Hydration

Sports Drinks & Water

The Human Antifreeze

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Introduction

Over the years, a huge emphasis has been placed on the importance of nutrition, not only in our daily lives, but also more importantly in sports. Over the past few years, I cannot think of any sports related magazine or book that has not had some type of article based on nutrition in sports. Whether it is USA Hockey Magazine, Sports Illustrated, or even Better Hockey just to name a few. There has also been an increase in books that deal specifically with nutrition in sports. Most people associate ***nutrition*** with eating, just as most people associate the word ***diet*** with losing weight. Those of us who are becoming ***"nutrition experts"*** know that nutrition involves more than just what we eat and a diet involves more than just losing weight. Although many athletes carefully regulate their diet, they may pay little attention to their body's fluid needs. They often misunderstand and, as a result, underplay the importance of water and sports drinks to good nutrition.

You can attend almost any hockey school or seminar and you will hear about all the foods that we should be eating. They will tell you when to eat certain foods, and how these foods will help us become bigger, stronger and faster. When it comes to the importance of hydration, it is my opinion that proper hydration has been given somewhat of a “back seat” level of importance. Peter Twist (1) created the perfect analogy of a body being like an automobile. I know the human body is far more complex than an automobile. The principles are the same. We have no problem putting the best fuel in our automobiles to ensure the best performance, the same way we should be putting the best fuel/proper food into our bodies to ensure the best performance. We also want to ensure we are putting the proper antifreeze/coolant in our automobiles to ensure the automobile does not over heat or freeze up when we need it the most. The same should be done for our bodies. We should be putting fluids in our bodies to keep them from over heating and seizing up. If our body seizes up, the end result could be, and in some cases, has been death. The importance of **hydration** should not be taken lightly. There have been times just within the last few years that athletes have died due in part to **dehydration.**

Matthew Thomas

A 14-year-old high school freshman from Victoria, Texas, Matthew was participating in pre-season football practice on August 12, 2003, when he told the trainer he was feeling ill and began vomiting, a symptom of **a heat stroke**. An ambulance was called and Matthew was rushed to DeTar Hospital, where he later died. The autopsy concluded that he died of cardiac arrhythmia (rapid, irregular heartbeat) related to mild dehydration, but

the medical examiner could not rule out the possibility that Matthew's death was heat related (the high temperature that day was 92 degrees) (18).

Dan Gorcyzk

On August 12, 2003, the same day Matthew died, heat claimed the life of a second high school football player. Dan Gorcyzk, a 16-year-old sophomore at Scranton (Pa) Prep, collapsed during an afternoon practice and died the next day. The cause of death has not been reported (18).

Ice Hockey in particular is a unique sport when it comes to the ability to hydrate properly. For the most part, ice hockey used to be just a "Winter Sport," but as technology has advanced, so has the type of arena we play in. Today, ice hockey is a year round sport. Leagues are now formed and exist in fall, spring and summer. With all these different leagues and different areas of the country that now host hockey leagues, hydration should be a very important priority when it comes to the health and well being of all hockey players regardless of age. In this modern era of travel, hockey players can travel from cold climates to warm climates in a matter of hours, play in rinks that are extremely cold to rinks that are somewhat warm. The temperature may be cold in the rink, but warm outside. When the winter season draws to a close, the players are drawn to the spring and summer leagues. Depending on what part of the country you play in, the humidity outside will have a direct impact on your ability to hydrate even when

playing inside. Not to mention, all those summer camps that have incorporated dryland training either before or after you have your ice session.

One of the other big changes in ice hockey is the equipment that is worn. When I started playing hockey, hockey equipment was not as elaborate or well designed as it is today. Helmets twenty or thirty years ago (if worn at all) were a lot more "ventilated"; shoulder pads just barely covered the shoulders and offered little protection by today's standards. These two pieces of equipment alone, covering the head, shoulder and chest areas are very important when it comes to heat regulation. Today's helmets cover more of the head, with thicker padding. Shoulder pads are lighter weight, but cover more of the torso area, greatly reducing the ability for air to circulate properly to cool down the body. Players today are wearing more undergarments than the players of earlier years. The tighter the undergarments, the less air is likely to flow and cool off the body. These minor changes in equipment alone, have lead to the bodies battle with maintaining proper hydration levels so it may function properly and not shut down. With all this being said, there are ways to battle dehydrating, but in order to do this, we need to know how the body works and what variables we have to prepare for every time we get ready to play or train, whether on the ice or off, whether inside or out of doors.

We need to take into consideration, the climate, whether inside or outdoors, how much humidity is in the air, is it warm or cold or both (depending on time of year, we could train in a rink and then outside for dryland). What impact if any does exercising have on our desire to drink? What type and how much clothing is being worn? What fluids should we consume and

when, and most importantly, how much should we consume? What can the body tolerate when it comes to hydrating? These are all factors that need to be considered when assessing hydration.

When it comes to the **humidity factor,** one thing must be remembered, humidity is not our friend! The rate of sweating is higher in humid conditions but the cooling is less. The reason the cooling is less, is because the air is already very saturated with water. Sweat cannot evaporate. Sweat that beads up and rolls off doesn't function in the cooling process. This process results in the body not being able to cool itself properly, and the internal body temperature can rise to dangerous levels. However, this **"futile sweat"** does deplete the body of vital water and salt. As dehydration progresses cooling becomes more difficult. Performance drops and heat injury becomes a real threat. Deaths have actually occurred when the air temperature was less than 75 degrees but the relative humidity was above 95%. As you can see, the higher the humidity the greater need for fluid uptake. (See Attachment 1)

In ice hockey, the times we are concerned most with humidity is in the late spring and summer months. These times are when most hockey schools are in their peak of operation. Hockey Schools today are more advanced than the schools of ten or fifteen years ago. A lot of "team development" is done off ice and outdoors. This is where the humidity factor comes into play. Because of the humidity factor, we increase the risk of **heat injuries**. The three categories of heat injuries are: Heat Cramps, Heat Exhaustion and Heat Stroke. The heat injuries most encountered in the sport of ice hockey are Heat Cramps and Heat Exhaustion. Heat Cramps can develop during training on or off ice, but Heat Exhaustion will most likely be encountered when

the training is moved outdoors. In most cases, the borders between Heat Cramps and Heat Exhaustion are blurred into one continuous spectrum. If a player complains of muscle spasms, usually in the arms, legs or abdomen, he or she may be experiencing heat cramps. Heat Cramps are thought to be caused by dehydration and loss of salt and other **electrolytes (2).** Heat Exhaustion is due to a more profound loss of water and electrolytes. The signs and symptoms are usually generalized by weakness, headache, dizziness, low blood pressure, elevated pulse, and temperature elevation. When it comes to treating these two ailments, both can usually be treated by removing the athlete from play and in the case of outdoor dryland training, place the athlete in a shaded area and ensure the athlete drinks plenty of fluids, especially fluids that contain sodium to replace lost salt. Ensuring proper hydration will greatly reduce the risk of the onset of heat injuries.

While we are still on the topic of weather, there is a misconception that athletes don't need to drink as much in the cold weather as they do in warm weather. Nothing could be further from the truth. This misconception could have fatal results. When you train or play in cold environments, you will have a tendency to wear more clothing than you would if you were in a warm environment. You may be unaware that you are losing body moisture. Your excess clothing absorbs the moisture that evaporates in the air. You must prepare yourself to drink water in cold weather even if you do not feel thirsty. You need to replace the fluids you are losing. Playing in the cold can play tricks on your mind. Just because you may not be sweating as much, doesn't mean you aren't losing vast amounts of fluids. The cold air will give you a false sense of being properly hydrated. Every time you take a breath in a cold environment, your body is using

fluids to produce heat to warm the air you are breathing in. This is when coaches, especially at the youth levels, must monitor their players and ensure they are drinking or sipping water after every shift.

Another factor that has been having a huge impact on athletes in recent years is **Exercise-Induced Asthma.** I have observed teams and have actually coached teams where more and more kids are being diagnosed with Exercise-Induced Asthma. In this modern era of ice hockey, where the training and playing intensity is greater than ever, it seems that the Asthmatic Inhaler is becoming as common to the game as are hockey sticks and pucks. It has been noted in recent studies that dehydration "worsens" exercise-induced asthma as evidenced in a recent study conducted by Paula Maxwell, Lead Investigator at the University of Buffalo, New York:

> Paula Maxwell and Colleagues compared airway reactivity after 6 minutes of high-intensity exercise in eight young adults with exercise-induced asthma and eight without the condition. Subjects first exercised when fully hydrated and again after 24 hours of voluntary water deprivation.
>
> Hydration status had no effect on lung function in normal subjects, but the study showed that in individuals with exercise-induced asthma, dehydration resulted in a significant decrease in FEV1, a measure of lung function based on the amount of air blown out in one second.

> This decline in lung function was evident both before and after exercise in these individuals, the research team reported at the American College of Sports Medicine meeting in Seattle, Washington. The investigators also noted that the rate of decline in lung function is the same in asthmatics whether they were hydrated or dehydrated, but when dehydrated, asthmatics start out with worse lung function than usual, and therefore experience more breathing problems than when they have enough water on board. (5)

According to Dr. Frank Cerny, Associate Professor and Chair of the University of Buffalo Department of Physical Therapy, Exercise and Nutrition Sciences; "Asthmatics are more sensitive than non-asthmatics to dehydration, but we need to investigate this condition further to determine how it affects (lung) function." Dr. Cerny also adds, "The message continues to be, 'Drink fluids whenever you get the chance,'" "If you have asthma, dehydration may make it worse, particularly during exercise."(5)

Now that I have brought your attention to factors that contribute to dehydration, I will cover how our body starts to dehydrate and what we need to do to compensate or decrease the dehydration process. I will discuss briefly how the body works and what to drink, when to drink it, and what effect different fluids have on our bodies.

Why not dehydrate? Dehydration will greatly reduce exercise capacity and tolerance to heat. The way your body cools is that the skin blood vessels dilate in the heat to initiate the

cooling process. They need more blood supply to do that. When the body becomes more active in the heat, the working muscles need blood too. With the onset of dehydration, competition between heat-induced vasodilation and muscular activity like skating and physical play leaves the body without enough circulating blood volume to go around (See Attachment 1). The blood pressure will begin to fall and the heart will pump less blood with each heartbeat, which will cause the heart rate to increase. The body will begin to overheat. The athlete will begin to feel faint and may be unable to play to full potential. Your body would rather cut your exercise ability than continue to generate heat through exercise. The dehydration causes the body temperature to rise with the exercise workload, but it is less able to cool itself through sweating and vasodilation because there just isn't enough water to go around.

How does your body lose water? Everyone loses body water several ways all day and all night as part of the normal metabolic processes of living. The body loses water through sweat, in liquid and solid waste, and through your skin and respiratory tract. As athletes, whether training or competing, the process will increase, especially in the area of sweat. Quite a few athletes deliberately don't drink fluids before competition to reduce their need to urinate when in the middle of training or competing. I have also observed athletes, often times with the coach or parent's encouragement buy sodas to increase their "energy" while playing. When you drink caffeine, it can increase your "output" to the point that you lose more fluid than was taken in.

How to conserve body water. Often times, athletes don't drink enough during competition or training because there is no "urge" to drink. In the area of nutrition, most "experts/researchers"

agree that in normal temperatures without exercise, you will lose approximately a half a cup of sweat in a day. In hot weather, sweating generally increases about 14 times and with heavy exercise up to 50 times and more. To compensate for extra fluid loss through sweating, urine volume decreases, sometimes drastically. The decreased urine output is your body's defense mechanism to reduce dehydration. At this point, your body is beginning another defense mechanism, it is starting to shut down, blood/fluid flow to the extremities will be decreased muscles will start to cramp up from the fluid depletion, the blood and fluids will be rerouted to your life support system, your heart, lungs and brain.

First of all, why do we need to replace lost fluids? Your body manufactures a small amount of water during normal metabolism, and you get a bit of water from your food, but you gain body water principally through drinking. If your fluid intake doesn't compensate for what the body will utilize during exercise, the body will begin to dehydrate. You need to add to your body's water stores before and after activity, and sometimes during activity depending on the length of the activity.

Fluid replacement is particularly important in the heat. Depending on how long and how intensely you exercise, you may benefit by adding electrolytes and carbohydrates during competition or exercise. After competition or exercise, the need to restore the lost or used carbohydrates that are utilized for fuel. There are "pros" and "cons" for the use of different drinks, depending on the different durations of exercise and the various times you should drink certain drinks, for example before, during and after competition or exercise.

Water: Depending on what sources you read, you normally lose slightly more than 2 quarts of water each day, over 3 quarts in hot weather and 6 or more quarts with heavy exercise. The need exists to replace equivalent amounts fluids. It is recommended that drinking at least 8 glasses of water a day, and up to another pint (half liter) every 15-20 minutes during exercise in the heat (1,2,3,12). Water replacement during activity reduces fatigue and feeling poorly. Replacing lost body water is a major factor in preventing overheating. Water is a good inexpensive, and easy fluid replacement. *The most overlooked athletic ability aid is water. You need to replace body water before and after activity and sometimes during activity, depending on duration, particularly in the heat (2).*

Electrolyte Replacers (Sports Drinks): Electrolyte drinks replace water and amounts of each electrolyte you need. They will eliminate the need to stop and eat. Unlike plain water, electrolyte drinks stimulate thirst, which encourages more drinking. The electrolytes help you absorb more water and more carbohydrates for energy. Once in your blood stream, these drinks help you retain water. When you drink plain water, your body excretes most of it back out. Just prior to competition, during competition and immediately after training or competition is the best time to consume your sports drinks. By doing this, you will maintain a level of electrolytes that is necessary to sustain the much needed energy levels your body needs to perform. Without replacement of electrolytes, your levels will fall too low and your ability to exercise decreases.

Another important factor in determining if you should use sports drinks is that sports drinks are considered “Carbohydrate Loaders.” Carbohydrate loaders have three main

applications: (1) During intense, long-duration exercise, they provide fuel to delay fatigue. (2) For athletes who can't eat enough calories through regular meals and snacks to maintain their weight with all their strenuous workouts, the drinks add calories. (3) For people unable to eat a regular meal before physical activity because of time restraints or because they may have a "jittery" stomach, the drinks become a temporary meal substitute.

As important as it might seem to be hydrated before and during the competition or training, it is equally or possibly more important to continue to stay hydrated post competition or training. I have found that no matter what books you read or which Sports Medicine people you speak with, they all agree that the first twenty or thirty minutes post training or competition are crucial to the body for major restocking of nutrients that were lost during the training or competition. The next two hours are the second most important stage. More often, I have observed players in the locker room pack their equipment away, hurry out the door and leave the rink, before eating or drinking anything. By this time, they have missed their "crucial restocking period." Replacement/Sports drinks serve as a quick fix for those players who prefer to drink rather than eat immediately after a game or practice.

Some of the benefits of sports drinks are: They are a lot tastier than plain water, which will stimulate/encourage players to drink more. They help retain the salts and potassium that the body needs to perform efficiently. They will provide carbohydrates during long exercises to delay the onset of fatigue. They also enter the blood stream just as fast as plain water. A popular misconception about sports drinks is that they must be diluted or taken in small doses. Dr. Robert

Murray, Director of the Gatorade Exercise Physiology Laboratory said that: “Diluting the drinks lessens their effectiveness. The drinks are designed to be taken in large volumes for rehydration.” (2)

Due to the numerous books and articles I have cited and Nutritionists and Sports Medicine people I have spoken with, I have chosen to use a combination of sports drinks and water, depending on the duration and intensity of my workouts or competition. I also take into consideration my diet and the diet of those I coach or teach. Depending on what “experts” you listen to, for the most part they all agree on the following guidelines:

$ For exercise lasting under 45 minutes, water is your bests choice. For the recreational athlete who may exercise for 30-40 minutes per session, water is sufficient

$ For workouts consisting of at least 45 minutes of continuous exercise or high intensity workouts of any duration like running, ice skating, aerobics and intense weight training, a sports drink may be beneficial in delaying muscle fatigue by providing your body with additional energy.

One thing that was not discussed yet is Hyponatremia. Hyponatremia is when there is substantial electrolyte loss. This happens with prolonged sweating. The body’s sodium level

falls below normal. Athletes lose salt through their sweat. With extreme electrolyte loss during long exercise, with only water to drink, the cells in the body may be abnormally diluted. This is also called water intoxication. In the sport of ice hockey, the affects of hyponatremia would most likely happen during dryland training in hot, humid weather. Affected athletes present a combination of disorientation, altered mental status, headaches, vomiting, lethargy (drowsiness) or possibly seizures. That is why it is important to balance when to drink water or when to drink sports drinks. Water will sustain hydration and sports drinks will help maintain your electrolyte balance. The decision you have to make is when according to your diet and physiological needs, will you drink water or sports drinks.

To summarize the fluid replace choices:

$ Water: The most overlooked athletic ability aid. Replacing lost body water prevents dehydration. Dehydration increases your chance of overheating, fatigue, and not feeling well in the heat.

$ Electrolyte Replacers: These drinks replace and retain needed electrolytes and water after long duration exercise in the heat. They stimulate thirst, resulting in greater fluid replacement.

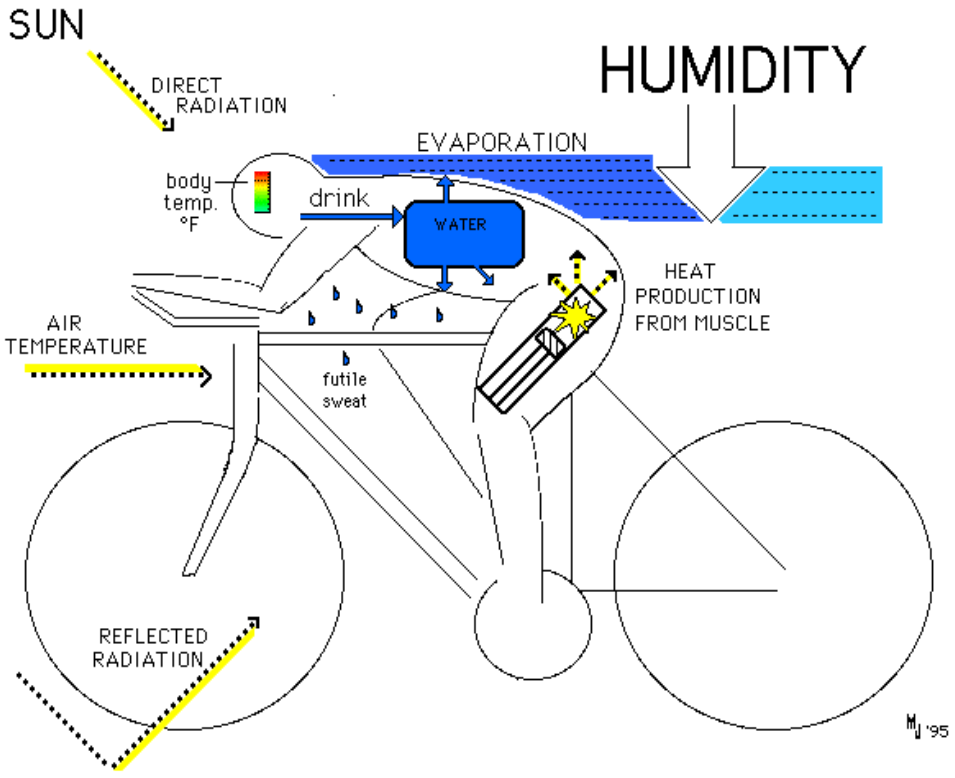
$ Carbohydrate Drinks: These drinks provide fuel and fluids to delay fatigue in long events, supplement calories, and can be temporary meal substitutes.

$ Carbohydrate Replacers: With a higher carbohydrate content than regular carbohydrate drinks, replacement drinks restock muscle and liver glycogen along with fluids after a hard activity.

$ Caffeine: Cut down if you comfortably can. If you are so accustomed to your coffee or sodas that missing your dose would hinder your ability to function, drink extra water to help offset your urinary output.

Conclusion

Finally, we as coaches are very demanding of our players. If we are going to be that demanding, we need to be more knowledgeable about the implications. Ice hockey training goes far beyond the “X’s” and “O’s” of the dry erase board. In today’s modern era of training, we need to be knowledgeable of many facets of the game. In this particular facet, young athletes do not have the education or sense to be as efficient at body temperature regulation as adults, the danger of dehydration and increased body temperature should be of primary concern to the performing athlete and the coaching staff. Remember, it is not only your performance on the ice or field that will suffer; not maintaining proper hydration could cause an athlete to unwittingly pay the ultimate price.



Attachment 1

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