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**Q: What should my athletes be drinking, water or Gatorade?**

**A:** Water is a good thirst quencher, but not a good rehydrator. That's because water turns off thirst prematurely and turns on the kidneys. As a result, research shows that people drink less water than they need during exercise and lose more in the form of urine. Keep in mind that Gatorade is formulated to work best when people need it most. In other words, the harder you work, the better it works. Your players should have both water and Gatorade available at practices and games. Giving athletes a choice of beverages will also encourage them to stay hydrated. Finally, sodium can indeed be replaced by Gatorade, but your athletes will still need to ingest a normal diet that contains ample salt. That's because we lose sodium chloride in the sweat at far greater rates than Gatorade can replace it. The salt in Gatorade (no more than in the same amount of milk) helps maintain the desire to drink and stimulates rapid rehydration following exercise. You can get more information on this topic from Sports Science Exchanges 3, 32, 50, and 63 on [www.gssiweb.com](http://www.gssiweb.com).

--Bob Murray, Ph.D. Director Gatorade Exercise Physiology Laboratory

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**Q: How often should you drink fluids?**

**A:** Staying hydrated is very important for athletic performance so it is important to drink fluids on a regular basis ? before, during and after exercise. Drink on a schedule not just when you're thirsty because by the time you're thirsty, you're already dehydrated.

- Before exercise ? Hydration should begin at least two hours before exercise with 17 to 20 oz. of water or sports drink, followed by 7 to 10 oz. 10 to 20 minutes before exercise.
- During exercise ? Consume 7 to 10 oz. of water or sports drink every 15 to 20 minutes.
- After exercise ? Approximately 20 to 24 oz. of water or sports drink should be consumed per pound of body weight lost during the course, until two hours after exercise has finished.

-- Bob Murray, Ph.D., FACSM, Director, Gatorade Sports Science Institute

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**Q: Why not just drink water during exercise?**

**A:** Water can be a good beverage choice during physical activity, particularly when nothing else is available. But water doesn't contain flavor, carbohydrates, or electrolytes, the stuff that makes sports drinks more effective than water at enhancing performance. It is important to drink fluids with an adequate amount of sodium, particularly for prolonged runs and continued sweat losses. Over enough time, not replacing sodium can cause blood sodium levels to fall, thereby increasing the risk of electrolyte imbalance. This can lead to muscle cramps or more severe situations such as hyponatremia, a potentially life-threatening condition.

-- Bob Murray, Ph.D., FACSM, Director, Gatorade Sports Science Institute

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**Q: What information is available on the use of glycerol as a hydration strategy in marathon running? Is it safe? Is it legal? Is it effective? What is the physiological rationale for its use?**

**A:** It is reported that loading with glycerol retains water to possibly help endurance athletes tolerate heat stress (e.g., more body water for sweating). Loading requires substantial fluid intake and a regimented sequence of drinking. No research is available to show that loading improves performance among distance runners. It will cause a weight gain of 2-3 lbs., which could slow the runner. Research from the Natick Army Labs demonstrates that glycerol loading prior to an exercise performance task offered no advantage over "drinking as you go" to replace sweat losses. Research from Ohio State University (OSU) showed that drinking a carbohydrate-electrolyte drink enhanced performance as well as, or better than the glycerol loading effect. A study in our lab and the research at OSU revealed potential side effects that included nausea, bloated feeling, and headaches. These can occur even when adequate extra fluid is consumed during the loading phase. Inadequate fluid during loading will likely exacerbate these side effects.

-- Craig A. Horswill, Ph.D. Principal Scientist Gatorade Sports Science Institute

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**Q: What are some ways I can prevent illness during training?**

**A:** There are several practical recommendations endurance athletes can follow to help ensure they stay healthy during training: (1) keep stress levels to a minimum; (2) follow a well-balanced diet; (3) get sufficient rest after a workout; and (4) avoid exposure to viruses and pathogens (e.g., wash hands, etc.); (5) drink a sports drink containing carbohydrates before, during, and after prolonged and intense exercise. In addition to keeping you hydrated, sports drinks contain carbs that help to reduce stress to your immune system.

-- David Nieman, Dr.PH, Researcher, Health Promotion, Appalachian State University

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**Q: What are the potential physiological consequences of exercising when in states of fatigue?**

**A:** The primary consequences of exercising while fatigued are: 1) increased risk of injury, and 2) decreased work/power output during the workout. The latter is inefficient in terms of maximizing gains from an exercise regimen. Gains can be made; however, most of the time, training intensity and total mileage are reduced, so fewer gains are made.

-- W. Larry Kenney, Ph.D., Professor of Physiology and Kinesiology, Penn State University

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**Q: What are signs of dehydration and how do I prevent it?**

**A:** If you have dry mouth, lightheadedness, a headache, fatigue or muscle cramps -- stop running, rest and drink fluids (sports drinks). If symptoms are more severe-- shortness of breath, high body temperature, nausea or incoherence, seek medical help immediately. Even when the temperature is as low as 60 degrees, you're still at risk for dehydration. The easiest way to help prevent dehydration is to consume fluids at a regular rate beginning before the start of exercise.

-- Craig A. Horswill, Ph.D. Principal Scientist Gatorade Sports Science Institute

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**Q: What should I remember on race day?****A: Eat Early**

It takes 3 to 4 hours for a pre-race meal to digest.

**Fuel Up**

Drink at least 16 ounces of sports drink or water 2 hours before the race, then another 8 ounces up to 15 minutes before the start.

Don't rely on thirst. Drink 2 to 4 ounces minimum (5 to 10 preferred) at every fluid station.

**Recognize Heat Illness**

If you experience lightheadedness, confusion, nausea, or muscle cramps, seek medical help immediately. Rehydrate by drinking fluids as nausea subsides.

-- Lisa Dorfman, M.S., R.D., L.M.H.C. Sports Nutritionist

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**Q: Why should people drink sports drinks?**

**A:** The simple answer is, "to rapidly replace the fluids and electrolytes lost through sweat, and provide energy for active muscles." Sweating is your body's way of cooling down, but dehydration is the penalty we pay. Drinking sports drinks during physical activity can reduce dehydration to zero and that's best for how an athlete feels and performs. Physical activity also increases our need for the carbohydrate energy that some sports drinks provide. As a result, we can exercise longer and harder.

-- Bob Murray, Ph.D., FACSM, Director, Gatorade Sports Science Institute

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**Q: What should I look for in a sports drink?**

**A:**

- Carbohydrate - about 6% (14g/8oz. serving) for optimum fluid absorption and energy. Appropriate mixtures include sucrose, glucose, and fructose. Avoid drinks containing only fructose--too much slows fluid absorption and causes abdominal cramps.
- Sodium, which stimulates fluid absorption, maintains the desire to drink, helps the body retain water, and enhances taste. Taste preferences change during and after exercise, such that we prefer slightly "salty" beverages.
- No carbonation, which can cause stomach discomfort.
- No caffeine, which can promote dehydration.

-- David Lamb, Ph.D. FACSM, Professor Emeritus, The Ohio State University

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**Q: Is more carbohydrate in a sports drink better?**

**A:** Research shows that optimal carbohydrate content for sports drinks is 6%. Gatorade is an example of a 6% carbohydrate beverage that is formulated with an amount of carbohydrate that helps stimulate fluid absorption. Sports drinks with higher carbohydrate, content of 8% or more, slow fluid absorption.

-- *Craig A. Horswill, Ph.D. Principal Scientist, Gatorade Sports Science Institute*

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**Q: Why do some sports drinks use maltodextrins?**

**A:** Maltodextrins have no specific advantage for a sports drink but are less sweet than sucrose, fructose, and glucose. Maltodextrins provide no added performance benefit alone or in combination with other sugars. Some sports drinks such as Powerade use maltodextrin to keep the beverage from becoming too sweet.

-- *Bob Murray, Ph.D., FACSM, Director, Gatorade Sports Science Institute*

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**Q: I was told to either use sports drinks in weak concentrations or drink plenty of water with sports drinks. What would you advise?**

**A:** There is no need to dilute a sports drink, provided it is formulated correctly. Research shows that diluting Gatorade will dilute its taste, carbohydrate content, and electrolyte level, any one of which will diminish its benefits. During training and competition, it is critical to avoid dehydration and to supply muscles with carbohydrate energy. Find a sports drink that tastes good, train with it regularly, and stick with it during competition.

-- *Fred Tedeschi, M.A., ATC, Chicago Bulls*

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**Q: Can I drink too much water?**

**A:** Most runners and cyclists don't realize overhydrating can dangerously lower blood sodium levels - a condition known as hyponatremia. Athletes in endurance races who lose lots of sodium in sweat and are hypervigilant about hydrating with water are at risk. To avoid hyponatremia:

- Don't drink more than you sweat.
- Favor sports drinks, with sodium, over water.
- Eat a salty diet days before the race and eat some pretzels in the last half of the race.
- Know your body to know how much drinking is too much.

-- *Randy Eichner, M.D., Professor, Team Physician, University of Oklahoma*

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**Q: Can I prehydrate instead of drinking fluids during races?**

**A:** Sufficient fluid intake during endurance exercise is preferable to drinking only before competition. However, athletes typically replenish less than 50% of sweat during exercise. It's best to prehydrate before exercise and drink during competition. When it's impossible to drink enough during exercise, prehydrating can improve cardiovascular function and body temperature regulation. Drink at least 16 oz in the morning, then another 16-32 oz one hour before competing. Fluids such as sports drinks, contain small amounts of sodium that decrease fluid losses in urination and better maintain hydration.

-- *David Lamb, Ph.D., Emeritus Professor, Ohio State University*

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**Q: How much sodium do I really need?**

**A:** The National Research Council recommends 500 to 2400 mg sodium daily (approximately 1 tsp. salt) for average adults. However endurance athletes risk sodium deficit if they avoid sodium during hot weather. At the extreme, athletes can lose up to 2.5 liters of sweat and up to 2300 mg sodium per liter sweat during one hour of intense exercise. Consuming sports drinks with at least 100 mg sodium per 8 oz. and salty foods and snacks help athletes get enough sodium.

-- *E. Randy Eichner, M.D., Professor, Team Physician, University of Oklahoma*

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**Q: Will the sodium from sports drinks make me retain water?**

**A:** That depends.

- No, if you're worried about excess fluid retention associated with increased blood pressure or body weight. The body very efficiently regulates blood sodium so the small amount in sports drinks (no more than a slice of bread or glass of milk) is insignificant.
- Yes, if you consider what happens during exercise. By replacing sodium lost in sweat, it helps maintain extracellular fluid volume and stimulates drinking. This limits dehydration, heat illness and decreased performance.

-- *Mark Davis Ph.D., Department of Exercise Science, School of Public Health, University of South Carolina*

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**Q: Are there vitamins and minerals that I need to include in my vegetarian diet?**

**A:** Depending on what kind of vegetarian you are, you may fall short on calcium, zinc, iron, and the B-vitamins, riboflavin and B12. By consuming milk or dairy products, you should get adequate calcium, riboflavin, and B12. The best non-meat sources for iron and zinc are legumes such as lentils, black beans, chickpeas, pinto beans and kidney beans. A multi-vitamin/mineral supplement that provides about 100% of the recommendations for most nutrients would be an adequate "insurance policy."

-- *Chris Rosenbloom, PhD, RD, chair, Department of Nutrition, Georgia State University*

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**Q: Can I do anything to prevent side stitches?**

**A:** If you suffer from side stitch pain, try the following:

- Eat moderately -sized meals at least 2-3 hours prior to exercise to allow for digestion.
- Choose sports drinks over juices or soft drinks, and sip frequently during exercise. Recent research shows sports drinks with a similar particle count to that of blood, like Gatorade, may be best. Beverages like juice or soft drinks may evoke side stitches. If side stitch still occurs, try bending forward while tightening abdominal muscles or exhaling through pursed lips.

-- Luis Aragón-Vargas, PhD, GSSI scientist, professor, University of Costa Rica

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**Q: Can sweating too much or too little affect my performance?**

**A:** Sweating too **little** can seriously affect performance and risk of heat-related illness. Insufficient sweat production limits evaporative cooling. This leads to a more rapid rise in body core temperature and fatigue during aerobic exercise in the heat. Low sweating rates are common in unacclimated and dehydrated exercisers.

Sweating too **much** is only a problem if humidity is so high that very little evaporation occurs or fluids are not replenished appropriately. If fluids are consumed before, during, and after exercise, sweating is maintained and evaporative cooling occurs.

-- Larry Kenney, PhD, Professor, Pennsylvania State University

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**Q: Do sports drinks have enough sodium to prevent muscle cramps in my legs?**

**A:** The link between muscle cramps and loss of salt from the body has been made for extreme sweat losses in industrial environments, but the association is less clear between moderate losses of sodium in sweat and the onset of muscle cramps in athletes. Sports drinks contain enough sodium to help prevent low blood sodium (hyponatremia) in prolonged exercise, and are more effective than plain water or other electrolyte-free beverages for maintaining hydration status. Adequate hydration helps minimize risk of cramps.

-- Ron Maughan, PhD, Professor, University of Aberdeen

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**Q: My friends add potassium or magnesium to their sports drinks. Should I?**

**A:** Some athletes think potassium or magnesium help combat cramping due to excessive sweat loss, however fluid and sodium depletion is more likely the cause. The amount of magnesium lost through sweat is negligible, making magnesium supplementation unnecessary. Magnesium and potassium are stored in the body, so deficits are rare. Potassium supplements can be dangerous - abnormal heart rhythms have occurred. Sports drinks like Gatorade contain sodium and potassium in amounts sufficient to replace what is lost through sweat.

-- Ellen Coleman, MPH, MA, RD, Sports Nutritionist, marathoner, cyclist and two-time Ironman finisher

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**Q: How many hours before a race should I stop drinking alcoholic beverages?**

**A:** This is a difficult question to provide a definitive answer. A safe rule of thumb for cessation of alcohol consumption prior to an endurance competition would be 48 hours. Alcohol has several properties that could potentially impair endurance performance. First, and perhaps foremost, alcohol is a diuretic and therefore could promote dehydration. Needless to say, entering a race dehydrated will have negative performance consequences. Cessation of alcohol consumption 48 hours prior to a race should provide adequate time for rehydration.

-- *Scott Powers, PhD, Professor, University of Florida*

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**Q: How can I fuel up before a race without having an upset stomach?**

**A:** "Train your gut" prior to competition. Find out whether it's best for you to eat a small 300-600 calorie meal one hour before exercise (1-2 gram carbs/kg) or a larger 800-1200 calorie meal four hours before exercise (3-4gram carbs/kg), or something in between. Try liquid meals. Also "train your gut" for drinking 8-16 oz of a sports drink 15 min before exercise and 4-8 oz every 15 minutes during exercise.

-- *J. Mark Davis, Professor, Department of Exercise Science, University of South Carolina, Columbia, S.C.*

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**Q: How fast are 8 oz of fluid from sports drinks absorbed into the blood?**

**A:** The absorption of a sports drink into the blood is determined by the rates of stomach emptying and intestinal absorption. Some ingested fluid can appear in the blood after only 5 min. Overall, the maximal rates of fluid absorption are approximately 1,300 - 1,500 ml/hr, while carbohydrate can be delivered at 60-80 g/hr. These rates are sufficient to help compensate for the fluid and energy losses experienced during exercise and thereby enhance exercise performance.

-- *Mark Hargreaves, PhD, FACSM, School of Health Sciences, Deakin University, Australia*

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**Q: How can you tell if you are drinking enough to be hydrated?**

**A:** I believe that the best way for the athlete to find out if they are drinking enough is to monitor their urine color. Athletes who are adequately hydrating will usually have clear urine. If the athlete is not hydrating adequately he or she will have a darker colored urine indicating that he or she needs to increase their fluid intake. While not scientific, is a good way for athletes to monitor their hydration status.

-- *Fred Tedeschi, MA, ATC, Head Athletic Trainer, The Chicago Bulls*

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**Q: A friend gave me a new sports drink during a race. I threw it up after drinking it. What happened?**

**A:** The drink was probably too concentrated so it emptied slowly from the stomach and caused abdominal discomfort. As you pick up the pace, gastric emptying rate is especially important. The body responded to the abdominal discomfort through the vomit reflex. Always check the concentration of the sports drink. Also try out sports drinks in training, never in a race.

-- Clyde Williams, Ph.D., Professor of Sports Science, Loughborough University, England

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**Q: My question centers around a unique population of persons who play the bagpipes in outdoor competitions. We have noticed that energy levels are depleted as the competition day goes on (which would be normal), however, we are struggling over a reference level for fluid and what type of fluid should be used throughout the day to help to maintain energy levels. Often the outdoor competition involves several hours (most of the day) which alternates between waiting to play and actually playing and temperatures will average 25-35 degrees celcius. If you could give any advice on which fluids should be recommended to consume and at what quantities, time periods etc. I would greatly appreciate it.**

**A:** The marching band and team of bagpipe players often get neglected for their fluid needs even though they work every bit as hard as the sports athletes. Drinking a sports drink would be an effective way to help keep energy levels up while also replacing the fluid lost as sweat while marching in the heat. The American College of Sports Medicine (ACSM) suggests consuming 600 to 1200 mL of fluid every hour. This range of volume is based on the rate that fluid empties from the stomach and is absorbed in the intestine. It is probably easier to drink these volumes as 150-300 mL every 15-20 min. Note that fluid needs may actually be greater than this range if band members sweat at rates of 1 to 2 liters per hour. Between marching, the heat, and the uniform, such sweat rates are likely. (Reference: Medicine and Science in Sports and Exercise 28:i-vii, 1996.) We at Gatorade and the ACSM recommend drinking 500 mL about 2 hours prior to physical exertion to help individuals start well hydrated. Having fluid in the stomach before activity also helps promote the movement of fluid in the right direction for fluid absorption. Research indicates that fluids with around 6% carbohydrate are optimal for delivering enough energy and promote fluid absorption. Research to be published in the Journal of Applied Physiology will show that for fluids at 8% carbohydrate (or above), fluid absorption is slowed. Furthermore, other research shows that the extra carbohydrate does not further enhance work performance compared to the effects of beverages at 6% carbohydrate. It is for these reasons that Gatorade is formulated with 6% carbohydrate. I hope this information is helpful to your bagpipe players.

-- Craig A. Horswill, Ph.D. Senior Research Scientist Gatorade Exercise Physiology Lab

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**Q: Won't drinking a lot of sports drinks during exercise lead to a lot of bathroom breaks?**

**A:** Just the opposite. Properly formulated sports drinks help your body retain the ingested fluid so you stay better hydrated. Omitting sports drinks to reduce bathroom breaks is a set up for dehydration and decreased athletic performance. Neither is desirable to achieve peak performance. Ingestion of sports drinks should keep pace with sweat loss (at least 4 cups per hour of exercise). In doing so frequent bathroom breaks will likely be avoided.

-- Fred Tedeschi, Head Athletic Trainer, the Chicago Bulls

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**Q: Besides water, what else is in sweat that athletes need?**

**A:** Human sweat contains numerous substances. The most important substance to be replaced during and after exercise besides water, is sodium chloride (salt). Salt helps maintain proper neuromuscular action and promotes rehydration. In addition, salt, as in sports drinks, triggers thirst and helps prevent dehydration. Frequent muscle cramping in a minority of athletes results from excessive amounts of salt lost through sweat. This can be alleviated by consuming larger quantities of salt, in addition that provided in sports drinks.

-- *Oded Bar-Or, Professor and Director of the Children's Exercise and Nutrition Centre, McMaster University*

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**Q: Is it true that carbonated drinks will take "wind away" from runners or other types of athletes?**

**A:** A legitimate question, and a concern many athletes have. Carbonation will not decrease endurance (reduce one's "wind") by causing an accumulation of CO<sub>2</sub> in the blood. Much of the carbonation comes out of solution in the stomach and may be "belched" away before entering the intestine, where fluid and nutrients actually get absorbed. For that reason, that of the stomach bloating, carbonated drinks are not a good choice as a hydration beverage during exercise. Carbonation also causes throat burn, which may deter the sweaty athlete from consuming enough fluid to stay hydrated. The resulting dehydration WILL cut into an athlete's wind. On a similar note, a new product, super-oxygenated water has come on the market with claims that it can enhance endurance. The theory is just the opposite to that of your speculation on carbonation: the oxygenated fluid boosts the blood levels of oxygen and will increase one's "wind." In reality, the idea of the intestines being a good site for oxygenating or degassing the blood would be like trying to pour fluid into your lungs to speed up rehydration. Our bodies tissues and organs are specialized and when healthy, do their job optimally. The lungs oxygenate the blood and remove carbon dioxide so efficiently that any gas entering the body through another site would be miniscule and have no effect on our physiology. There is no need for the gut to do the work of the lungs.

-- *Craig A. Horswill, Ph.D. Research Scientist Gatorade Exercise Physiology Lab*

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**Q: Are sports drinks harmful to teeth?**

**A:** No more than other foods or beverages. All foods or beverages have the same potential for promoting cavities or tooth damage. Dental erosion is influenced by: how well we care for our teeth, genetics, improper eating habits (e.g., giving a baby a bottle at bedtime), bizarre eating patterns (e.g., holding a soft drink in your mouth until fizz dissipates) or conditions that diminish saliva production. Two different research groups have shown no relationship between use of sports drinks and dental erosion in healthy athletes.

-- *Craig Horswill, Ph.D., Senior Scientist, Gatorade Sports Science Institute*

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**Q: What can I do to prevent feeling lightheaded and dizzy at the end of a race?**

**A:** Inadequate hydration and carbohydrate intake can lead to dizziness from energy depletion and dehydration. A glucose finger stick can detect hypoglycemia (low blood sugar). However, post-race lightheadedness is more often attributed to sudden cessation of activity. When exercise is stopped suddenly, cardiac output slowly returns to baseline, blood pools in the lower extremities, and blood flow to the brain is temporarily diminished, leading to dizziness. An appropriate "cool-down" routine significantly reduces the incidence of light-headedness.

-- Yvonne Satterwhite, M.D., Orthopedic Surgeon, Hughston Clinic

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**Q: What effects do electrolytes have on athletes exercising less than 90 minutes?**

**A:** Sodium is the primary electrolyte required during and following any physical activity that results in sweat loss. For example, an athlete who loses five liters of sweat during one day's training will have lost (at a sweat sodium concentration of 50 mEq/liter), 5,750 mg of sodium or over 14 grams of sodium chloride. Sodium intake during exercise is important for the following reasons: 1) sodium in a beverage helps maintain the physiological drive to drink, stimulating greater voluntary fluid intake (see Wilk and Bar-Or. J. Appl. Physiol. 80:1112-1117, 1996); 2) in concert with glucose, enhances fluid absorption in the proximal small intestine (see Gisolfi et al. Amer. J. Physiol. 258 (Gastrointest. Liver Physiol.) 21: G216-G222, 1990.); and 3) stimulates the rate and completeness of rehydration (see Wemple et al. Int. J. Sports Nutr. 7:104-116, 1997).

-- Bob Murray, Ph.D. Director Gatorade Exercise Physiology Laboratory

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**Q: Will drinking 64oz. of gatorade every work out 5 days a week elevate your glucose?**

**A:** Blood glucose rises anytime we ingest carbohydrate in any form. As long as we have a healthy pancreas and are sensitive to the insulin it releases, blood glucose eventually returns to its resting level. It's important to understand that a rise in blood glucose is a normal and vital response to consuming carbohydrate. The Gatorade you ingest results in a small rise in blood glucose (smaller during exercise than at rest). As you exercise, the combined influence of insulin and muscular contraction cause the glucose from the bloodstream to enter muscle and other tissues. The carbohydrate is then burned by muscle for energy.

-- Bob Murray, Ph.D. Director Gatorade Exercise Physiology Laboratory

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**Q: I have had a ileostomy for the last 15 years. Thus, I am very prone to de-hydration. In October of 1999, I plan on running the Chicago marathon. My only concern is trying to stay hydrated throughout the race. Do you have any suggestons? Or do you know of anyone with an ileosotomy who has run the marathon?**

**A:** I don't personally know anyone with an ileostomy who has run a marathon, but I bet it's been done. If not, you can be the first, to prove it can be done. I recall not long ago a professional baseball player made a comeback after an ileostomy for inflammatory bowel disease that had been debilitating. Suggestions? Follow the accepted guidelines: If a cup is 8 oz, drink 3 cups two hours before the race, one cup just before the race, and one cup every 15 minutes during the race. Drink not water, but a sports drink like Gatorade. If you sweat heavily, during the last half of the race, consume extra sodium - pretzels or the like. Key: Practice, practice, practice drinking as you build up your training slowly - over months - to the marathon level. Never try anything new on race day! Good luck, and good for you.

-- E. Randy Eichner, MD, FACSM

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**Q: Is there any validity to the idea of oxygenated water?**

**A:** There is absolutely no validity to the claims for oxygenated water. The notion that ingesting a beverage with additional dissolved oxygen will somehow influence the oxygen content of the blood is as weak a proposition as would be taking water into the lungs to help stay hydrated. There are two fundamental reasons why oxygenated water doesn't work. The first is that the tiny amount of oxygen that can be dissolved in water will come out of solution as it is warmed by the body; the same thing happens when we consume a carbonated beverage - the birth of the burp. The second reason is that arterial blood is already almost totally saturated with oxygen; little more can be added. Even breathing 100% oxygen has little impact on the oxyhemoglobin content or the dissolved oxygen content of blood.

-- Bob Murray, PhD Director Gatorade Exercise Physiology Lab

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**Q: What research is available on youth soccer players regarding fluid loss?**

**A:** Without knowing the environmental conditions and the level of fitness or heat acclimatization of the kids, it's difficult to predict how much fluid they will lose. Also, it depends on how much running time that they'll perform -- a variable that may depend on how many substitutes will be available the match day. If you are conducting a study for academic requirements or for potential publication, I highly recommend that you do preliminary testing by weighing the subjects before and after practice. Also, account for the amount of fluid that they consume during the practice. The difference between body weights plus the volume of fluid consumed (16 oz = 1 lb) will tell you the sweat rate. Literature values indicate that this age group might have sweat rates of 500 mL to 1 L (about 16 oz to 32 oz) per hour. You should review the papers from Oded Bar-Or's lab to confirm this range. Because of so many factors influencing sweat rate, the best way to predict for your study is to estimate from practice sessions.

--Craig A. Horswill, Ph.D. Senior Research Scientist Gatorade Exercise Physiology Lab

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