FLUID AND ELECTROLYTE REPLACEMENT FOR EXERCISERS

Medscape's Interview with Nina S. Stachenfeld, Ph.D

Nina S. Stachenfeld, PhD: First, the issue of dehydrating is more important when a person exercises in the heat, of course, because they're going to sweat more. And so the hotter it is, the more an individual would actually be at risk.

And let's forget about distance, maybe exercise time is a better way to think about it. So, for example, if you're exercising when it's not particularly hot out for under 2 hours, your risk of dehydrating in a dangerous way is quite low.

Now thirst is going to kick in, so people are probably going to drink during exercise, so during a shorter workout I think you can rely on the thirst mechanism. But if you know that you are going to be out there for more than 2 hours, or if it's very hot, then you don't want to only base your drinking behavior on thirst. Under these circumstances, you would want to plan ahead. A lot of people would argue that if you don't do that, by the time you do start to feel really thirsty, you have been sweating a lot, and it may be a bit too late at that point to replace the water and get yourself hydrated to the point your performance will not be detrimentally affected.

Medscape: I also read that some people, such older people, are at high risk for not actually experiencing thirst until they are dehydrated.

Dr. Stachenfeld: Yes, there certainly are populations who don't feel as thirsty or their thirst mechanism is delayed, and older people are one of them. However, older people also have slower functioning kidneys, so they're going to retain a little bit more water, too. Taken together, this means that you might let them know to be aware of their sweating, but also be conscious of overdrinking or drinking too quickly. Thus, even though thirst is frequently delayed in older people, it's not so delayed, at least in my opinion, that it puts them at greater risk for dehydrating, except if they're exercising when it's hot. Older people will be more sensitive to temperature, so [in that case] they would want to be concerned about drinking earlier and pay attention to drinking beyond what they might be motivated to do based only on their thirst.

Medscape: What about electrolyte replacement? What's the best way of accomplishing that?

Dr. Stachenfeld: There a number of different schools of thought on electrolyte replacement. Some scientists feel you don't really need to start replacing electrolytes until you're into a longtermexercise bout. When exercising in the heat, healthy, active people can safely lose about 2% of their body weight without significant risk. Once you get past 2% of your body weight, then you want to start being concerned about replacing both water and electrolytes.

Essentially, you should replace the lost water and electrolytes in the most pleasant way that you can, which is as individual a choice as any food or drink preference. Some people like sports drinks, some people just stick with water and get electrolytes through food, such as carbohydrate/electrolyte gels, sports candies, or bars. There are so many sources now of electrolytes and carbohydrates so an athlete needs to find something that works for him or her, and use it.

Medscape: The idea of eating salty snacks is actually to become thirsty then, right?

Dr. Stachenfeld: Yes, ingesting salt, either through fluids or foods, serves 2 purposes. Salt ingestion replaces the sodium you have lost through sweating, so if you drink, let's say, a sports drink or eat the sodium through bars, or take a sodium supplement, etc, you'll replace the electrolytes first and

foremost. In addition, sodium ingestion will stimulate the thirst sensation and remind athletes to drink as they exercise. Athletes who take a supplement should know that some are harder to digest than others. Sodium chloride, which is what is usually in food, is the best for digestion. In my opinion, it makes no difference at all whether you get sodium from food or supplements the food provides calories, which certainly helps with running. I do think that sodium supplements are a waste of money. Limited amounts of sodium chloride (salt packets, or just some table salt) work just fine. However, in any case, it comes down to personal preference. Whatever the athlete decides, it is a good idea to take your sodium at least an hour before the race starts.

Medscape: Is there a danger of overhydrating?

Dr. Stachenfeld: There can be, yes. However, in my opinion that's really hard to do. There's concern for exercise associated hyponatremia (EAH) (low sodium concentration in the blood) when you drink too much, especially of plain water. This process can be slowed by sports drinks, but they too, are hypotonic to plasma so will not eliminate the risk for hyponatremia. Hyponatremia usually occurs because your body doesn't get rid of water fast enough. Perhaps there's some fall in the blood flow to your kidneys, so your kidney is working a little bit slower. Then you start to retain the water, and the sodium blood levels rather than go up like they normally do during exercise actually start to fall. If they fall far enough, it could be dangerous. In fact, it could kill you. So that's why there's concern. That having been said, EAH is fairly rare because when most of us drink too much water, whether during exercise or not, we will simply urinate. EAH is important to consider though because some people will not urinate sufficiently so will take on water and cause blood sodium concentrations to fall. I have also read stories in *The New York Times* (usually right before the NYC marathon) of someone who drank gallons and gallons of water the night before a marathon, continued drinking before and during the race, and managed to dilute their blood enough so that their sodium fell and they got very sick.

There has got to be some balance between dehydration and hyponatremia. I think you're much more at risk for becoming dehydrated than you are for becoming hyponatremic. However, being dehydrated is just not as dangerous as being hyponatremic. So that's why the answer isn't as simple as just always drinking a lot or not ever drinking too much. If you become really dehydrated, you can get sick, and you can limit your ability to sweat, so your body temperature goes up, and you can get into situations where you have heat exhaustion or even heat stroke, but most people recover from that. Extreme hyponatremia can cause brain damage or death, so the consequences of hyponatremia are worse, but it's much more rare. I should also mention that the risk for EAH vs dehydration during long term exercise is a hotly debated issue among exercise physiologists, so there should be more to come.

Medscape: Are there specific people at risk for hyponatremia?

Dr. Stachenfeld: Well, women tend to be more at risk than men for hyponatremia. While the exact mechanism for the sex differences has not been elucidated yet, this difference is likely associated with women's smaller body size and different levels of sex hormones, such as estrogens. Women have less body surface area from which to sweat, and so they tend to sweat a little bit less and hang on to a little bit more water. Moreover, estrogens are associated with different cellular function in the brain between men and women, making women more susceptible to low sodium sothat when they become hyponatremic, they tend to experience symptoms and negative consequences to a greater degree than men do. Thus, a man and a woman can become equally hyponatremic, but the woman will get sick and he man won't. There is also some discussion that older people and children are a little more susceptible to hyponatremia than are healthy adults.

Medscape: In general, if a person exercises intensively whether professional or amateur is there any recommendation for sodium intake, assuming they're not salt sensitive?

Dr. Stachenfeld: No, and if you read the ACSM Position Stand, one of the things you'll see is a wide range of recommendations. The reason for this is because people regulate sodium and water so differently, and we backed off any specific recommendations other than those wide ranges of numbers because there is so much variation across individuals.

The problem with an overall recommendation is that it's not going to work for everybody. Thus, the most important thing is that an individual learn what works best for him or her. For example, let's say an athlete is planning to run a marathon. He or she is going to have a specific training program, because that's the only way to prepare for a marathon. The athlete should always train in the same way to determine how to replenish electrolytes and water in an individual way. In other words, do hydration training. Each person needs to figure out how he or she responds to running in a variety of conditions. Thus, during training, athletes should weigh themselves before and after a training session to assess the level of water loss (be sure to correct for fluid intake and urine produced). Athletes will get a very good idea as to how much fluid they need to replenish to maintain performance. Athletes should do this under more than one condition (heat, cold, rain, etc). Trying different drinks or food for electrolyte replacement during the training period is also essential.

And the other thing to check is your urine. That's an excellent method to see how hydrated or dehydrated you are. If you have clear urine then you're nice and hydrated; if it's dark it means that you're dehydrated because your urine is very concentrated and your body is holding the water in.

Medscape: So what about eating? Is there any kind of recommendation for specific foods and when youshould eat and when you shouldn't eat?

Dr. Stachenfeld: You mean in terms of sodium or electrolytes?

Medscape: Yes.

Dr. Stachenfeld: That's also going to be very individualized. I mean, one of the things that a lot of athletes recommend to each other, and it's not necessarily a scientific thought, but I think it can make the difference between a successful race and an unsuccessful one or a healthy one or an unhealthy one, is to find out what the race directors are going to be putting on the course. Then train using that substance. All races are going to supply water, but they also usually have something else. Most of the time it's Gatorade, but sometimes they have those gels to eat and various other things. Some people don't like the offerings, but it is worth training to get used to them because [racers are] left with 2 options: they have to carry something with them for the whole race, which is a pain, or just get used to drinking whatever it is that they don't like.

It's good to start out the race or workout well hydrated. And when you are training, salty food is great. All the things that you're going to tell people not to eat, like pretzels, are great for people who are training for races. They need that, they need the water. There are always going to be athletes who are also salt sensitive and have problems regulating their blood pressure, and that's a completely separate group who need to monitor blood pressure as they train and eat.

But for healthy athletes who have no problem regulating their blood pressure, they do need the salt.

Medscape: If you had a person who was hypertensive and his or her blood pressure was under control and they wanted to exercise intensively, would your recommendations change in terms of how you would suggest they would hydrate or maintain sodium at basic levels?

Dr. Stachenfeld: For an individual who is hypertensive, but their blood pressure is controlled through

medication, you mean?

Medscape: Yes, or through exercising.

Dr. Stachenfeld: I think then I would stick with my recommendation, with a huge caveat saying they would really have to watch their blood pressure. So, say a bag of pretzels is a great way to get sodium and it's a low fat source, so you eat it. You do have to think about who you are. If you are somebody who is really sensitive to salt, but you're extremely fit, then you would have to be sensible and keep an eye on your blood pressure, obviously, and be sure that those extra sodium snacks don't start to increase it. And if they do, you have to be a little bit more creative. There are other ways of getting things in your body that can help you retain water. Even sugar can help, which is not necessarily the healthiest thing.

Medscape: Is there anything else you'd like to add?

Dr. Stachenfeld: I think it's really important to emphasize that the amount of sodium and the amount of water are very individual, because the amount and electrolyte composition of sweat varies a lot among us. So that means that how much we have to replace or come in with to exercise is going to vary, too. Unfortunately, recommending the amount of sodium/water for exercise isn't a "one size fits all" kind of thing.

I also would like to strongly advise that people think about their hydration regimen before they go out and do these long races or exercise for long periods of time, especially in the heat. They want to train for this as much as they want to train for the running part of the race. I'm talking about running marathons, but this holds true for long cycling races, triathlons, soccer anything that is long term exercise.

You have to get good at hydrating. You want to think about trying your hydration regimen in different climates make sure you do it on a hot day, do it again when it's a little cooler. After a person has done that a couple of times, he or she will get a good sense of how much they need to be taking in, and that's much more important than a doctor or trainer coming up with a specific number. "I have to have this exact amount of sodium and this exact amount of potassium." It just doesn't work that way.

Medscape: Any comment on salt restriction in general?

Dr. Stachenfeld: I'm not going to get into salt's effect on the public, because I am much more focused on sports, buts alt can make things taste better without adding fat. So it's not a bad thing to include it in a diet program. Of course ,you have to make a big caveat, because a lot of people are sensitive to salt, and a person doesn't necessarily know if he or she is sensitive. However, an awful lot of people are also completely insensitive to salt, and even some who are salt sensitive don't respond to a low salt diet. But almost everyone responds to a high fat diet. So that's really my one pro-salt public health point.