Healthy You - Hydration

Your health care professional may have advised you to try to stay well hydrated. It is really important that you try, here's why.

- Water composes 75% of your brain
- It makes up 85% of your blood
- 75% of your muscles
- Dehydration affects your reaction time, memory, concentration, and can increase pain sensitivity and fatigue.

Hydration is vital for the normal function of the cardiovascular, respiratory and reproductive systems, the digestive tract, the kidney, liver and brain, and the peripheral nervous system [1] – basically, everything!

Top Tips

Here are some top tips to staying well hydrated.

- Drink between **400-600ml per hour**, more may not be absorbed and will be lost as waste.
- Drink 30 minutes before you eat if possible. Drinking on an **empty stomach** leads to swifter fluid absorption.
- **Cooler, low sugar drinks**, with a touch of **salt*** result in the maximum hydration in the shortest time.
- A good tip is to drink water about an hour before an **exercise/activity**, then drink water during, and after as well. Here's an example of how it should work:
  - One hour before your exercise/activity, drink 400-600ml
  - During exercise/activity, drink another 200ml every 15 minutes
  - Within an hour of the exercise/activity drink another 400-600ml
- Remember that you will gain some of your fluids through your **foods**. Fruit, vegetables and soups are best, and fibrous foods hold water in the intestines allowing for further absorption.
- To summarise, it is more effective to drink slowly and steadily throughout the day. Carrying a water bottle is a convenient way of doing this.

But why is hydration so important, how does it affect your body and how is it regulated? If you're interested in learning about hydration in more detail, please read on.

***Taking on board more than the recommended daily amounts of water and salt can negatively affect pre-existing heart or kidney conditions and should only occur on the advice of a doctor.**

What happens when you get dehydrated?

When you don't get enough water, there is a slow reduction in the ability of your brain, muscles and other organs to function. If your brain believes that the dehydration is severe, it will react to protect itself by going into standby mode, that is, you will faint.

Physical signs that you are beginning to get dehydrated are:

1. Thirst, dry mouth, dry/cracked lips, general tiredness
2. Overall fatigue, headache, dry skin, urine darkening, cold sweats
3. Dizziness, lightheadedness, no tears when crying
4. Extreme thirst, dark or no urine, severe headache/dizziness, sunken eyes
5. Rapid heartbeat/breathing, low blood pressure, fever, tremors.

It is estimated that blood volume makes up 7% of a person's body weight, so a loss of 1% of your body weight through sweat could have a really big impact on your blood volume. To spell that out, in a 65kg person, that would be just 650g.

Dehydration can affect your ability to be active and exercise well as less water makes your muscles stiffer and you tire more easily meaning an increased risk of injuring yourself.

Non-physical signs of dehydration

- Once you are severely dehydrated (more than 2% of your weight lost to dehydration) your performance in most tasks related to concentration declines [2]. There is evidence that giving people water improves certain tasks like sustained visual attention and short-term memory [3].
- Research has consistently found associations between dehydration and mood with people describing feeling things like 'less alert', 'difficulty in concentrating', 'fatigue' and 'tension'. These changes can be present whether or not cognitive performance changes are there [3].
- There is a link between hydration and the way that you experience pain. Even one day's worth of mild dehydration can result in your sensitivity to pain increasing [4] and this can even be seen in the way you brain's pain centres activate [5].
- Cardiovascular function is compromised under dehydration conditions. Heart rate increases and blood pressure decreases more rapidly when dehydrated [6]. A

person's ability to control their body temperature is also altered when dehydrated [6].

How does dehydration cause all these effects?

There are three proposed ways that dehydration affects us:

1. Psychological (relating to the normal functioning of the brain) – it is proposed that the brain super computer can only manage so many tasks at one time. With something as essential as thirst, a lot of attention is focussed, creating a loss of "processing" power for things like memory. This is known as the Global Workspace Model [7].
2. Physiological 1 (relating to the normal functioning of the body) – actual changes can occur in body tissue with water loss such as the brain shrinkage.
3. Physiological 2 – reactivity of the cardiovascular system. Altered cardiovascular function reduces blood supply to the brain and other structures like muscles, and so less of the substances needed for healthy function such as oxygen and glucose are delivered.

How does the body manage its water?

- Water passes from the stomach into the small intestine where around 80% is absorbed into the blood via the gut wall. This process is absolutely dependent on the presence of other molecules, particularly sodium.
- On average the body can only absorb a maximum of 600ml per hour.
- Water (in the blood) is pumped to the cells that need it where it is absorbed using a mechanism that needs sodium and potassium salts, and molecules like glucose.
- Sodium and potassium are the keys to water absorption speed and effectiveness [8], and so the brain monitors them very closely keeping a fine balance. As long as the levels of sodium and potassium remain as they should, the amount of water inside and outside the cells remains constant and so your whole body is considered well hydrated.
- Minute changes, about 1%, in sodium and potassium levels can provoke the body to take action: too much means we need water and too little means we need to get rid of it. When we need water, the kidneys are told to conserve water and you feel thirsty [6].
- We know that we take water in with drinking and eating. We lose it via the kidneys as urine (controlled), in the faeces, sweating and in our breath. The last

three are un-regulated routes and are known as insensible water loss. Sweat also contains small amounts of salt [8].

- Although these mechanisms for water balance are sensitive, they are not 100% reliable, particularly in vulnerable groups [3]. Thirst is not always an accurate or sufficient indicator of hydration status.

How much should you drink?

There can be no universal water intake recommendation applicable to all individuals as there are many factors that affect a person's need for water, such as environmental conditions, changing physical activity levels, their age, gender and weight [8]. Recommendations vary across governmental agencies too.

The European Food Safety Authority (EFSA) has set recommended guidelines of 2L of fluids for adult women and 2.5L for adult men to be consumed per day [9]. However this is lower than the American and World Health Organisations recommendations of 2.7L for women and 3.7L for men [10]. These values are usually described for sedentary conditions.

- *Sedentary* means a lifestyle that includes only the light physical activity associated with typical day-to-day life.
- *Moderately* active means a lifestyle that includes physical activity equivalent to walking about 1.5 to 3 miles per day at 3 to 4 miles per hour, in addition to the light physical activity associated with typical day-to-day life.
- *Active* means a lifestyle that includes physical activity equivalent to walking more than 3 miles per day at 3 to 4 miles per hour, in addition to the light physical activity associated with typical day-to-day life.
  [11]

Therefore, if you consider yourself more active than sedentary, you need to take in more. Ideally what goes out should be equalled by what goes in so that your body systems never lack hydration. In an 18-25° temperature range, a healthy sedentary individual will lose 1.8 - 3.0 Litres/day through normal mechanisms [6].

Guidelines have been worked out using healthy people with no history of illness. Bear in mind your own level of fitness and effort required to perform daily tasks. Their idea of a sedentary life may be your idea of hard work as your condition means the effort involved in performing the same tasks is much greater. Do you work in an air-conditioned

environment, travel on hot public transport, sleep more than 8 hours daily? All these things will affect your water loss and intake.

If you have been diagnosed with a condition such as postural orthostatic tachycardia syndrome (POTS) where maintaining a better than average volume of fluid in your circulation is recommended, it may be recommended that you drink even more than the standard recommendations [12, 13]. Keep in mind that these amounts include the water that you consume in food and other beverages too, besides water. 80% of intake comes from beverages, while about 20 % comes from food.

How to stay well hydrated

- On average, the body can only absorb 400-600ml per hour, so any more may not be absorbed and will be lost as waste.
- The rate of stomach emptying and small intestinal absorption of fluids affect the speed at which water is assimilated into the body [14].
- Based on the current evidence, water absorption in the gut reaches its peak into the bloodstream between 20 and 60 min after ingestion [3]. However, water can begin reaching the intestines in as little as 5 minutes [15].

To enhance this:

- Take in fluids separately from food, if there is food involved, the fluid will stay with it until the food is in a state to be broken down [14]. Drink 30 minutes before food so as to absorb it and not have it held up by digesting food.
- Cooler, low energy (sugar) content drinks with a little salt improve the rate of stomach emptying and absorption [14-16].
- Drink slowly and steadily throughout the day.

Other tips to maximise hydration:

- If you have lowered the salt intake in your diet to below the recommended daily amount (6g or 1 teaspoon), increase your salt intake – salt helps the body retain water (& other nutrients) in its cells. Not enough salt = body cannot retain water = dehydration.*see below
- Fibrous foods help hold fluid for longer in the intestines keeping it available for absorption. Some good examples of fibrous foods are berries or legumes (chickpeas, beans, lentils etc).

- If you're concerned about sleep disturbance due to increased fluid intake, stop the majority of intake 2 hours before your bedtime to allow for transit and excretion, and then just prior to sleeping, take in 200-300ml of a low sugar electrolyte drink to help see you through the night. Try to have the same amount again as soon as you wake and before you get up, allowing up to 15 minutes for it to reach your intestines for absorption before getting up. Some examples of low sugar electrolyte drinks are given at the end.

What about specific advice for activities like exercise?

- A good tip is to drink water about an hour before an activity, then drink water during, and after as well. Here's a sample of how it should work:
    - One hour before your exercise/activity, drink 400-600ml of water
    - During exercise/activity, drink another 200ml every 15 minutes
    - Within an hour of the exercise/activity drink another 400-600ml
- Some sources advise drinking a sports drink during exercise but sweating leads to greater water losses than salt losses [17], so during exercise, fluid replacement is more important than salt replacement - you don't need to drink a sports drink [1].

Other things to consider:

- Watch your overall weight – lean mass holds more water than fat mass. Moving a body around with a higher than recommended BMI requires more energy. This is delivered to the muscles by blood and so being overweight can provoke symptoms of POTS more easily. The evidence for a low BMI being associated with POTS is not clear [18].
- If you are prone to bouts of diarrhoea as part of your overall presentation, consider using a salt replacement on those days [1].
- Monitor the colour of your urine. Colour charts are available on-line. Light coloured/clear urine means the body is not working to reserve water that is, the cells have all the water they want. Bear in mind that this is not an infallible method. If you are drinking too great a volume in one go, you may be excreting the excess that your body can't handle and so it is not reaching your bloodstream and cells.

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Sources of hydration

Water can be efficiently absorbed from virtually all foods and drinks, although the rate of absorption can increase or decrease to some extent, depending on their composition [8]. Water is absorbed from all the fluids we consume, including milk, juices, fruit drinks, tea and coffee. This includes alcoholic drinks, but their diuretic effects will affect how much of this is retained [8]. There is no need to avoid caffeine unless you drink strong concentrated drinks in excess [19] or you have been recommended to do so by your clinicians.

The evidence suggests that dilute low carbohydrate-electrolyte drinks are better at hydrating effectively than plain water, but that is not to say that water is not effective [20]. Reasonably diluted solutions of electrolytes, sugars, and amino acids maximize transfer of fluid from mouth to blood.

In terms of food, there is around:

- 80% in most soups, fruit and vegetables
- 40% to 70% in hot meals
- less than 40% in cereal products such as bread and biscuits
- less than 10% in savoury snacks and confectionery.

Suggestions of low carbohydrate electrolyte drinks, be sure to check for any caffeine content and please note there are others and these are not recommendations:

- Viridian electrolyte Fix drops. No added sugar or preservatives: https://www.viridian-nutrition.com/Shop/Sports-Electrolyte-Fix-Liquid-P698.aspx

- High 5 Zero electrolyte tablets: http://highfive.co.uk/product/hydrate/zero

- Higher nature sachets, no artificial sweeteners, gluten or dairy: http://www.highernature.co.uk/ShowProductFamily.aspx?ProductFamilyID=775&AgentID=115&gclid=CL_fsdT19r4CFeyWtAodYDIAAQ#.U5r3Y2pwaCg

To sum up

Staying well hydrated is vital for our well-being in so many ways. This information sheet has tried to provide information to help you understand its importance and provide tips to help you stay hydrated well.

We will update this information sheet as new information becomes available.

Author: Dr Ann McCarthy Date: October 2018

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