

HYDRATION FOR ATHLETES

Featuring:

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TRANSCRIPT

Maura Bowen: Maybe you're a runner or a footballer, American or otherwise. Or maybe you're posterizing your opponents on a 94-foot court, or you're dunking on your kids in your driveway. Or maybe you're a cyclist pedaling down Route 66 or on a stationary bike in your basement. In any of these scenarios, chances are you know what it means to work out hard, to feel thirsty or even dehydrated after all of those great post-workout endorphins subside.

So, let's talk about hydration, and for the fun of it let's use as our example Rob Gronkowski, a tight end for the Tampa Bay Buccaneers. Now, Gronk is known for his relentless and impeccable discipline on the field and for his astonishing physical condition, a 31-year-old elite athlete who weighs 265 pounds and is six feet six inches tall. So, let's say he exercises for two hours, pushing himself through another grueling NFL workout. A guy like Gronk could need to drink upwards of 24 cups of fluid to rehydrate from a workout like that. 24 cups!

But what about a weekend warrior such as yourself? How much fluid do you need? Really, it depends on your age, your gender, how hard and how long you work out and how often, what you're wearing, whether you're inside or out in the fresh air, whether it's hot or cold. These are only some of the factors that influence your hydration status, but it's super important to think about these factors so you can ensure you take in enough fluid to replenish what you've lost.

Now, I'm not here to tell you why. We'll let the expert do that. I'm Maura Bowen, podcasting for Abbott Nutrition Health Institute, and I'm here with Craig Horswill, who is a clinical associate professor of kinesiology and nutrition in the College of Applied Health Sciences at the University of Illinois at Chicago here in the United States. Dr. Horswill will discuss how performance affects hydration status. He'll explain the role of hydration before, during and after exercise and more. So, thank you for joining us today, Dr. Horswill.

Craig Horswill: Oh, thank you for having me. I appreciate the invitation.

Maura Bowen: So, before we get started, I want to remind everyone we're still in the middle of a pandemic. We're playing it safe by social distancing, and by that, I mean Dr. Horswill and I are both dialing in for this discussion. So, the sound quality of this recording may sound a little different from what you're used to hearing. I should also note that this recording is just the first in a three-episode series on hydration. In episode two, we'll discuss the science on hydration and how to know when you're dehydrated. And in the third episode, we'll talk about hydration across the lifespan. These episodes are full of useful information, and we hope you'll check back regularly to hear them all. So, Dr. Horswill, before we begin, do you mind telling our listeners a little bit about your background?

Craig Horswill: Yeah, I'd be glad to. I really got interested in hydration and nutrition and everything as a wrestler at the University of Wisconsin. And there, I got my undergrad in natural sciences and then switched over into the field of exercise physiology for Master's. Following that and all the competition, I went to the University of Illinois at Urbana-Champaign, got my PhD. We did a lot with body composition there, but water is an important part of the composition, so I continued on that theme of hydration.

From there, I went to Ball State University for a couple of years--a major lab in sports nutrition and sports physiology--then took a little bit of switch in direction and ended up in Columbus, Ohio for about six years at Children's Hospital studying growth and development of children and metabolism of protein carbohydrate. I then spent 16 years in the food and beverage industry, specifically doing research and science support for sports drinks. Then now I've been at the University of Illinois at Chicago, or UIC as we say, for about 10 years doing research as well as teaching.

Maura Bowen: Well, awesome. That's a great background and thank you for sharing that with us. Now, how about if we start today by talking about hydration for competitive athletes? Does that sound okay?

Craig Horswill: Very good. Yeah, it's an important group to address.

Maura Bowen: Okay, great. So, I know we teased this idea in the intro, but we already know hydration plays a huge role in how well a competitive athlete will perform. Can you talk about this for a moment?

Craig Horswill: Yeah. If you consider that our bodies have a very substantial amount of water, if you look at the lean tissue, particularly of an athlete who has very little body fat, they're going to be about 65% water and of their muscle mass alone--the fat free tissue--it's about 70, almost 75% water. That's in important places such as in the muscle. It's also a part of our vascular space, and it's very important in terms of how our bodies operate and regulate, particularly when we're exercising and producing body heat.

Maura Bowen: So as anyone who exercises regularly can say, it's important to hydrate before and during and after exercise, especially for elite performers. So why is this and what role can hydration play in recovery?

Craig Horswill: Yeah. Well, as we exercise and generate body heat, we need to cool our bodies down. We have a very narrow range of body temperature in which we operate effectively. Too cool and we're going to suffer from hypothermia, and for too hot you end up with heatstroke or hyperthermia and actually you could die from either of those, so this narrow range is important. And our body will sweat as we get hotter. In other words, we're producing this layer of fluid on the surface of our skin. You could almost imagine the analogy of putting rubbing alcohol on your finger and then waving it around in the air. You feel that cooling effect.

Well, that's basically what the body does when we exercise. You produce this layer of fluid. It evaporates off of our skin and essentially our body's boiling that off and that removes heat from our body, dissipates the heat and helps us keep that normal body temperature. Because of that sweating, we lose fluid from those important spaces that I mentioned, the muscle, cardiovascular space, and that affects our ability to keep going and also affects the regulation of our temperature. We heat up much faster if we're dehydrated than if we exercise when we're well-hydrated.

Maura Bowen: So, it seems like our bodies send us cues to remind us to stay hydrated, right? What are some of those cues? For instance, is thirst a good indicator for athletes?

Craig Horswill: It's okay. It actually lags behind a real need for fluid. It's almost as if something goes wrong with our car engine, we don't see the light on the dashboard 'till we've already got a problem. And so, as we develop a deficit in our bodies of fluid, the signals, a salty bloodstream, a reduced blood volume, kind of daze the brain and alert our bodies to behave then as to go and drink. But that only happens after we've been set back that we're about 2% dehydrated.

Maura Bowen: So, as I was researching to prepare for this discussion, I came across a word hyponatremia. What is it and what makes it a risky condition? And along those lines, how can athletes avoid it if they can?

Craig Horswill: So, I mentioned when we get thirsty, one of the signals is more salty blood. We have sodium and we have chloride floating around in the body fluids that are outside of our cells. We call that the extra cellular space. As we lose fluid, we lose water and we lose the sodium and chloride, our salts, as we sweat, but we lose the water in a greater proportion. So typically, that becomes a little more concentrated. In the case of "hypo," low, below normal, "na" or "natre" is sodium. If you think of the periodic table elements, the Na is sodium and "emia" has to do with blood. So low sodium in our blood. We've either lost too much sodium or we've taken in too much water and diluted what we have. We've diluted the normal concentrations.

Craig Horswill: When that happens, our bodies don't keep water in the right space. The salts, the sodium and chloride are very important in holding fluid in the extracellular, outside of the fluid space, and lacking that, too much fluid starts to move inside of our cells, and they expand. Now, if those cells are, let's say, the brain stem and our brain, that starts to affect our breathing, our consciousness, everything, and that can be very drastic. People have actually died from drinking too much water. We need to be aware of that and not overdrink when we exercise.

Maura Bowen: So, I'm guessing it would help our listeners to know what sports professionals recommend to elite athletes relative to appropriate fluid intake before, during, and also after a workout. So, would you mind reviewing some of those guidelines for us?

Craig Horswill: I'd be glad to, and I'm going to preface it by saying these are merely guidelines. All of this has to be really customized and considered, as you mentioned at the beginning, the state of the person and a lot of other factors. But according to the American College of Sports Medicine, and this is in a position stand that they issued about four years ago, 2016, that prior to exercise, maybe two to four hours, maybe as a part of the pre-event meal or pre-exercise meal, people could take in about five to 10 milliliters of fluid per kilogram body weight.

So, what does that translate into? Let's say you have a 154-pound person. They would be taking in about 12 ounces up to maybe about 24 ounces or about a pint and a half of fluid just to make sure that they start their exercise session well-hydrated or normally hydrated. During exercise, and this is again based on sweat rates of athletes and exercisers that have been reported in the literature, a consumption of about 0.4 to 0.8 liters per hour, or you could say a 0.4 to 0.8 quarts per hour, roughly, would be about right to cover most people's sweat rates. So again, we're losing fluid to keep our bodies cool. We want to replace that. And that range typically mirrors what most people would lose during exercise.

Now, certainly not everybody, and we mentioned a football player at the beginning of our podcast. But that individual may sweat at much higher rates. Afterwards, if a person is in a deficit, let's say that you drank fluids, but you got done exercising and you're two pounds lighter than you started. Well, that represents 32 ounces of fluid. You're dehydrated. You're down that amount of fluid. So, it's been recommended that you consume a little bit more than you'd normally just to help make sure and ensure that you're normally hydrated for the next exercise bout, the next competition. That's the range that you want to be in. That kind of helps make sure that you put enough back in the body and compensates for some of the urine losses that will occur during that recovery period.

Maura Bowen: Do you have any thoughts on how our listeners can take these recommendations and apply them by creating a personalized hydration plan?

Craig Horswill: Yeah, it's rather simple. The advice really is to weigh in and out before and after the exercise occasion. We always think of exercising and losing weight for health reasons, but in that short of a period, acute weight change is fluid loss and primarily water loss, and that's really what we want to place. If you think back, I mentioned earlier that these fluids come out of our main tissues, the muscle, the bloodstream. Those are the places that we need to replace the water.

And so, weighing in and out around the exercise occasion is a good way to monitor your fluid loss and allow you to create the strategy, how much do you need to replace when you're sweating? And when you're doing that workout again in subsequent times, you also want to account for changes in the weather too, or the heat of the environment that you're in. If it's going to be hotter, you're probably going to sweat at a higher rate, so you might have to adjust that upward.

Maura Bowen: So, let's switch gears just slightly and talk about recreational athletes. We're pounding the pavement too, so what do we need to know? Starting with the anatomy of sweat, I know that you've mentioned that sweat is primarily water, but what else do you lose while you're sweating and why?

Craig Horswill: So, water, but also there's a lot of the electrolytes lost, the salts that we talked about. So, the sodium and chloride and some potassium, and there may be some trace amounts of other things such as calcium, magnesium, maybe some iron. It would take quite a bit of sweating and a very poor diet to really cause a calcium deficit or iron deficit, but the sodium and the chloride are lost at very high levels, and those are the things that are important to replace because those are the things that hold the fluid back in our body and allow us to rehydrate. If we simply drank a bolus of water alone, that tends to just run through us, even if we're dehydrated, but having a little sodium chloride in it helps the body hold onto it long enough so it can redistribute into the places within our muscle and other places to help totally rehydrate the body.

Maura Bowen: Now, you've talked about how clinicians assess hydration in those elite athletes, but what about recreational athletes? Is it a different assessment process?

Craig Horswill: So, it's really not. It's the same thing. Now, it's kind of funny. The elite athletes that are heat-adapted and that, they will often have lower levels of electrolytes in their sweat. They do a better job. Their body has been trained to do a better job of holding onto those and just producing a very dilute sweat. Whereas recreational athletes, particularly maybe not as fit or not heat-adapted, will have higher levels. So, there's a little bit of a trade-off. They may have higher levels, but maybe they're not sweating enough. They're not doing what the football players would be doing and they don't have the insulation of the uniforms and equipment to promote more sweating. Weighing in and out, watching the urine color, are good ways to also help them in terms of knowing what the hydration needs are and staying on top of that.

Maura Bowen: So, along those lines though, how can recreational athletes assess their own hydration status at home? I imagine some of those steps like weighing in and out and checking the color of your urine and those types of things would be the same. Is there anything else?

Craig Horswill: They can do that. That's definitely wise. You can typically buy the dipsticks at the local pharmacy that would tell you the urine specific gravity. If they really want to get technical, they can typically buy, or you can buy, a refractometer to measure that and give you a number rather than just a category of where you fall. There are some other tests that are gross measures, pinching the skin on the back of your hand, and dryness, even sometimes headaches can be a symptom of being dehydrated. So, some of those kinds of signs and symptoms might also be worth watching, but the risk probably of dehydration recreational athletes is a little lower since their sweat rates may not be quite as high as the elite athletes.

Maura Bowen: So, you've touched already on how dehydration is dangerous. So, what are we really trying to say here? What impact does even mild dehydration have on exercise and just on your overall wellbeing?

Craig Horswill: So, we think that about 2% dehydration impacts on endurance, physical endurance. So, we're talking about a 150-pound person being down three pounds and it doesn't take a lot to do that. Even overnight, sleeping in eight hours, you can lose, easily, two pounds through water vapor lost in our breath, insensible water loss off our skin. I mean, it doesn't take a lot to lose fluid. Our bodies are always losing fluid and our only route of intake or putting it back is by drinking. That's an issue, 2% or more, and the greater dehydration, the more impact that's going to have in a negative way on our performance.

But there's research to show that even less than that, between one and 2%, can impact our physical ability and even some effects on cognitive function. Certainly, the more dehydrated, the more stress we feel, the harder it is to concentrate. Short-term memory, executive function, can all be impacted by that. There's even some interesting research showing that while people who had been deprived of water for a 24-hour period, they're induced about 2% of dehydration, their cognitive function could be maintained, but it was much more challenging. When they asked for the rating of how hard it was to do that and replicate their cognitive function tests, they said it was much more stressful, much harder, much harder to concentrate on doing the tests. So, it's interesting how that dehydration can have an impact on direct measures, but also some of the indirect measures of how we feel and how stressful things are.

Maura Bowen: All right. That's great. One final question for you. So, what are some common challenges in hydrating enough before and during and after exercise? For instance, what are some quick and easy ways to overcome those challenges?

Craig Horswill: So, there are a lot of barriers, obviously. I mean, when we sweat, when our kidneys are continually producing urine, when we're breathing, we have water loss. So, we have three or four routes of

water loss and only one replacement and that's through our mouth. One barrier is just the opportunity. Do I have a bottle within arm's reach? Do I have a timeout or an opportunity to go get that if it's a ways away from me? Does it taste good? Does it encourage me to drink? A little bit of salt in the beverage will often do that, stimulate our thirst so we drink enough, you don't fall short.

If we have extremely high sweat rates, back to that example of the football player that you mentioned, we've seen some football players that can lose 16 to 18 pounds in a two-hour workout. That's a challenge to keep up and replace that as you go as during the practice. And if that player only has three hours between two-a-day training, he definitely is coming back in the afternoon session in a deficit. He's not going to have an opportunity to totally replace that and now he's got another practice in the heat of the day that further puts him behind. So, the composition of the fluid can help. If it's poorly tolerated or slowly absorbed by the body, people tend to have GI distress or more GI distress, or they feel full and bloated, they're less likely to drink. So, all of those considerations. I think setting up strategies of when to drink, trying to keep up with what you're losing, drinking products that get absorbed quickly and are less likely to prompt GI distress are all things that the athlete can take into consideration to help design an overall program that helps prevent dehydration.

Maura Bowen: Well, this was great, Dr. Horswill. The details you've shared are incredibly helpful and, best of all, easy enough to apply to our next workout. So, we really want to thank you for that and thanks for joining us today.

Craig Horswill: Well, thank you. I enjoyed it, and I hope the listeners get a lot out of it and do a good job of staying hydrated and preventing hyponatremia at the same time.

Maura Bowen: Excellent. And for our listeners, I mentioned at the beginning of this recording that we're developing two additional hydration related podcast episodes for your listening pleasure. You'll be able to find these and many other episodes on health and nutrition by typing ANHI.org into your browser, clicking "Resources," and then "Podcasts and Videos." If you become an ANHI.org member today, which you can do by clicking "Register" at the top of our homepage, you'll receive regular nutrition science news updates from our team. And of course, you can also follow the Abbott Nutrition Health Institute on LinkedIn. Then finally, our website, ANHI.org, has a series of printable resources related to topics like this and you can find these resources on ANHI.org by clicking "Resources and Printable Materials." In fact, we have a great infographic on hydration, and we hope you'll check it out. Anyway, look, do what both your mama and your coach said, drink your fluids. Thanks, everyone. Stay healthy and safe.