HYDRATION LAID BARE

Does the 8x8 Rule Hold True in This Agua Age?

by Jim Thornton

John Harvey Kellogg would be proud of us. A century ago, this nationally known health guru advocated yogurt enemas and drinking gallons of water as a means to better health. While there hasn't yet been a run on Dannon and Yoplait, there is little doubt that fanatical water drinking has seeped deep into the zeitgeist. It's hard to be alive in this Perrier Period of History and not be constantly reminded of how critical proper hydration is. Claims made on behalf of water are legion. Sipping agua all day long is touted as the best way to slash the risk of various diseases including colon, breast and bladder cancer, ease back and joint pain, stoke our metabolic rate, clear our complexion and help us lose weight. Insufficient water drinking is allegedly the top cause of daytime grogginess. A mere 2 percent drop in hydration is said to impair short-term memory. It seems that you are no longer what you eat but what you imbibe. And pity the fool who drinks anything but pure H2O (or one of its enhanced cousins—vitamin drinks and oxygenated water).

Alas, I am precisely such a fool. For years, I've bookended my days with three mugs of dark-roasted Starbucks in the a.m., and several pints of equally strong lager in the late p.m. The liquid bridge connecting my mornings and nights typically consists of a glass or two of Tropicana, maybe a Coke or an iced tea and a few swigs from the drinking fountain at the pool.

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Cathleen Clapper

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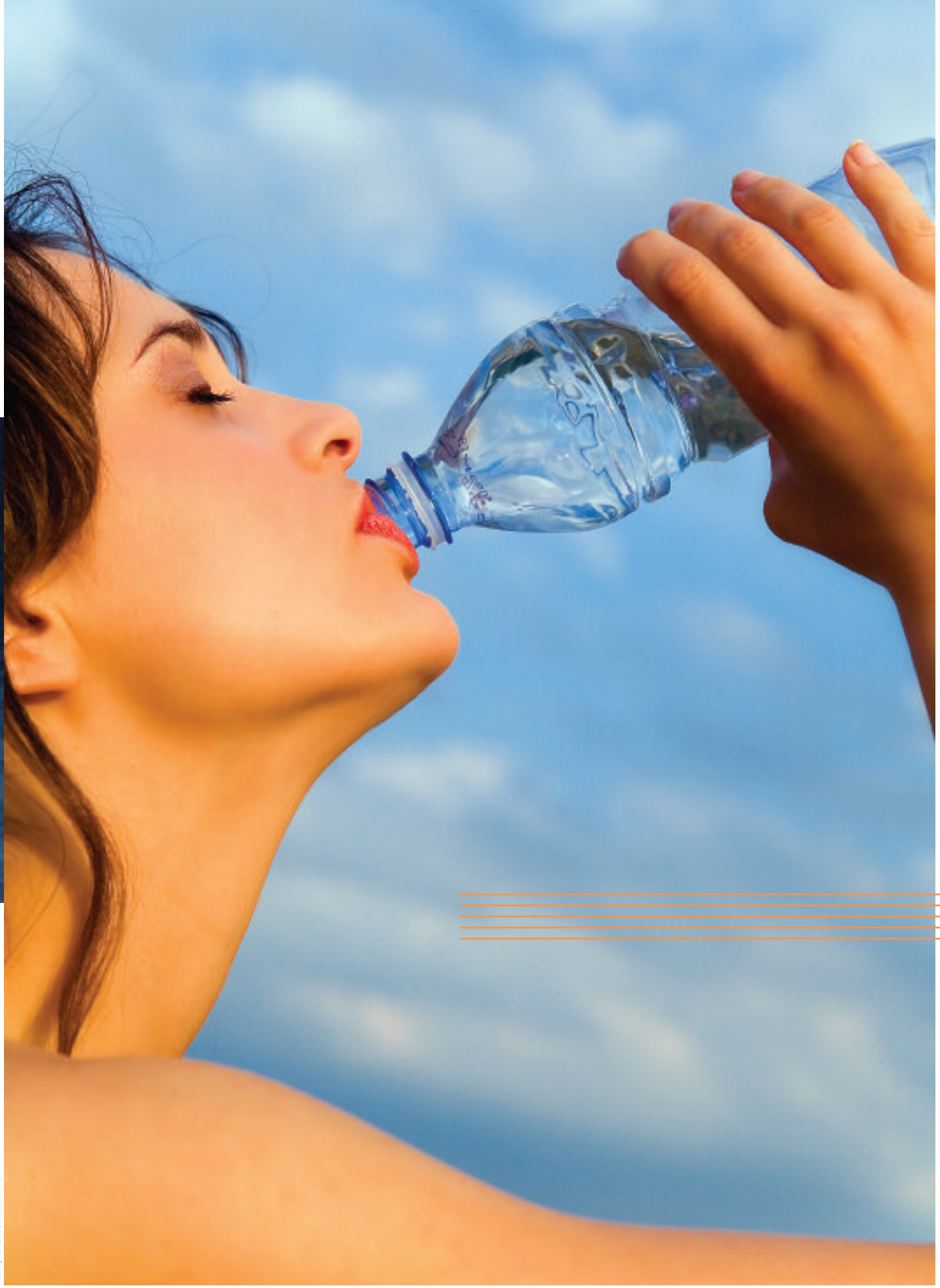
This is woefully short of what everyone has come to believe is optimal—a minimum of eight 8-ounce glasses of unadulterated water per day. So ubiquitous is this prescription, that water's diehard proponents have come up with a shorthand expression for it: 8x8.

Though the origin of 8x8 is impossible to pinpoint, daily fluid intake in American adults has climbed by a third since the late 1970s. In the intervening years, the water bottle has firmly supplanted the disco medallion and the roach clip as the accessory of choice. Not a bad tradeoff, one would think. But is such constant autoirrigation really necessary? Or is it, in fact, more than a coincidence that Evian spelled backward is naive?

Heinz Valtin, M.D., a professor emeritus of physiology at Dartmouth Medical School, is one of the world's preeminent experts on osmoregulation: that is, the body's complex systems for maintaining water balance. In 2002, he published a lengthy review on the subject of 8x8 in the *American Journal of Physiology*. He had spent over a year combing through every published study he could unearth on the



Kateryna Govorushchenko

subject of optimal hydration, and his became the most exhaustive analysis of water-drinking literature ever undertaken. Despite the doggedness of his quest, the scientific evidence Valtin found in support of 8x8 for otherwise healthy adults? Absolutely zilch.

"When my article first came out," Valtin tells me, "I knew I was in the awkward position of trying to prove a negative, so I invited any readers who knew of contrary scientific evidence to bring it to my attention." He's been interviewed on four continents and has received hundreds of letters. "Out of all these responses, not a single paper to the contrary has been pointed out to me," he says. Valtin's not sure how the water myth got so entrenched, but he suspects it probably began with a basic truism—we need water to live. This indisputable fact, in turn, was perverted well beyond its illogical extremes. It's sort of like suggesting that since we need oxygen to survive, ergo we need to spend all our time hanging out in oxygen bars.

Martin Heijkenskjöld

"Our osmoregulatory system for maintaining water balances has evolved over millions of years," says Valtin. "As a scientist, I find it very difficult to imagine that evolution could have left us with a chronic water deficit that needs to be compensated by forcing a high fluid intake."

At the risk of oversimplifying things, here's how the osmoregulatory system snaps into action the moment we begin, ever so slightly, to dry up: Coursing through our circulatory system is a vast Red Sea of salty liquid containing solutes such as sodium, sugars and protein molecules. As we lose fluid through skin evaporation, urination and exhalation of breath, our blood becomes ever so slightly saltier and more concentrated. Incredibly fine-tuned sensors thought to reside in the brain's hypothalamus immediately pick up on the most minute changes here and send signals to the pituitary gland to secrete antidiuretic hormone (ADH).

In the absence of ADH, tiny tubules in the kidneys are impermeable to water, which means any excess fluids are shunted to the bladder and urinated away. In the presence of ADH, on the other hand, these tubules open up and reabsorb fluid, returning it to the bloodstream. The more ADH, the more reabsorption. "ADH takes care of our moment-to-moment regulation of water balance," explains Valtin. This system, he adds, is "wonderfully sensitive, quick and accurate" and it all occurs without us having the slightest conscious awareness.

But ADH can handle things only so far. If you continue to lose more water than you take in, your blood will become increasingly concentrated. At a certain point, a second system kicks in: thirst. Typically, we start feeling thirsty when our blood concentration has risen by less than 2 percent. Most experts agree we don't become clinically dehydrated till it reaches at least 5 percent.

In response to Valtin's article, the International Bottled Water Association, a lobbying group for this lucrative $7.7 billion business, quickly published a position paper calling his work reckless, irresponsible and sensational. Though replete with dogmatic assertions about the necessity to continue guzzling water, the paper failed to provide a single scientific reference to bolster their counterclaims.

To be sure, the author of this particular position paper is not without impressive credentials. Barbara Levine, Ph.D., R.D., is an associate professor of nutrition in medicine at Weill Medical College of Cornell University in New York. When I call Levine to ask her about science in support of 8x8, she admits she doesn't have it handy and rather lamely says, "There probably is a scientific basis in metabolic studies that were done very far back."

Though Levine couldn't recall the source for the 8x8 theory, Valtin's bibliography pointed me in the right direction. In 1945, the Food and Nutrition Board of the National Research Council wrote that, on average, people need about 1 milliliter of fluid for every calorie of food consumed. The 8x8 prescription works out to about 1.9 liters of fluid, and most of us eat somewhere between 1,800 and 2,600 calories a day. What the water boosters appear to have conveniently missed is the very

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next sentence in the Food and Nutrition Board's report: "Most of this quantity [of water] is contained in prepared foods."

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Soup, for example, is 90 percent water; corn, 76 percent; cooked pasta, 66 percent; and ground beef, 53 percent. In fact, the next time you're eating pizza, realize it's arguably just as correct to say you're drinking it, because each slice is exactly half water.

"The 8x8 advice," says Grandjean, "came from this total water recommendation. Somehow it'd been inappropriately translated into glasses of water." Indeed, when you subtract the water content of food, the 8x8 actual drinking prescription becomes less than 4x8.

Another common misperception is that any beverage containing caffeine, from coffee to tea to cola, doesn't count toward the 8x8 formula because of caffeine's presumed diuretic qualities (i.e., it makes you pee). If anything, suggest the evangelists of liquefaction, you need to make up for each mug of coffee with a chaser of water just to break even. Grandjean, who says that unsweetened caffeineated drinks are actually 99 percent water, became interested in this question because of her work with Olympic athletes, who frequently compete in countries where drinking tap water poses a serious risk of traveler's diarrhea. She found herself advising that instead of local water, they drink canned or bottled soft drinks if bottled water wasn't available.

Observing elite competitors in swimming, track, boxing and other sports, Grandjean failed to see any evidence for the much ballyhooed dehydrating effects of caffeine in the Coke and Pepsi drinkers. She decided to put the matter to a scientific test, and in a series of lab experiments with athlete volunteers, she and other researchers have demonstrated that high doses of caffeine (the equivalent of six cups of strong coffee) do have a mild diuretic effect, but only on the so-called "caffeine naïve," people whose systems are not used to it. For the vast majority of people, it takes only one to four days of drinking caffeinated beverages to develop a diuretic tolerance. In other words, if your daily routine involves downing a couple of cups of coffee, this will have virtually the same effect on your hydration status as water.

There's even some evidence that the other grand scourge of water purists—alcohol—may not be such a bugaboo either. Though hard liquor is an undeniable diuretic, a recent Scottish study found that mild alcoholic drinks, such as lite beer, were not appreciably worse than water in rehydrating athletes after exercise.

Two weeks before my most important swim meet of the year, I find I'm sold intellectually but still not emotionally on Valtin's conclusions. So maybe science doesn't back 8x8—yet. Still, so many people (including many of my teammates) swear by water's miracle powers, I feel I owe it to myself to give so-called optimum hydration a shot. Though Valtin declines to sanction my own proposed human trial, after some cajoling he does provide the nuts and bolts of an experiment that he has had his students in renal physiology try out over the years.

His original design is simple enough: Get an empty gallon milk jug and keep track of the liquid that leaves your body via urination. Valtin's students do this for 24 hours and average about one and a half liters of urine each.

I decide to do my own guinea-pigging over three days, during which I will measure not only my output but my input as well, all the while monitoring myself for subjective symptoms. Here, in short form, are the results (for reference, one cup equals 237 milliliters):

••• **Day 1:** My habitual drinking pattern. Intake: 900 milliliters coffee; 75 milliliters milk (with cereal); 800 milliliters orange juice; 800 milliliters ale; 400 milliliters lemonade; for a total of 2.975 liters . Output: 1.7 liters urine. Subjective symptoms: I feel as normal as ever.

••• **Day 2:** Caffeinated and alcoholic beverages only. Intake: 900 milliliters coffee; 400 milliliters Coca-Cola; 800 milliliters ale; 400 more milliliters Coke; for a total of 2.5 liters. Output: 1.25 liters urine. Subjective symptoms: I still feel like my usual self, though the midnight Coke makes me feel like a freshman getting ready for an all-nighter.

••• **Day 3:** 8x8 plus. I save the best for last, figuring if there's any truth to optimal hydration with water, doing this regimen at the end should help maximize my swimming performance at the upcoming meet. According to the IBWA's online "hydration calculator," which factors in exercise, I should drink not 8x8 but nearly 16x8. In addition to this, I decide to balance any caffeinated or alcoholic beverages with an equal dose of spring water. Intake: 400 milliliters orange juice; 150 milliliters milk; 900 milliliters coffee; 1.6 liters spring water; 1 liter ale; 800 additional milliliters spring water; for a total of 4.85 liters. Output: 3.6 liters urine. Subjective symptoms: Misery. Not only do I urinate 23 times that day, but during an easy workout in the pool, my body seizes up with cramps in muscles I didn't know I owned. That night, my bladder is like a malfunctioning alarm clock, waking me every hour for yet another pilgrimage to the bathroom. In the morning, I'm a bleary-eyed wreck.

In reviewing my results, the experts point out an obvious fact: If you subtract the output from the input on each of the three days, the amount my body used remained remarkably consistent—about 1.25 liters. The more total liquid I consumed, regardless of what form this took, the excess simply ended up in the local sewer system.

In terms of the cramps and fatigue I suffered following the "optimal" day, Grandjean suggests that pushing fluids was the likely culprit. "By drinking so much," she says, "you flushed salts and other electrolytes out of your body."

Variously called hyponatremia or water intoxication, in extreme cases it can be fatal—proof once again that too much of a good thing can be one's undoing. So, in the final analysis, what should a healthy adult be drinking? It's not all that complicated, Valtin suggests. First, drink what you do habitually.

Second, drink when you're thirsty. If you're into moderate exercise, adds Grandjean, the best guide is body weight—check yourself on a scale before and after activity. If you lose, say, two pounds during your workout, realize this is virtually all water weight, meaning you'll need to drink two pints of fluid (32 ounces) to bring yourself back to your starting point.

If you do suffer a medical condition like kidney stones, diabetes or heart disease, or if your exercise tends toward the extreme, best talk to your doctor. Otherwise, let nature—not hype—be your guide. "When it comes to things like water balance," concludes Grandjean, "our bodies are smarter than we are." <<<