and mental activity. Chemical technology has created sports beverages, such as Gatorade, to prolong energy and increase athletic performance. Chemical technology has also produced energy drinks, such as Red Bull, to serve the working person who needs to counter fatigue, to be alert for long periods of time.

Gatorade

The first replenishing sports drink came in 1965 with the creation of Gatorade by Dr. Robert Cade. Gatorade, and the sports drinks that followed, were developed to replenish fluids, carbohydrates, and **electrolytes**[1] lost in exercise. Two seasons after supplying Gatorade for the team, the Florida Gators won the Orange Bowl, its first Orange Bowl win in the school's history. After Florida's victory, Bud Carson, coach of the runner-up Georgia Tech Yellow Jackets said, "We didn't have Gatorade. *That* made the difference."

Benefits of Gatorade vs. Water

An active athlete sweats up to three liters (5 pounds) per hour. Water is important for an athlete for maintaining a healthy body temperature. Water is a major part of blood that provides nutrients for muscles. Either water or a sports beverage is able to to

[1] A salt that conducts an electric current in solution. In the human body electrolytes such as sodium chloride and potassium chloride are important for conducting nerve impulses.

replenish fluids in the body. However, unlike water, a sports drink also supplies carbohydrates and electrolytes. Studies conducted by the **ACSM**[2] have shown that a 6-8% carbohydrate solution maximizes athletic performance. Multiple carb sources, such as sucrose, glucose, and fructose, provide energy to muscles quickly and help increase fluid absorption. Gatorade and Powerade are examples of sports beverages that have an optimum concentration of carbohydrate to provide improved athletic performance better than that provided by water.

Along with carbohydrates for energy, sports beverages also contain electrolytes necessary to maintain proper muscle contraction and a normal fluid balance in the body. A normal fluid balance means that humans maintain homeostasis.

For an athlete, the amount of fluid lost in athletic performance should be equal to the amount of fluid taken in. When athletes exercise throughout the week, electrolyte deficiencies can occur. A deficiency of **sodium ion**[3] may lead to nausea and dizziness. Sodium ion is an essential electrolyte for safe exercise. **Potassium ion**[4] is the other essential electrolyte for athletic performance. Potassium and sodium ions are needed to conduct electric nerve impulses, crucial for exercise. A deficiency in potassium ion leads to muscle cramps, especially in a hot climate. The National Research Group recommends a ratio of about 3.5 grams of potassium per 2.4 grams of sodium; an optimum sports beverage has a sodium-to-potassium ratio of 2:3. The 110 mg of sodium ion, 30 mg of potassium ions, and 14 g of carbohydrates inside a serving of Gatorade make it a better option for energy replenishment than a can of Coca-Cola, which only contains 30 mg of sodium ion and no potassium ion in a 16 fluid ounce

[2] *American College of Sports Medicine*
[3] Sodium salt is the main electrolyte inside extracellular fluids, to maintain normal balance of bodily fluids.
[4] Potassium salt is the main electrolyte inside body cells.

bottle. Diet Coca-Cola also contains about 30 mg of sodium ion, but no sugar, which seems to make it a better option than regular Coke. However, the artificial sweeteners put inside Diet Coca-Cola disrupt regular metabolic pathways. Also, the small amount of sodium ion in both Coke and Diet Coke make them less viable options for athletes looking to replenish carbohydrates and electrolytes.

Detriments of Gatorade vs. Water

Despite the benefits of sports drinks like Gatorade, there are some negative side effects. The ACSM states that for events of less than one hour, "replacement of sodium and potassium is unnecessary. Addition of carbohydrate to any solution consumed will only serve to exacerbate the reduced **gastric emptying**[5] that occurs during high-intensity exercise." Sports beverages are not recommended for events lasting less than one hour. For such events, water may provide a better option.

The good taste of Gatorade has made it appealing even in situations that are not athletic, such as a meal or a party. Table I gives nutrition facts for a normal Gatorade drink. It shows that there are 14 grams of sugar in one serving for Gatorade, or 54 grams of sugar in one regular bottle; that is too high for one drink. In comparison, a can of Coca-Cola has 40 grams (or 10 teaspoons) of sugar. The consumption of sports beverages by people not participating in intense exercise may lead to problems associated with too much sugar-intake: obesity, heart problems, and diabetes. Thus, while sport drinks like Gatorade benefit athletes, they may create a health problem for non-athlete consumers.

[5] Fluids inside the gastrointestinal tract are absorbed more slowly during exercise

Nutrition Facts

Serving Size 8 fl oz (240 mL)
Servings Per Container 4

Amount Per Serving	
Calories 50	
	% Daily Value*
Total Fat 0g	**0%**
Sodium 110mg	**5%**
Potassium 30mg	**1%**
Total Carbohydrate 14g	**5%**
Sugars 14g	
Protein 0g	

Not a significant source of Calories from Fat, Saturated Fat, Cholesterol, Dietary Fiber, Vitamin A, Vitamin C, Calcium, Iron.

* Percent Daily Values are based on a 2,000 calorie diet.

Table 1. Nutrition Facts for a Regular-Sized Gatorade Drink

Energy Drinks

Following the creation of sports beverages, food chemists created the "energy drink," a cold beverage with high **caffeine**[6] content such as Red Bull, that is used as a pick-me-up for consumers who need a boost of energy. The Institute of Medicine lists mild stimulation and wakefulness, ability to sustain intellectual activity, and shortened reaction times as some of the pharmacological effects of caffeine. Indeed, those in need of a stimulant, such as employees working long hours or students staying up late to write papers, tend to use energy drinks to keep them alert. The Institute of Medicine recommends an intake in the range 100-600 mg as effective for increasing cognitive

[6] Caffeine (1,3,7-trimethylxanthine) is an alkaloid. 99% of caffeine is absorbed within one hour of ingestion. Caffeine readily passes the blood-brain barrier. A fatal dose of caffeine is near 14 g

performance and for stimulating wakefulness. A can of Red Bull has about 250 mg of caffeine, making it an ideal source of caffeine. A serving of Red Bull has about 25 grams of sugar, 15 grams less than a can of Coca-Cola; this makes it a healthier option for those looking for an energy boost without an excess of sugar.

Detriments of Energy Drinks

Despite the usefulness of energy drinks to those in need of an energy boost, there are some detrimental side effects of energy drinks. These effects mainly stem from two components of the drink: high sugar and caffeine content. Table 2 gives nutrition facts for a regular can of Red Bull; it shows that the drink contains about 25.7 grams of sugar. High intake of sugar may lead to negative side effects such as obesity and diabetes. However, Red Bull also can create problems related to excessive use of caffeine. Caffeine is one of the most widely consumed psychoactive drugs used as a stimulant; like many other drugs, there is a tolerance build up with continued use, and a withdrawal effect when regular intake suddenly stops. Withdrawal symptoms include headache. Also, the mental performance that is boosted with caffeine decreases significantly during withdrawal, until mitigated by time or by restarting caffeine use. Energy drinks provide benefits for those in need of an energy boost. But they also give negative side effects when used in excess.

Nutrient	Amount	% Daily Requirement
Total Carbohydrate	27.9 g	9%
Sugars	25.7 g	-
Water	226 g	-
Caffeine	76.5 mg	-

Table 2. Nutrition Facts for 1 Regular Can of Red Bull

Conclusion

Sports drinks and energy drinks are of benefit to athletes and to those lacking sufficient energy throughout the day. The benefits of these drinks, energy replenishment, wakefulness, and stimulation, are accompanied by detrimental features, including weight gain from high amounts of sugar, and withdrawal effects from dependence on caffeine.

These beverages have had much influence throughout the world. By the end of 2011, 13.3 billion liters of sports drinks per year are expected to be consumed per year in 2011. Similarly, about 3.5 billion liters of energy drinks per year are projected to be consumed by the end of 2011 per year. With a 32-oz bottle of Gatorade and a 250 mL can of Red Bull, each costing two to three dollars, the sports-and-energy-drinks industry amounts to a multi-billion dollar per-year industry.

Works Cited

Caffeine for the Sustainment of Mental Task Performance: Formulations for Military Operations. Washington, D.C.: National Academy, 2001. Print.

Driskell, Judy A., and Ira Wolinsky. Macroelements, Water, and Electrolytes in Sports Nutrition. Boca Raton [Fla.: CRC, 1999. Print.

"Football Inventions That Shaped the Modern Game." InventHelp, "The Invent Help People": Have an Invention Idea? InventHelp, Aug. 2005. Web. 30 Sept. 2011. <http://www.inventhelp.com/Football_Inventions.asp>.

Kies, Constance, and Judy A. Driskell. Sports Nutrition: Minerals and Electrolytes. Boca Raton: CRC, 1995. Print.

Nutrition Facts, Calories in Food, Labels, Nutritional Information and Analysis – NutritionData.com. Web. 30 Sept. 2011. <http://nutritiondata.self.com/>.

Williams, Melvin H. Nutrition for Health, Fitness & Sport. Boston: McGraw-Hill, 2002. Print.

http://www.science-house.org/CO2/activities/co2/soda.html