

# [ Active Bones ]

February 2012

Dear Reader:

This month, our focus is on the importance of staying hydrated. Water is our body's primary chemical component and comprises about 60 percent of our weight. Every system in our body depends on water, so when we do not get enough we become dehydrated. Even mild dehydration can drain our energy and make us feel tired. Your level of activity, weather conditions and the duration of an activity affect your hydration level. Maintaining adequate hydration is just as important as proper training and nutrition to achieve your top performance.

In this issue, Linda Samuels, a registered dietitian and sports nutrition consultant, shares her expertise with us. Her information on hydration and calculating fluid requirements to stay properly hydrated should be helpful for budding and elite athletes.

Drinking water and staying hydrated is important to our health, but is there anything better to drink than water? Many studies have been done on this topic, but recent research on energy drinks is very interesting and something to read before giving a child or young adult anything but water or lowfat chocolate milk after a sports activity. That's right, chocolate milk. It appears the old dairy advertising slogan, "Milk it does a body good," is more scientific fact than marketing. New research proves it once again and suggests that perhaps we should reach for lowfat chocolate milk rather than water after a workout.

In the past, I've spoken at length about OTRF's ongoing research. However, our mission also includes education. One educational program I am very proud of provides athletic trainers the opportunity to gain career experience as a physician extender. We currently are accepting applications for the 2012, one-year physician extender residency program. If you are interested in this career path, please visit the National Athletic Trainers' Association (NATA) website for program details and an application. The information is located in NATA's Career Center. Applications must be received by OTRF no later than April 6, 2012.

As always, thank you for your continued interest in OTRF.

Sincerely,



Steven C. Chudik, MD

President OTRF

Orthopaedic Surgeon and Sports Medicine Physician



ORTHOPAEDIC SURGERY AND SPORTS MEDICINE  
TEACHING AND RESEARCH FOUNDATION

## Proper hydration key to effective year-round training, competition performance

By Linda Samuels, MS, RD, LDN  
Petersen Performance Lab

From the time you began participating in sports, you most likely were told, "drink water to stay hydrated." It is excellent advice, but knowing how much to drink and when is important. Insufficient fluid intake and dehydration can significantly affect your training and performance.



According to current American College of Sports Medicine (ACSM) guidelines, athletes need to consume fluid to replace sweat losses. Measuring your sweat rate is one way to determine and monitor your hydration needs during a specific activity in a specific environmental condition. Weather conditions and the intensity and duration of an activity can significantly change your sweat rate. Therefore, it is important to re-check your sweat rate regularly. Changes in the weather and/or changes in your training schedule provide the perfect opportunity to reassess what your current hydration needs should be.

Once you know your sweat rate (see calculations on the next page), a hydration schedule can be developed. Generally, an athlete can consume 4 to 6 ounces of water or sports drink every 15 minutes, or about 20 to 24 ounces per hour of athletic activity. However, if you sweat heavily during workouts or sports events, you may need even more fluid. Just a 2 percent loss of body weight due to sweat losses can affect your performance.

So, how much is enough? The following steps and calculations will help you establish your sweat rate. It varies depending upon the activity and weather, so you will have to recalculate it several times. Your sweat rate is used to create your hydration plan. Your hydration plan is the amount of fluid you need to consume to keep your body weight loss to less than 2 percent during workouts and sports events.

### To calculate your sweat rate:

1. Prior to exercise/practice, weigh yourself without clothes and record the weight.
2. Dress and exercise/practice for one hour. Keep track, in ounces, of the fluid you consume during the hour.
3. DO NOT go to the bathroom during the 1-hour workout.
4. At the end of the 1-hour workout, weigh yourself dry and without clothes. Record your weight.
5. Using the two recorded weights, complete the calculation on the next page.

*(continued on next page)*



### Sweat Rate Calculation Example

Athlete's weight prior to exercise	160 lbs.
– (minus) athlete's weight after exercise	–159 lbs.
<hr/>	
Athlete's weight loss from exercise	1 lb.

1. Convert weight lost into ounces: 1 lb. = 16 ounces
2. Add the fluid ounces consumed during the workout
3. The total of the two amounts is the net sweat loss\*

$$\begin{array}{r} 1 \text{ lb.} \times 16 \text{ ounces} = 16 \text{ ounces of weight lost} \\ +12 \text{ ounces of fluid consumed (example only)} \\ \hline 28 \text{ ounces of fluid lost (net sweat loss*)} \end{array}$$

*\*Variable calculation based on environmental conditions of that day and specific to that workout or sports event.*

In the above example, the athlete's sweat rate is 28 ounces per hour—higher than the ACSM guidelines. Therefore, this athlete's personal hydration plan should be to drink 7 ounces every 15 minutes, or 5 ounces every 10 minutes during a similar workout and weather conditions. An average "gulp" equals about 1 fluid ounce.

It is very important not to extrapolate the calculations when determining the sweat loss for an activity that lasts more than one hour because the data can be skewed. If you regularly exercise for more than one hour, you should complete a sweat rate test for that specific time duration—two hours, three hours, etc. Otherwise, your hydration plan will be incorrect and you will consume more fluid than is needed or healthful.

#### Some other factors to consider when calculating sweat rates:

- To maximize your performance, hydrate like an elite athlete. Have a hydration plan determined and implement it. That means you should use a documented hydration plan for every anticipated athletic activity—year-round. You can do this by keeping a log of your sweat rates taken in different environmental conditions—both hot and cold. With year-round recordings, you can look at the weather that day and know what hydration plan to use.
- Too much water can cause water intoxication, a rare condition often not recognized by its early symptoms of nausea, vomiting, confusion and disorientation. This can happen when an athlete consumes large amounts of water for a long time. Those at greatest risk are athletes training for,

*(continued on next page)*



or competing in, a long-course triathlon, marathon, or two-a-day training sessions during extreme temperatures and/or humidity. Therefore, it is very important to calculate an hourly sweat rate and not extrapolate when determining a hydration plan. Endurance athletes should consider consulting a sports dietitian to plan not only their hydration needs, but also additional factors such as electrolyte, vitamin and mineral losses.

- When determining your hydration plan, it also is important to consider sodium needs. Some individuals are "salty sweaters" which means the amount of sodium in their sweat is higher than normal. You are a salty sweater if you have a salt film on your face after exercise (you can feel the crystals), or if the sweat stains on your exercise clothes have white rings. Salty sweaters need to consume additional sodium prior to and during a lengthy exercise or sports event. Drinking sport drinks or eating pretzels are a couple of ways to address the need for additional sodium. However, these individuals should consult a sports dietitian for assessment and further suggestions.
  
- Changes in weather can radically alter an individual's sweat rate because:
  - ◆ The cold diminishes thirst, so an athlete might not feel the urge to drink adequately.
  - ◆ More fluids are needed for the process of respiration when it is cold.
  - ◆ Weather conditions such as high winds, cold and moisture can lead to a higher rate of heat loss due to the body's attempt to regulate its temperature.
  - ◆ Layers of clothing may promote more sweating. We are tempted to bundle ourselves with lots of layers, but over-layering can actually hold in too much heat causing you to sweat more and become dehydrated faster. Follow the layering rule of three—a wicking layer, an insulating layer and a protective layer.
  - ◆ Avoid cotton and invest in technology-based fabrics that draw the moisture from sweat away from your skin. When moisture is in contact with skin, heat loss is accelerated.
  - ◆ The locations and opportunities for rehydration may change during the winter months. Many public parks close, as well as most outdoor restrooms and drinking fountains. This may require prior planning and possibly adjusting your route or workout locale so you can stop at accessible locations with water sources.

Another way to tell if you are properly hydrated is by the color of your urine. The goal is to maintain a pale yellow or almost clear urine color. If it is dark yellow/gold, you are dehydrated. Try following these strategies to stay hydrated:

- Start drinking fluids as soon as you awake each morning. Start with 8 to 16 ounces of water.
- Keep a fluid bottle with you so you can drink throughout the day. Drink extra fluids with meals.
- Sports drinks are a great choice if you are a salty sweater, tend to get muscle cramps or if your training/sports event will last longer than 60 to 90 minutes.
- Four hours prior to your training session/sports event, preload with fluids at an amount of 5 to 7 ml/kg body weight. For a 150-pound athlete, this would be 12 to 16 ounces (see calculations on the next page).

*(continued on next page)*



- Two hours prior to your training session/sports event if you haven't urinated, or your urine is dark, slowly drink another 3 to 5 ml/kg body weight. For a 150-pound athlete, this would be 7 to 12 ounces (see calculations below).
- Continue to sip fluids right up to your training time/sports event. If you can not drink the recommended amount of fluids at least two hours before the event, you should drink 8 to 12 ounces of a cold sports drink containing sodium 10 to 20 minutes before the event/training starts.
- Follow your sweat rate hydration plan for the specific weather conditions. If you don't have a personalized hydration plan, drink 4 to 6 ounces of fluid every 15 to 20 minutes during your training/sports event. If you are a heavy sweater, drink 6 to 8 ounces every 15 to 20 minutes during your training/sports event. It may be easier to schedule your fluid intake for 10-minute increments because you will be drinking less at each break.

### Fluid Consumption Calculation

1. Convert your weight into kilograms.:  $2.2 \text{ lbs} = 1 \text{ kg}$   
 $150 \text{ lbs.} \div 2.2 = 68 \text{ kg}$
2. Multiply your weight in kilograms by the **above** recommended milliliter (ml)/kilogram (kg) amount  
 $68 \text{ kg} \times 5 \text{ ml/kg (preload amount example for 4 hours prior)} = 340 \text{ ml}$
3. Convert milliliter amount into ounces:  $29.6 \text{ ml} = 1 \text{ ounce}$   
 $340 \text{ ml} \div 29.6 \text{ ml/oz.} = 11.48 \text{ oz (12 ounces rounded up to nearest full unit)}$

Regardless of the season in which you train or play a sport, planning for adequate hydration just takes a little preparation. Start your next exercise session with a sweat rate test so you can always be fully hydrated and perform your best.



Linda Samuels, MS, RD, LDN, is a private practice sports dietitian specializing in endurance sports nutrition. She is the team dietitian for the Northwestern University Triathlon Team and works with athletes from Petersen Performance Lab. Her sports nutrition philosophy is "training starts at the table." To contact Linda, you can email her at: [TrainingTableNutrition@gmail.com/](mailto:TrainingTableNutrition@gmail.com/).



## Hydration Research Round Up

The importance of keeping the body hydrated, whether you are an athlete or not, is well documented and has been the advice of physicians, athletic trainers and dietitians for decades. However, debate continues over what is the most healthful and beneficial beverage to consume. The following recaps some of the current research and recommendations on energy drinks—even lowfat chocolate milk.

### Energy drink study raises concern about use by adolescents, young adults

According to research published in the February 2011 issue of *Pediatrics*, the Journal of the American Academy of Pediatrics, 30 to 50 percent of adolescents and young adults consume energy drinks. Energy drinks, as defined by this study, are beverages that may contain stimulants and other drugs such as caffeine, ephedrine, taurine, sugars or sweeteners, herbal supplements and other ingredients like guarana, L-carnitine, ginseng and yohimbine. They differ from sports drinks and vitamin waters which contain vitamins, nutrients and sweeteners, but no stimulants.



The researchers noted energy drinks have no therapeutic benefit and frequently contain high and unregulated amounts of caffeine or other dangerous stimulants. The drinks also have been associated with adverse effects in individuals with seizures, diabetes, cardiac abnormalities or mood and behavioral disorders, or those taking certain medications, particularly those under age 19. Furthermore, some of the other additives, such as vinpocetine, yohimbine, ginseng and 5-hydroxy tryptophan, can cause potentially serious

drug interactions with prescription drugs and even commonly consumed products like aspirin, garlic and vitamin E.

Therefore, based on their findings, the researchers recommended the need for a long-term study to:

- Establish safe consumption levels
- Determine the effects of chronic use
- Examine the effects on at-risk populations
- Better document and track adverse health effects as performance benefits

They also support regulation of energy drinks and consumption levels based on appropriate research.

*Note:* The term energy drink was created by companies in the beverage industry and it is not recognized by the U.S. Food and Drug Administration (FDA) or the U.S. Department of Agriculture (USDA).

*(continued on next page)*

## Got chocolate milk for after your workout?

Independent research continues to support findings first reported in 2008 about the benefits of drinking lowfat chocolate milk following a vigorous workout or sports event. Three new and related studies conducted at the University of Texas at Austin were presented at the 2011 American College of Sport Medicine annual conference and one was published in the May 2011 issue of the *Journal of Strength and Conditioning*.

Conducted on both trained and amateur cyclists, the research found those who drank lowfat chocolate milk immediately after cycling and once again during their recovery had improved training times, developed 3 pounds more whole body lean muscle than fat, and were in better shape than study participants who consumed a carbohydrate beverage with the same calories (similar to a typical sports drink) or a calorie-free placebo (water flavored with noncaloric flavoring and artificial sweetener).



According to University of Texas at Austin lead researcher, John L. Ivy, Ph.D., the studies suggest lowfat chocolate milk can improve performance and aid training, but noted additional research is needed to determine the exact reasons why lowfat chocolate milk is superior to the other beverages.

Other benefits of lowfat chocolate milk that didn't make the study are cost and availability. A gallon of chocolate milk usually costs less than \$5 compared to \$30 or more for the same amounts of performance or recovery drinks. Moreover, there's no need to shop at health stores or order online because lowfat chocolate milk is available virtually everywhere—from the gas station and pharmacy, to the grocery store and even fast food establishments.

### U.S. Department of Agriculture (USDA) nutrient analysis 1 cup, lowfat chocolate milk with vitamins A & D

<b>Protein</b> 8.10 g	<b>Calcium</b> 290 mg	<b>Potassium (K)</b> 425 mg	<b>Riboflavin</b> .415 mg	<b>Vitamin A</b> 490 IU	<b>Polyunsaturated Fats</b> .088g	
<b>Carbohydrate</b> 26.10 g	<b>Iron</b> .68 mg	<b>Sodium</b> 152 mg	<b>Niacin</b> .318 mg	<b>Vitamin D</b> 122 IU	<b>Monounsaturated Fats</b> .750 g	
<b>Fiber</b> 1.2 g	<b>Magnesium</b> 32 mg	<b>Zinc</b> 1.02 mg	<b>Vitamin B-6</b> .102 mg	<b>Vitamin E</b> .05 mg	<b>Saturated Fats</b> 1.540 g	<b>Caffeine</b> 5 mg
<b>Sugar</b> 24.85 g	<b>Phosphorus</b> 258 mg	<b>Thiamin</b> .095 mg	<b>Vitamin B-12</b> .80 µg	<b>Water</b> 205.85 g	<b>Total Lipid Fats</b> 2.50 g	<b>Cholesterol</b> 8 mg



## Orthopaedic Surgery and Sports Medicine Teaching and Research Foundation Helps People Stay Fit and Healthy

Steven Chudik, orthopaedic surgeon and sports medicine physician with the Steven Chudik Shoulder and Knee Injury Clinic, founded the Orthopaedic Surgery and Sports Medicine Teaching and Research Foundation (OTRF) in 2007. OTRF is a nonprofit, 501(c)(3) organization dedicated to funding research and education for the purpose of keeping people active and healthy.

In an effort to prevent injury and remain active, especially for young athletes, Dr. Chudik saw a growing demand from patients, athletic trainers and clinicians for up-to-date medical information and unbiased research on injury prevention, arthritis and wear and tear on the musculoskeletal systems such as joints, cartilage, tendons, ligaments, etc. To meet these needs, OTRF produces and distributes this newsletter, shares information about health performance-related issues like nutrition and fitness, hosts athletic training educational programs, conducts seminars for healthcare providers and the community and most important, funds unbiased research and development particularly in emerging areas such as arthroscopic and minimally invasive surgery for injuries to the meniscus, labrum, rotator cuff, ACL and cartilage.

However, none of this is possible without ongoing financial support. We are extremely grateful to all those who have contributed in the past. Many of the donations came from patients or their family members who benefited from Dr. Chudik's orthopaedic and sports medicine expertise. If you might be interested in helping us continue our research, please speak with Dr. Chudik or a member of his staff. Also, many companies sponsor programs that match charitable contributions made by their employees. Some even match donations made by retirees and/or spouses. Matching gift programs are a great way to double your generosity. Regardless the amount, every contribution helps make a difference.

Thank you for your interest in our newsletter, **Active Bones**, and the work of OTRF.

Steven C. Chudik, MD  
OTRF Founder and President  
Orthopaedic Surgeon and Sports Medicine Physician

Dr. Steven C. Chudik  
1010 Executive Courts, Suite 250  
Westmont, IL 60559  
Phone: 630-920-2350  
Fax: 630-920-2382  
Email: [stevenchudikmd@gmail.com](mailto:stevenchudikmd@gmail.com)

[www.stevenchudikmd.com](http://www.stevenchudikmd.com)

© 2012 Orthopaedic Surgery and Sports Medicine Teaching and Research Foundation. All rights reserved.

### OTRF Board of Directors

Steven C. Chudik, MD, SSC  
Blair Ciecko  
Geoffrey S. Kuhlman, MD, CAQSM,  
FAAFP  
Ketan Mody, MD, CA QSM  
Brent Smith, MS, ATC  
Lark Welch, MS, ATC, CSCS

Please call 630-794-8668 or email us  
at [stevenchudikmd@gmail.com](mailto:stevenchudikmd@gmail.com) to  
receive this newsletter directly

