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Hydration is a term used to describe your body's ability to manage water. This means water management at every level down to the individual cells. Correct hydration is dependent on cellular uptake of water, not simply whole body intake of water. Drinking only water is not sufficient to ensure optimal hydration.

If you are well hydrated your body will take the water you drink (and eat as part of your food) and distribute it correctly to all the cells in your body that need it, taking with the water all the essential nutrients for those cells. The well hydrated body is also able to use this cellular water to wash out waste products and toxins from cells and deliver them to the organs of excretion. In a poorly hydrated body these processes will be sluggish or absent and nutrients will be unavailable to the cells and waste products will build up to toxic levels. Hydration is one of the most fundamental processes in a healthy body, yet it has received very little attention by the biomedical research community and by the population at large.

In this chapter we will tell you about the dynamics of the hydration process, look at its implications in health and disease and show you how to improve your hydration state.

HOW IMPORTANT IS WATER?

Water has several roles in the human body. It gives structure and form to cells and tissues. It provides the medium for movement of heat from the core of the body to the surface. It is the matrix within the body which creates the biochemical reactions that together make up cellular metabolism. Water is the transport mechanism for all internal movements of all nutrients and biomolecules, exchange of nutrients between the environment and cells and clearance of waste products.

Water is the most important nutrient that the body uses. It is correctly thought of as a nutrient as it is a limiting factor in many, if not all, biochemical processes. The correct metabolism of all other nutrients depends on the availability of sufficient water for correct biochemistry to occur. The macronutrients (nutrients required in relatively large amounts on a daily basis) protein, carbohydrate and fat all require water for their correct assimilation and



What is Hydration?



The volume of research into this factor is significant and the general finding is that water that exhibits good "life-force" is more bioavailable and supports the various steps of the hydration cascade better. This kind of water, which finds its origins in naturally occurring water in mountain streams or from underground sources, has recently been mimicked by various techniques and is now available commercially in bottled form and via filter units that can be installed next to your kitchen tap. The evidence that these waters have more to offer than conventional purified water is compelling and well worth investigation.

The range of other drinks that one can choose from is vast and we don't plan to review them all in detail here. The ability of a given drink to improve hydration is dependent very much on the hydration state of the individual concerned. For example the appropriate use of a sports drink by a well hydrated sports person during training or competition will give a very much different result to the use of the same

drink by a dehydrated competitor. As another example the use of a caffeinated beverage (coffee or soft drink) by a dehydrated individual as a 3 o'clock in the afternoon pick-me-up will often result in a greater degree of dehydration (with the attendant tiredness) than if that drink was had with a glass or two of water on a regular basis.

The real problem with selecting what to drink, apart from water, is that it is a chicken-and-the-egg problem with many drinks acting to perpetuate the current dehydrated state of the individual. How then does one break the dehydration cycle? There are two approaches. The first is to use the water co-transporter fructose, with abundant water to reactivate the hydration mechanism. Fortunately fructose is available in abundance in apple and pear juices and when these juices (preferably in organic unfiltered form) are diluted 1:2 or 1:3 with purified water and sipped throughout the day they will switch hydration mechanisms back on to a significant extent. Sucrose also works (as it is broken down to fructose and glucose in the gut) and so a very diluted soft drink can be used if apple or pear juices are not available.

The second approach is to use herbal and homeopathic remedies to reactivate the hydration mechanisms in a more long-term way. These remedies can be simple herbs which have a known hydrating effect or a specialised combination of remedies that have been assembled for this exact purpose. Called the "Aqua Hydration Formulas" these have been developed here in Australia. They are taken morning and night in the apple-juice/water mixture and there are even different formulas for women and men because their hydration mechanisms are subtly different.



As to the question of how much to drink there has been much said about the need to drink X glasses (250ml) of water a day. We have seen articles where that X is 12 and a recent article by a medical professional from the United States who said X is zero as we get all the water we need from the food we eat! The standard is 8 but where this came from is anyone's guess. The facts are that the average (adult but not elderly) 55kg female is composed of about 32kg of water. A component of that water is exchanged each day and if that woman is well but sedentary that component is about 2-to-2.5 litres. That means this

amount of water is excreted each day; 60 per cent in urine, 5 per cent in faeces, 5 per cent in basal sweating and 30 per cent in exhaled air. That water must be replaced and that will come as follows: 10 per cent from the burning of carbohydrate fuel, 30 per cent from ingested food and 60 per cent from ingested fluids. So you can see that the baseline requirement is more like five glasses but this is baseline only. These figures will all vary according to factors including the amount of exercise (exercise increases respiration, metabolism and sweating), the ambient temperature (the hotter it gets the more you sweat), humidity (the more humid it is the less water you expire) and so on. In addition it has been shown in several studies that many factors quickly increase the kidney's requirement for water to facilitate clearance of waste products including use of prescription and recreational drugs (including caffeine), exercise and exposure to environmental toxins. So we quickly get back to the eight glasses a day as a good rule of thumb. What is even better, however, is to let the body itself set the correct intake on a moment-to-moment basis by maintaining an accurate and effective thirst reflex.

WHAT WILL HAPPEN WHEN I BECOME WELL HYDRATED?

The well hydrated individual will not become a super-hero overnight but improvements in digestion, energy levels, sleeping patterns, skin quality, recovery from illness and physical exertion and clarity of thought are often reported. Menstrual and menopausal symptoms often reduce and allergies and sensitivities become less troublesome. Athletic performance is critically dependent on hydration not just because of its role in metabolism but because water is the basis of our temperature control mechanisms.

Because hydration is such a requisite component of cellular metabolism any improvement in someone who is compromised will result in a sequence of changes that will result overall in an improvement in wellness.

A FINAL WORD

Hydration is the most important, yet most commonly overlooked, component of a holistic approach to wellness. Water is at the very basis of the functioning of our cells and our cells make up our tissues and organs. Keeping well hydrated means making sure that water is available in abundance, moving where it needs to move and sustaining the river of life.

utilisation. All micronutrients (nutrients required in smaller amounts or less frequently) including vitamins and minerals require water for correct uptake and distribution.

THE WATER PATHWAY

It may be useful for us to have a look at what happens to water, and other nutrients, as they enter the body. The first process is digestion. The digestive process is not required for plain water, but every other food or drink that is ingested starts the digestive process. This process depends on the secretion of gastric juices in the stomach and other digestive juices in the small intestine. These juices are largely composed of water, so this initial step of digestion actually requires the body to secrete a considerable quantity of water.

In a poorly hydrated individual this may compromise an already stressed system. This is especially important in athletes where this temporary loss of circulating water can be critical. Many individuals who experience digestive difficulties may see rapid improvements following some attention to improved hydration. If sufficient water is available the digestive process continues until the fully digested food finds its way into the part of the small intestine where uptake of nutrients occurs. Here water again plays its part as all nutrients are wrapped in a cocoon of water so they can be transported out of the gastrointestinal tract and into the circulation. In some cases this occurs via diffusion – the dissolved nutrient simply moves through the cells of the gut and into the surrounding small blood vessels. In other cases there are specific pumps that select a particular nutrient and actively moves it to the circulation where it is picked up by transport mechanisms so that it finds its correct destination. These processes all depend on the correct amounts of water being available at all times and will quickly falter in a dehydrated individual.

The second process is distribution via the circulation. At this point the water from the gut, laden with nutrients, becomes circulating water, now a component of the blood's plasma. This circulating water will take the dissolved nutrients and the specific transporters to the right cell for the nutrients to be used to build new cells, repair damaged cells, nourish existing cells and to create energy and cell products like hormones, electrical activity or immune components. The water, having entered the specific cell to carry its cargo then leaves the cells, this time carrying a load of waste products or toxins. This is the third and last part of the process –

excretion. This cargo of waste product is transported to the organs or excretion (kidneys, gut, skin and lungs) where the waste products are packaged and delivered back to the outside world.

In someone whose hydration is compromised these transport processes are limited and the whole system becomes compromised. There are many reasons this transport cascade fails but the most common reason is that the transport medium – water – is not present in sufficient amount. This is the metabolic state usually known as dehydration. In a dehydrated individual any available water follows a much shorter path and does not facilitate the transport of nutrients or clearance of waste products. Long term or chronic dehydration, even to only a small extent, steadily downgrades the nutrient transport system and progressively degrades the body.



HYDRATION AND THIRST

Dehydration also downgrades another system – the thirst reflex. Paradoxically long-term dehydration has the effect of decreasing our sensitivity to the very system that should notify us that all is not right. The reason is that the thirst reflex is a complex behavioural circuit and is actively filtered by our higher brain functions. To understand this consider the situation where you are at a cocktail party. You are standing speaking to someone and you are able to concentrate on what they are saying without any difficulty because you are able to filter out all of the background noise. Now a few metres away someone says your name and even though you have no idea what else they are saying you hear your name loud and clear above the noise. This is the filter at work. Normally the background noise is filtered out, but when it contains an important piece of information, in this example your name, the filter lets that information through.

It turns out that the thirst reflex is also filtered. When all is well, like when we are young and well hydrated, the message gets through the filter every time because the filter knows the message to drink is an important one.

As we grow older (and these days this can begin at a young age) we start to respond to the message to drink with actions that don't actually do much to hydrate the system. Often we drink soft drinks or milk. Later in life it's caffeinated soft drinks, tea, coffee, and alcoholic beverages. These drinks don't do much for our immediate hydration state because, unlike water, they need to be digested or they act as diuretics and actually dehydrate us. The consequence of this is that the message to drink begins to be filtered because, like the boy who cried wolf, our thirst reflex is not being heard. Ultimately the message can be lost altogether and often the most profoundly dehydrated individuals will report that they are never thirsty. (This isn't always the case as some dehydrated people speak of the unquenchable thirst – the flip side of the same coin). One added consequence of the lost thirst reflex is that many people begin to confuse the thirst message with the hunger message. What is really a message to drink finds an answer in eating food. We conjecture that at least with some people their tendency to overeat is a consequence of a damaged thirst reflex.

Resetting the reflex is not an easy process and requires attention to drinking water whenever the vaguest thirst is perceived as this will serve to strengthen the reflex. There are specific remedies designed to reset the reflex that can help with this also.

WHAT SHOULD I DRINK AND HOW MUCH?

As you can see from what we have discussed about hydration, water has a special place in the list of what we should drink. Because it needs no processing to be taken up water is unique and in most cases results in the most rapid improvements in hydration. There are however many other beverages to choose from and all have their place.

The choice of what kind of water to drink is quite large. There is good scientific evidence to support the choice of the purest water that is available. This may be bottled, filtered from a pristine local source or even, depending on where you live, out of the tap. The danger represented by the many potential contaminants of water will not be reviewed in detail here but we do know that many of the common contaminants in tap waters and water from unprotected sources pose health risks and have a direct effect on the hydration process. Another factor, though not so well defined in strict scientific terms, is that of "life-force".