Laying the Caffeine - Dehydration Myth to Rest

A Conversation with

Dr. Ann Grandjean, Hydration Researcher and Sports Nutritionist

If you regularly enjoy a few daily cups of caffeinated coffee, tea or soft drinks, you may be relieved to learn that the Institute of Medicine (IOM) has recently concluded that caffeinated beverages can contribute to your daily water needs. However, you may also wonder how this can be true, since like many people, you have probably always heard that caffeinated beverages don't "count" toward water needs.

To understand how science challenged – and refuted – the long-held belief that caffeinated beverages are dehydrating, The Beverage Institute for Health & Wellness (BIHW) talked with noted hydration expert Ann Grandjean, EdD, FACSM, CNS.

BIHW: We've heard for years that caffeine is dehydrating. Now the Institute of Medicine (IOM) says that caffeinated beverages can contribute to hydration. How did this change come about?

Dr. Grandjean: Every 10 years, the IOM appoints panels of experts to update Dietary Reference Intakes (DRIs), which are the official nutrient intake guidelines for the US population. The expert panel for the 2004 DRI report on water and electrolytes carefully reviewed the existing scientific literature related to caffeine and hydration, including a number of newer studies published within the past decade. They determined there was sufficient scientific evidence finding that caffeine-containing beverages do not increase 24-hour urine volume in healthy individuals compared to other beverages and that caffeinated beverages appear to contribute to the body's daily total water intake in amounts similar to that contributed by non-caffeinated beverages.[1] In other words, the common belief that caffeinated beverages don't contribute to hydration is a myth.

BIHW: But, wasn't the common belief that caffeinated beverages are dehydrating based on science?

Dr. Grandjean: Yes, but it's important to note that research studies are designed to answer a specific question. For example, much of the research conducted on caffeine was designed to answer the question, "Does caffeine increase urine output in caffeine-naive individuals?" This means the subjects were required to abstain from caffeine for one to four days or more before the study specifically to eliminate the impact of the body's ability to develop a tolerance to caffeine.[2,3] You see, the body develops a tolerance to caffeine after about three to five days of regular use – which greatly diminishes the weak diuretic effect of caffeine.[2,4] As a result, although these studies found increased urine output in caffeine-naive subjects after caffeine ingestion, they also led to distorted conclusions about the effect of caffeine-containing beverages on people who normally consume them.

Other design commonalities in these studies also made their findings less relevant for everyday life. For instance, most studies collected urine for only a short time. The half-life of caffeine in the bloodstream is relatively short – about six hours in healthy adult nonsmokers and about 3.5 hours in healthy adult smokers,[5] although this can vary widely. Thus, because most of the diuretic effect occurs in a relatively short period after ingestion, especially after consuming large amounts of caffeine, short-term urine collections can lead to distorted conclusions regarding caffeine's overall effect on daily water needs.

Numerous studies gave a single large dose of caffeine, collected urine for a short period, and recorded increased output.[6,7,8] However, acute ingestion of caffeine at levels higher than those normally consumed is known to result in short-term stimulation of urine output.

BIHW: Your work contributed to the change in scientific opinion regarding hydration and caffeine. What did you do differently?

Dr. Grandjean: If the real question is, "Does habitual consumption of caffeinated beverages in amounts and patterns normally consumed cause dehydration?" – which is the question we were interested in – then drawing conclusions from studies using caffeine-naive subjects, looking at short-term urine output, or giving amounts of caffeine higher than normally consumed was not, we believed, scientifically appropriate. Instead, we decided our clinical trials should more closely replicate the "real world" experience of caffeinated beverage consumers.[9,10]

Our clinical trial results included a counterbalanced crossover study involving 18 healthy adult males who consumed water or water plus varying combinations of beverages, including carbonated, caffeinated caloric and non-caloric colas and coffee, on four separate occasions. We found no significant differences in the effect of various combinations of beverages on the hydration status of our volunteers.[9] In a second study, we measured the effect of two regimens – one that included drinking water as part of the dietary beverages and one that did not. Again, we found no significant difference between the regimens on indicators of hydration status.[10] As a result, we concluded that the popular notion that caffeinated beverages cause dehydration is a myth. Subsequently, other studies and reports have confirmed our findings.[11,12,13]

Interestingly, a study from way back in 1928 involving subjects who normally consumed caffeine-containing beverages also showed that these beverages did not increase 24-hour urine output.[14]

BIHW: You say that caffeine has a weak diuretic effect in people who don't regularly consume caffeine. Isn't that detrimental to hydration status?

Dr. Grandjean: As mentioned earlier, the human body develops a tolerance to caffeine after about three to five days of regular use.[2,4] This is why, even though caffeine is a weak diuretic, drinking caffeinated beverages is not detrimental to the hydration status of those who regularly consume them. Our bodies are very good at making adjustments to maintain homeostasis. Since water is so critical for life, it only makes sense that our bodies can negate the mild diuretic effect of caffeine. Research now solidly substantiates that this adjustment does, in fact, occur.[9,11,12,13,14]

BIHW: But what about athletes, who have higher fluid needs? Shouldn't they avoid caffeinated coffee, tea and soft drinks?

Dr. Grandjean: A critique of the published controlled research shows that consuming caffeinated beverages during physical performance does not increase urine output or detrimentally affect performance.[11] In fact, when water is consumed during the rehydration phase, a greater loss of electrolytes appears to occur than does with caffeinated beverages.[11] Moreover, in my experience working with professional and Olympic athletes, asking them to change their drinking habits by eliminating caffeinated beverages can lead to inadequate fluid consumption. They just won't drink as much. In some cases, this can increase their risk of dehydration.

BIHW: If the science proves that caffeinated beverages contribute to hydration, why do so many people still believe caffeine-containing beverages dehydrate?

Dr. Grandjean: It takes time for research that challenges long-held beliefs to become the "accepted" norm, which is why it is so important to help people understand the science that disproves such beliefs. This is certainly true with the misperception that caffeinated beverages are dehydrating. So, although the science is clear, I'm afraid public confusion is likely to continue until this newer science is widely and repeatedly disseminated by educators in the classroom and the media through television, magazines and newspapers. And, of course, numerous Internet sites must be updated with the correct information. Here's the challenge: it only takes a few lines to convey the outdated information, but much more time, work and space to accurately convey the new information and put it into perspective. This interview is a good example. It takes effort, but putting pseudo-scientific myths to rest is worth it.

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