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Thirsty work

1 Drinking is essential for life, but if you find plain water too boring, there are many alternative drinks that promise optimal hydration or other benefits. How do they measure up, asks David Cox

2 RECENTLY, I have become somewhat obsessed with a new index on my smartwatch that purports to calculate whether I am sufficiently hydrated. The idea is to prompt the wearer to drink enough fluids to avoid dehydration. A watch tracking hydration might sound like a gimmick, but new research suggests there could be lasting health effects to being even mildly dehydrated.

3 One stumbling block I have faced on my hydration mission is that I find plain water, well, plain boring. But these days, there are a myriad other types of fluid available, from sports and energy drinks to coconut water. Then there's my personal favourite: coffee. Aside from taste, are any of these a suitable substitute, in terms of both my health and hydration? Do I even need to think this much about my fluid intake?

4 Our notions about what we ought to be drinking are confounded by half-truths and questionable health claims. So, here is a guide to modern hydration, cutting through the hype to discover the science about what we really should be drinking — and how much.

5 Water is the main constituent of the human body, making up around half of our adult body mass. The body's balance of water intake and output is tightly regulated to keep the concentration of salts and minerals, or electrolytes, in our blood at a precise level. To prevent dehydration, hormonal and neural mechanisms are activated, stimulating thirst to encourage water intake and increased water reabsorption by the kidneys to decrease water output.

6 The question of whether we are drinking enough for optimal health has been a matter of contention for decades. You may have heard that we should drink eight glasses of water per day, but this figure turns out to have no scientific basis.

7 The first scientific recommendation for our water requirements came from a rough calculation added to a set of dietary guidelines from the US National Academy of Sciences in 1945. It was achieved through estimating that the average male diet involved consuming about 2500 kilocalories of food per day and might require 1 millilitre of water per kilocalorie for digestive purposes, equating to a daily water requirement of 2.5 litres. One problem with this figure is that it arguably overestimates how much water we need to drink, as it doesn't take into account the fluid we ingest from our food, which makes up around 20 to 30 per cent of our intake.

8 Nevertheless, these estimates have stuck, helping to fuel a bottled water industry now worth around $240 billion in global sales. "In the US, it got marketed that everybody needed eight glasses of plain water. That made bottled water [sales] soar, even though water is something that you can get out of a tap for free," says Tamara Hew-Butler at Wayne State University in Detroit, Michigan.

9 To fully understand how much water is needed by the body each day, last year an international consortium tracked water input and loss in more than 5500 people by giving them water to drink labelled with an isotope of hydrogen. "We found a typical man in their mid-20s, in the US or Europe, will require around 1.5 to 1.8 litres per day, and a typical woman will require around 1.3 to 1.4 litres," says John Speakman at the University of Aberdeen, UK. "These are just averages, so if you're active and out a lot in hot weather, you will need more than 2 litres."

10 Drinking more water than you need, above thirst, usually isn't a problem, however, as the kidneys quickly adjust to produce more urine. While it is possible to drink such an excess to cause hyponatremia, where the kidneys are unable to cope and the sodium content of the blood becomes dangerously diluted, Speakman says that, in practice, this is rare.

11 Instead, a more pressing problem appears to be the consequences of repeatedly not meeting our daily water needs. The long-term effects of chronic underhydration haven't been well studied, but new data is starting to emerge. For example, a 2019 study in mice by Natalia Dmitrieva at the US National Institutes of Health and her colleagues showed that long-term suboptimal hydration caused inflammation, as well as accelerated age-related degeneration of the heart, kidneys and central nervous system. It also shortened the animals' lives by around six months, equivalent to 15 years in humans.

Hydration risks

(Source: © Dominka Zarzycka/Alamy)

12 The people who are most likely to experience dehydration probably aren't the ones rushing out to buy the latest hydration drink to hit the shelves: older adults. One study from earlier this year showed that a quarter of over 65s have low-intake dehydration due to consuming insufficient fluid each day. This has been linked to a range of common health problems, from impaired cognition to urinary tract infections.

13 One of the reasons why older people are more vulnerable to dehydration is linked to the thirst reflex. it has long been known that the sensation of thirst steadily deteriorates as we age.

14 On top of this, some medications can encourage fluid loss, and many older adults actively choose to drink less due to worries about accessing a toilet or incontinence, says Lee Hooper at the University of East Anglia in the UK.

15 "Older people also have smaller body water reserves, as body water is found in muscle which declines with age," she says. "They also concentrate urine less well, so they lose additional fluid when they go to the toilet, even when they haven't drunk enough."

16 To tackle this, Hooper believes that we need more public health messaging on the importance of staying hydrated with age, as well as better ways of detecting dehydration. One common recommendation has been to check the colour of your urine, as the darker the colour, the more dehydrated you are. However, given our kidneys are less able to concentrate urine as we age, this test may mistakenly suggest that you are adequately hydrated, says Hooper.

17 Now, Dmitrieva and her colleagues have investigated the impacts in humans of long-term mild dehydration, in which the body's water conservation mechanisms are activated to reduce urine output and blood sodium levels are slightly elevated but still within the normal range.

18 Using data gathered from 11,255 adults over a 30-year period, the researchers found that those with slightly elevated sodium levels displayed greater signs of biological ageing based on how well their heart, lungs, kidneys and immune systems were functioning.

19 "Detrimental effects of chronic underhydration on long-term health outcomes is a relatively new concept," says Dmitrieva. "It seems that insufficient hydration could promote accelerated ageing and therefore increase the risk of developing chronic diseases." Other research backs up this view. One 2020 study, for example, found that underhydration in people aged over 50 – as measured by elevated blood sodium levels and/or concentration of salts in urine – is associated with obesity and chronic diseases. However, it is possible that these biomarkers could be influenced by factors such as diet and the ingestion of sugary beverages.

Thirst quencher

20 How do you know if you are getting enough fluids? For most people, the first sign that you need a drink is thirst, although this isn't a fail-safe, as the so-called thirst reflex wanes as we get older (see "Hydration risks"). Other signs include a dry mouth, tiredness, darker-coloured urine and feeling lightheaded.

21 There are two main types of dehydration. One occurs when you lose fluid and electrolytes by sweating, for example during exercise, or by vomiting or experiencing diarrhoea. The other, known as low-intake dehydration, occurs through not drinking enough. "In this case, your electrolyte levels stay the same, but there's less fluid, so the concentration of your electrolytes rises across cells," says Lee Hooper at the University of East Anglia in the UK. "It means that cells shrink a bit and changes the environment inside them."

22 More research is needed before we have a clear view of the link between mild dehydration and our health. "Can drinking more reduce the risk of kidney stones?" asks Hew-Butler. "Another interesting question about hydration for me is the link to cognition. Does drinking make you more alert? These are things we need to understand more about."

23 Throughout most of human history, people would have replenished fluids by drinking plain water, whereas today, an ever increasing array of different options is available. Earlier this year, actor Florence Pugh spoke for many when she claimed that water is "too boring to drink", preferring elderflower pressé, orange juice and tea. Scientists agree that other options are fine. "Our message is that any [non-alcoholic] fluid is good fluid and if you want to drink tea then that's adding fluid into your body," says Jennie Wilson at the University of West London. "The same is the case for coffee. There is scant evidence for it acting as a diuretic and even if it does, that would require consumption of very large amounts."

24 But a visit to the supermarket reveals a vast array of drink options that claim to give you a boost in other ways, not just hydration. Known in the industry as "functional beverages", two main types take up much of the room on store shelves: energy drinks and sports drinks.

25 Sports drinks are formulated to replace fluids and electrolytes, such as sodium, potassium and calcium, in the body during and after exercise. Originally developed for athletes, many are now marketed to the general public, though it is questionable whether these drinks offer any notable benefits over water for the average person.

26 Water is more than sufficient for the casual jogger or someone who goes to the gym a couple of times a week, says David Rowlands at Massey University, New Zealand. "Most of these sports drinks were designed for high performance," he says. "For most people, exercising half an hour to an hour, they might lose 1 litre of fluid at the most, which can easily be replaced with four cups of water over the couple of hours following exercise."

27 Many sports drinks are isotonic, which means they contain similar concentrations of sugars and salts to blood. However, they are still less effective than water at hydrating the body because the sugars they contain tend to be simple sugars like fructose, glucose and sucrose, which are rapidly digested as soon as they hit the small intestine, creating a higher concentration of sugars in the gut, says Rowlands. "The problem is that the gut can only absorb so much sugar at a time," he says. "The maximum rate seems to be around 1 gram per minute. If there's more sugar than that coming in, the body holds water back, which limits the amount of fluid getting into the body."

Good hydrations

28 For serious amateur or professional athletes, hypotonic drinks – which still contain some carbohydrates and salts, but at a lower concentration than in blood – have been shown in some studies to be the best hydration agents. This is because of a phenomenon called solvent drag, where the steady absorption of carbohydrates and electrolytes through the gut helps draw more water into the bloodstream. Rowlands suggests that coconut water could be an alternative as it contains low concentrations of carbohydrates and electrolytes, similar to the formulation of hypotonic sports drinks.

29 Another drink touted for its ability to boost sports performance is beetroot juice, but this isn't to do with hydration. "This is more something that serious athletes take because it has a high nitrate content, which improves blood flow to the muscles," says Rowlands. "There's some suggestion it can improve performance in high level amateurs."

30 While purchasing sports drinks can be expensive, an effective rehydrating drink – providing both the fluid and nutrients that the body needs to recover from exercise – can be obtained very cheaply: cow's milk. "Milk is actually the best recovery drink of all," says Hew-Butler. "Everyone's looking for this elusive beverage that does everything, but if you can tolerate milk, it ticks all the boxes because it has protein and carbohydrates and other nutrients."

31 Milk and chocolate milk contain carbohydrate in the form of lactose, as well as amino acids to aid muscle synthesis, and both have been shown to assist recovery following exercise. Rowlands says that the sheer number of nutrients within milk bind to water and keep sufficient levels of fluid within the body, rather than being urinated out. But don't expect this news to dent the rise of the increasingly popular sports drink sector any time soon.

32 Energy drinks are another fast growing product, worth around $46 billion globally in 2020. Particularly popular among young people, these are formulated to give an instant energy boost through stimulants such as caffeine, guarana and taurine. Many also contain a high dose of sugar. Red Bull, for example, contains 27 grams of sugar per 250 millilitre can, almost the entire 30 milligrams daily recommended maximum sugar intake for adults in the UK, as well as 80 milligrams of caffeine, which is roughly the same as that in a cup of coffee.

33 However, sugar-free varieties are on the rise. One of the latest is the popular drink Prime Energy, founded by social media stars Logan Paul and KS1, which contains 200 mg of caffeine per 355 ml can sold in the US or 140 mg per 330 ml can in the UK.

(Source: © Nurphoto/Getty Images)

So many different drinks are available, but is water better?

34 While energy drinks may keep you alert in the short term, they are associated with poorer sleep quality and can be problematic for anyone with heart conditions, due to the increased risk of palpitations or irregular heart rhythms – which is why these drinks carry warnings for people sensitive to caffeine and some are restricted to those over the age of 18.

35 Evidence also suggests that sugary energy drinks may have a dehydrating effect as they are hypertonic, meaning they contain a higher concentration of salt and sugar than in blood. "Hypertonic drinks actually draw fluid out of the body to aid in digestion," says Rowlands.

36 Another current trend in the beverage industry is the addition of ingredients such as ginseng, green tea, turmeric, vitamins and even protein to drinks. But Hew-Butler is sceptical about the health benefits. "A lot of it is just marketing," she says. "if you're eating a good diet, they're things that you'll be getting from your food anyway."

37 Where does all this leave me in my mission for better hydration? As a coffee lover, I am particularly pleased to know that it contributes to my daily hydration requirements. And while having a watch with an inbuilt monitor may seem a little excessive, it definitely acts as a useful reminder to consume extra fluids, particularly on busy days when it is easy to go many hours without drinking. As to whether it really makes any difference to my long-term health, I will have to wait and see.

David Cox is a freelance writer based in Brighton, UK.

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