

DEBUNKING THE BENEFITS OF ALKALINE WATER

Contrary to the belief that alkaline water can cure a host of illnesses, the evidence from chemistry and physiology suggests that it can cause health problems resulting from stomach acid production going into overdrive.

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Can alkaline water help fight disease, combat acidity, enhance longevity and even cure cancer? Do the health claims being made for this new "wonder water" stand up to scientific scrutiny? More importantly, is there any evidence that some forms of "alkaline water" may even be harmful?

Many claims have been made about the health benefits of drinking alkaline water. Whether from techno-wizards from Korea or China pushing "water ionisers", manufacturers touting the benefits of plastic-packaged water or perhaps one of the many self-published "health experts", these claims all promote the idea that "alkaline water" is not only vital for good health but is an essential weapon in the fight against all manner of disease and chronic health conditions.

In this article, we take a closer look at the types of water being promoted and the claims for and against alkaline water, leaving you better informed and able to determine whether or not "alkaline water" is essential to good health or whether the claims are merely pseudo-scientific. First, we need to look more closely at pH and alkalinity.

Definition of alkalinity

The term "alkaline", which is so commonly used to describe a particular type of water, is neither technically accurate nor scientifically correct. Here's why.

Chemists express acidity or alkalinity on the pH scale, which is considered to run from zero to 14.0 (although extremely acidic or extremely basic solutions have values outside this range). Acidic solutions are considered to have pH values of less than 7.0 and alkaline solutions greater than 7.0. The definition of alkalinity or acidity is the measure of a solution's ability to *resist changes in pH*.

An alkaline solution, such as household bleach (NaOCl, sodium hypochlorite), has a pH value around 11.0. With a maximum value on the pH scale of 14, bleach is highly alkaline. If we were to mix sodium hypochlorite with a highly acidic solution like hydrochloric acid (HCl), which has a pH value around 2.0, then a roughly equal measure of one solution is required to cancel the other out. In other words, it requires around one litre of hydrochloric acid at pH 2.0 to neutralise one litre of household bleach at pH 11.0, creating a new solution with a reading of around pH 7.0 (neutral). The dilution required is equal because each solution has highly alkaline or highly acidic properties. In other words, the solutions strongly resist changes in pH. These solutions are *strongly buffered*.

However, if we took one litre of hydrochloric acid at pH 2.0 and added one litre of water at pH 9.0 (which is very high for water), then the pH of the mixed solution would only be raised to around pH 3.0 or 4.0. This is because water is neither strongly alkaline nor strongly acidic. In chemistry, water is considered to be *weakly buffered*: it cannot resist changes to its pH, nor can it change the pH of a *strongly buffered* solution to any great degree. Water cannot effectively change the pH of hydrochloric acid or of an alkali like bleach unless dilution by a very significant factor occurs.

Why call water alkaline?

Alkalinity or, more accurately, the pH reading of water is determined solely by the following three factors:

Temperature: The temperature at which a sample of water is tested, which is always stated on laboratory reports, will affect the pH reading; for example, at 50°C the pH of water is 6.55.

Dissolved gases: Gases such as hydrogen, produced by the electrolysis process of water ionisers, will raise pH, while carbon dioxide, usually found dissolved in rain water, will lower pH by 1.0 or 2.0 pH units. In a laboratory setting, water is usually degassed before pH is measured.

Mineral content: By far the most important determining factor in water pH is the mineral content. Usually the more minerals present in water, the higher the pH reading. However, this is not a hard-and-fast rule; it depends on the types of minerals and gases present. A chemist will always measure pH with reference to "alkalinity as CaCO₃" (the chemical name for calcium carbonate or limestone). This measure is the correct way to determine pH because it takes into account the most important factor of all: the presence of minerals in water.

Trying to measure water alkalinity without factoring in temperature, dissolved gases and total mineral content is like reading the headline of a newspaper without reading the text. The result is often misleading.

Before we move on to the role of minerals in water, I want to take a quick look at low-pH water.

Low-pH water

Apart from in volcanic sulphur springs, it is only possible for water to have a naturally low pH if it is devoid of minerals.

Rain water has no minerals. In nature, rain falls to the ground, collecting minerals on its journey down through the earth to the water table. When water is ready, it bubbles up through natural fissures in the earth, collecting more minerals on its way, and reappears on the surface as spring water. Capturing rain water interrupts the natural hydrological cycle.



"It's our latest. Waterised water: pure-grade water specially concentrated with an injection of extra water."

There was a time when many leading health experts recommended absolutely pure water as the healthiest water. However, opinions change with the times and with new knowledge.

When water falls from the sky in what is essentially a distillation process, it often tests as acidic with a pH reading below 7.0. Why? Water needs minerals to maintain balance, and if it has none it then takes carbon dioxide (CO₂) from the air. Why? The CO₂ then reacts to form carbonic acid (H₂CO₃). This is a totally harmless, weakly buffered acid but it is the reason why rain water reads pH 5.5 or 6.0.

Again, the water is not really acidic in the true sense of the word. The pH meter is simply reading carbonic acid and these pH readings can be easily moved towards neutral by bubbling oxygen through the water for a few minutes. Because water is weakly buffered, a low pH reading does not mean that the water is actually acidic or harmful to health, just the same as a high pH reading does not mean that water can alkalise the body.

Another way to remove minerals and produce low pH readings is to use distillation or reverse-osmosis systems. The important fact to note is that, apart from rain water, demineralised water is not found in nature.

Aside from some environmental impurities, *the low pH of rain water is not harmful and it does not affect body pH in any way.* However, we do

need to take a closer look at the health effects of water that contains *no* minerals.

No minerals = dead water?

There was a time when many leading health experts recommended absolutely pure water as the healthiest water. However, opinions change with the times and with new knowledge. As one doctor puts it:

"One of (by far) the most brilliant men of the recent era, Dr Hans Nieper (MD and PhD) was *against the long-term ingestion of distilled water due to the fact that there were no minerals on board to give it a 'charge' as opposed to being pure H₂O (which doesn't occur in nature).*

"There does exist research (from more than one source) suggesting that even the intake of minerals from food doesn't make up for high-volume intake of totally mineral-free water..."

(Source: Dr Allan Spreen, MD, Health Sciences Institute, USA. <http://www.hsialert.com>; see <http://tinyurl.com/6ozfpg>)

Recently, the World Health Organization (WHO) formed an investigative committee to look at the need for calcium and magnesium to be present in drinking water. Here is an abridged quotation:

"The World Health Organization has formed the International Symposium on Health Aspects of Calcium and Magnesium in Drinking Water. The symposium of about 200 medical researchers [is] evaluating studies suggesting possible links between insufficient magnesium consumption and a greater human susceptibility to heart attack, hypertension and even type 2 diabetes since many people in regions with mineral-rich or hard drinking water seem to have a lower incidence of heart attack or high blood pressure..."

(Source: *Water Technology News*, April 2006)

Alkaline water claims

A search of the Internet under the term "alkaline water health benefits" brings up over 650 references. A great majority of these have been put up by the vendors of "alkaline water ionizers [*sic*]". Amongst the websites you will find claims such as drinking alkaline water helps prevent, reverse or cure the following conditions:

- High blood pressure
- Diabetes
- Poor blood circulation
- Constipation
- Common colds
- Muscle aches
- Urea stones
- Slow wound-healing
- Chronic fatigue
- Gout and arthritis
- Morning sickness
- Osteoporosis
- Hyperacidity
- Diarrhoea
- Water retention
- Hangovers
- Body odour
- Obesity
- Migraine
- Gastric problems.

We are told that these and other health conditions too numerous to mention, including cancer, can be cured with alkaline water. Does this sound too good to be true? Well, it is! To discover the truth, let's first take a look at electrical water ionisers.

Alkaline water ionisers

Water ionisers use a relatively simple process known as electrolysis, discovered in 1832, to produce a chemically altered solution. Electrolysis uses a pair of oppositely charged platinum electrodes. As water is passed over the electrodes, a direct electrical current reacts with the dissolved minerals to create a chemically altered synthetic solution.

Positive ions naturally present in the water are attracted by the electrical current at the negative electrode, which is a heavy metal plate. Here they acquire negatively charged electrons (hydroxyl ions). The process also releases hydrogen gas. The negative ions are attracted to the positive electrode and give up electrons, with the effect of lowering the pH level. The so-called "acid water" comprises almost 50 per cent of the solution and is usually discarded down the drain as waste water.

Is there scientific evidence?

Are there any medical data to support the bold health claims made for alkaline ionised water? In the early 1950s, Japanese researchers believed that alkaline water with a pH greater than 9.0 could offer relief to sufferers of gastric hyperacidity. However, as we shall see, this belief was later proved to be misplaced.

Here is what the Health Services Department at the University of Columbia, USA, has to say:

"A normal pH, the measure of acidity vs. alkalinity, is carefully monitored by various body systems to stay between 7.35 and 7.45. This is slightly on the alkaline side of neutral (7 on a scale of 1–14). Activities like changing your respiration rate or eating different foods impact the pH slightly, but the

Minerals and alkalising

Spring water with dissolved minerals typically gives pH readings above 7.0. This "alkaline" pH reading is due entirely to the presence of dissolved minerals such as calcium and magnesium. In the body, minerals act as natural acid buffers and help to neutralise acidic wastes. So, would it be fair to assume that mineralised water can alkalise the body?

Not exactly... The mineral content of municipal water is negligible. The alkalising effect would be too small to be measured.

Even spring water with a higher mineral content than town water has insufficient mineral content to affect the body's natural acid-forming waste processes in any significant way.

However, you can alkalise your body by eating lots of fruits and raw vegetables. These contain many important acid-buffering minerals, and a high water content which helps to flush acidic wastes from the body.

Another option is to add "colloidal" and "ionic" mineral supplements to your diet. Again, the minerals act as a natural acid buffer and they can also help supplement foods that have been depleted of minerals due to modern farming practices.

So what makes the body acidic?

Acid bodies

There is valid research showing that the consumption of too many processed foods, sugars and starches increases the body's toxic load and leads to a generally acidic condition. It is a fact that certain diseases seem to thrive in a body overloaded with accumulated toxins, which are merely the natural metabolic by-products of living and breathing.

So if we don't eat enough cleansing, alkaline foods such as fresh fruits, vegetables and legumes and if we don't drink sufficient water to flush out toxins, we can create an overly acidic cellular environment. Ultimately, overacidity is the result of years of poor nutrition and dehydration.

Now, here is the trap... If water helps flush toxins and prevents acidic waste build-up, then surely drinking "alkaline" water will help neutralise acids far better? Alkaline neutralises acidic. This seems like good advice. It sounds like common sense, doesn't it?

As logical as it may seem, the notion that you can alkalise your body with alkaline water is just plain wrong. But it is human nature to think that more is better, and of course a quick fix is always very appealing. What better way to correct years of poor diet, lack of exercise and chronic dehydration than by simply drinking "alkalising" water? Easy! Sadly, *this claim just doesn't hold water*. Why?

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body quickly compensates, mainly by releasing neutralizing agents into the bloodstream or changing the acidity level of your urine. If your blood starts to become too acidic, the kidneys will quickly compensate by releasing more acid into the urine. Similarly, if the alkaline level rises above normal, your kidneys will release more basic solution into the urine. Because urine is held apart from the rest of the body fluids and soon excreted, the body can maintain a stable pH by adjusting the pH of the urine, then getting rid of it.

"Although claims have been made that a diet high in alkaline food or water will slow down the aging process or inhibit the growth of cancer cells, there is no human research to support this. Cancer cells may die in a test tube environment more alkaline than the normal body, but healthy cells cannot survive in that kind of environment either. So reducing acid levels in the body might kill cancer cells, but it would probably kill the rest of your cells too. In addition, important chemical reactions such as those involved in digestion can only take place within the normal 7.35–7.45 range. That is why the body so carefully moderates its own acid/alkaline balance."

(Source: <http://tinyurl.com/6x82j5>)

No matter how it is produced, water is weakly buffered and will always be neutralised by a true acid or alkali. For example, our stomach contains hydrochloric acid with a pH of around 3.0 to 4.0. If we drink water with a pH 8.5 or 9.0, it is immediately neutralised by our gastric acids and loses its ability to alkalis our body as soon as it enters the highly acidic stomach environment.

Health professionals speak out

The renowned complementary health specialist and author Andrew Weil, MD, is one of the most respected health specialists in the USA. He is the founder of the Integrative Medicine Program at the University of Arizona and is a best-selling author. Dr Weil's books include *Spontaneous Healing*, *8 Weeks to Optimum Health*, *Eating Well for Optimum Health* and *The Healthy Kitchen*. He commented in 2002:

"Home water ionizers, which I've seen offered for sale on the internet, are just the latest twist in the ongoing effort to promote the notion that alkaline water is somehow protective of your health. The underlying idea is that you can prevent disease by balancing your body's pH..."

"None of these claims are [sic] true."

(Source: Dr Andrew Weil, 4 September 2002, <http://tinyurl.com/2fplhn>)

Dr Weil also stated back in 1999:

"Rumours are circulating on the Internet and elsewhere that drinking alkaline water is beneficial to health and can miraculously cure everything from obesity and high blood pressure to breast cancer. Alkaline water purportedly 'neutralizes' the 'acidic wastes' in the body. These 'wastes' are

said to include malignant cells and acid 'accumulations'.

"This theory seems very well developed and may sound plausible to some, but it is absolutely untrue. I get a lot of questions about alkalinity and acidity and whether eating alkaline foods (or acidic ones) influence the body's pH in a healthful direction. There is no scientific research supporting this line of thinking..."

(Source: Dr Andrew Weil, 29 July 1999, <http://tinyurl.com/4ajmb6>)

However, this is not the first time that the health claims for alkaline water have been found wanting.

Alkaline water warning?

We all know that the dangers of living under electrical power lines include higher incidence of leukaemia and other forms of rare cancers. And let's not forget the dangers posed by mobile phones and transmission towers. The point is that *many of these technologies were once considered safe or posed what the experts call "minimal risk"*.

The same principle applies to electrical water ionisers.

Clinical evidence recently uncovered by researchers on the US National Institutes of Health's medical research database (<http://www.pubmed.com>) has found strong evidence that alkaline water can increase the risk of heart attack:

• "Influence of alkaline ionized water on rat erythrocyte hexokinase activity and myocardium" (Watanabe T. et al., *J Toxicol Sci* 1997 May; 22[2]:141-52):

"Alkaline ionized water (AKW) produced by the electrolysis of tap water (TPW) was given to pregnant rats throughout gestation... Hyperkalemia was observed in males and females given AKW at 15 weeks old. Especially in males, pathological changes of necrosis in myocardiac muscle were observed." (Emphasis

added.)

Hyperkalaemia is a life-threatening condition that can lead to sudden death from heart attack!

• "Degradation of myocardiac myosin and creatine kinase in rats given alkaline ionized water" (Watanabe, T., Kishikawa, Y., *J Vet Med Sci* 1998 Feb; 60[2]:245-50):

"Recently, the authors have shown that marked necrosis and fibrosis of myocardium were observed in rats given alkaline ionized water (AKW)... The activities of myosin ATPase and actomyosin ATPase in the AKW group were higher than those in the TPW group, and these elevated activities were caused by the degradation of myosin in the AKW group... It is concluded that *this disorder of coupled reaction may cause marked myocardiac necrosis and fibrosis in rats given AKW.*" (Emphasis added.)

While this sounds all scientific, the bottom line is that *"alkaline water" is causing "pathological changes" in heart muscle cells.*

Every time you drink artificially high pH (alkaline) "ionised" water, your stomach produces more acid to compensate for the dilution of acid in the stomach.

• "Histopathological influence of alkaline ionized water on myocardial muscle of mother rats" (Watanabe, T. et al., *J Toxicol Sci* 1998 Dec; 23[5]:411-17):

"The myocardial lesion in the mother rats given AKW showed cell infiltration, vacuolation and fibrosis in the papillary muscle of the left ventricle, as were observed in male rats of 15 weeks old. Myocardial degeneration may cause a leakage of potassium into the blood that results in a higher concentration of potassium in the blood in the test group than in that of the control group given tap water." (Emphasis added.)

Laboratory rats given "alkaline water" saw myocardial (heart muscle) lesions, cell infiltration, fibrosis and potassium leakage into the blood. These results were recorded after only 15 weeks. Can you imagine how serious these problems could get after six months or six years?

Clearly, this evidence goes well beyond questioning whether "alkaline water" lives up to its health claims. It raises serious doubts about its health and safety.

Digestion interrupted?

If the fact that "alkaline water" does not alkalise your body and could actually increase the risk of your having a heart attack is not enough to make you question the marketing hype, then let's consider the effect it can have on your digestive system.

In order to digest food, our stomach acids are strongly buffered and highly acidic at pH 2.0–5.0.

We noted before that weakly buffered "alkaline water" (even at pH 11.00) is immediately neutralised by the stomach acids. However, it does have an effect on the digestive system. Every time you drink artificially high pH "ionised" water, your stomach produces more acid to compensate for the dilution of acid in the stomach.

Remember, "alkaline water ionisers" were originally approved to treat abnormal gastric conditions. What happens when this water is introduced into a normal gut environment on a daily basis?

"As far as the health benefits claimed for alkaline ionised water are concerned, these seem to be based on some serious misunderstandings of chemistry and physiology."

(Source: Dr David A. Bender, Department of Biochemistry and Molecular Biology, University College London, in *HealthWatch* Newsletter no. 57, April 2005, <http://www.healthwatch-uk.org/newsletterarchive/nlett57.htm#water>)

Theoretically, the constant ingestion of "alkaline water" creates a localised gastric event where the stomach goes into acid production overdrive. This constant alkaline assault on the system can create an abnormal digestive condition in a previously healthy gut.

As we age, the production of gastric acids slows down. It is estimated that after age 40, there is an approximate decrease in the body's ability to produce enzymes by 20–30 per cent. If, as suspected, "alkaline water" disrupts enzyme production, then *drinking it once you are past 40 is one of the worst things you can do. Is it a risk worth taking?*

pH value	Example
pH = 0	Battery Acid
pH = 1	Sulfuric Acid
pH = 2	Lemon Juice
pH = 3	Orange Juice
pH = 4	Tomato Juice Acid Lake
pH = 5	Clean Rain Soft Drink
pH = 6	Healthy Lake Milk
pH = 7	Pure Water
pH = 8	Sea Water
pH = 9	Baking Soda
pH = 10	Magnesia Milk
pH = 11	Ammonia
pH = 12	Soapy Water
pH = 13	Bleach
pH = 14	Drain Cleaner

In summary

The marketing of alkaline water as a panacea for a range of health conditions is pervasive. Based, however, on flawed science, it may actually lead to deterioration in your health. Realistically, there are no short-cuts to maintaining your body's pH at the optimal level for all metabolic and detoxification processes to proceed appropriately.

To sum up, keeping your body operating at the desired, slightly alkaline pH requires a diet of fresh, whole, unrefined foods, and reduced intake of tea, coffee and alcohol, replaced with an abundance of purified water, regular exercise and stress-reduction measures. And Wellness Water should be your purified water of choice!

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About the Author:

Jan Roberts, BPharm (Hons), has spent almost 40 years in the health care industry, 25 of those working in the area of women's reproductive health. She is a pharmacist with a postgraduate diploma in clinical nutrition and is the Australian representative for Foresight, the British Association famous for its work in promoting preconception health care.

As co-author (with Francesca Naish) of the international best-selling series *The Natural Way to Better Babies* (reviewed in NEXUS 3/06), ...*A Better Pregnancy*, ...*Better Birth and Bonding* and ...*Better Breastfeeding*, Jan Roberts is passionate about the need for and promotion of toxicity-free products and environments. For more information, visit the website <http://betterbabies.well4life.com.au> and the blogsite betterbabies.blogspot.com.

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