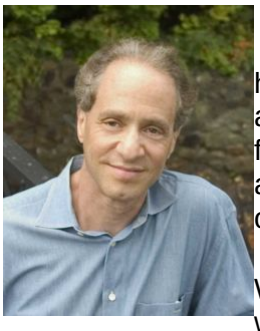
Scientist Ray Kurzweil Talks About Alkaline / Ionized Water

Ray Kurzweil was inducted in 2002 into the National Inventors Hall of Fame, established by the U.S. Patent Office. He received the 1999 National Medal of Technology, the nation's highest honor in technology, from President Clinton in a White House ceremony.

He has also received twelve honorary Doctorates and honors from three U.S. presidents.

Question: I have read on the Internet that it is not possible to create alkaline or acid water from pure water and that water that is pure enough to drink can't be split into alkaline and acid components. Is this true?



Answer: As responsible scientists, we had the same skepticism when we first heard about alkaline water. Therefore, the first thing we did was to purchase a water alkalinizer as well as an accurate electronic pH meter. We ran tap water with pH 7.1 from our home faucet into the device and found that the water coming out of the alkaline outlet had a pH of 9.5 (indicating very alkaline), while the water from the acid outlet measured pH 4.5 (indicating very acidic).

We repeated this experiment with a variety of tap waters obtaining alkaline outputs with a pH ranging from 9.5 to 9.9. It is true that "pure" or distilled water can not be ionized. If you were to try to "split" distilled water, it would not work. Tap or spring water, however, has dissolved minerals in it. It's the minerals in the water; primarily calcium, potassium and magnesium that allow water to be "split" by an electric current into alkaline, "electron-rich" (i.e. containing negatively charged ions that can engage in chemical reactions to provide electrons to positively charged free radicals) and acid, "electron-deficient" components. Individuals who say it is not possible to split tap or spring water are misinformed.

One site on the Internet states "Ionized water is nothing more than sales fiction; the term is meaningless to chemists. Most water that is fit for drinking is too unconductive to undergo significant electrolysis."

The above statement is easily shown to be incorrect with a simple pH meter and an electrolysis machine. Most tap waters run through the machine produce highly alkaline water as measured by a pH meter.

Question: Since you advocate drinking alkaline water, why not simply mix something like sodium bicarbonate (baking soda) with water and drink that? There are, in fact, alkaline waters sold that are made by mixing water with bicarbonate. Wouldn't that work as well and be much less expensive than a water alkalinizer?

Answer: There are more benefits to "alkaline water" than simply the alkalinity or pH. The most important feature of alkaline water produced by a water alkalinizer is its oxidation reduction potential (ORP). Water with a high negative ORP is of particular value in its ability to neutralize oxygen free radicals.

ORP can also be directly tested using an ORP sensor and meter. We have conducted these experiments as well. We found that water coming directly from the tap had an ORP of +290mV, while the water coming out of the water alkalinizer had a negative ORP. The more negative the ORP of a substance (that is, the higher its negative ORP), the more likely it is to engage in chemical reactions that donate electrons. These electrons are immediately available to engage in reactions that neutralize positively charged free radicals.

This is the key benefit of water produced by a water alkalinizer that is not available by simply drinking water than has had some bicarb or other compounds dissolved in it to make it alkaline.

Although water mixed with bicarbonate is indeed alkaline, it does not have a negative ORP; rather it has a positive ORP, meaning that it is unable to neutralize oxygen free radicals. Alkaline water produced by running tap water through an electrolysis machine does have a high negative ORP, meaning that it does have the ability to neutralize oxygen free radicals. We have confirmed these ORP measurements through our direct tests.

Question: Why is it important to drink alkaline water with a high negative ORP?

Answer: All chemical reactions occur with the transfer of electrons. Negatively charged entities are said to be reducing agents, meaning they are relatively electron rich and are able to donate electrons, reducing the charge of the entity with which they react. Relatively electron-poor entities are referred to as oxidizing agents, meaning they tend to pull electrons away. Thus, each substance in our body may act as either an oxidizing or reducing agent.

However, not just any negatively charged ion will be able to engage in the specific chemical reactions needed to neutralize oxygen free radicals. The HCO3- (bicarbonate) ions in alkaline bicarb water do not have this potential, whereas the OH- and mineral-rich water coming from an electrolysis machine (from tap water) does have this potential. That is implied in the negative value of the "oxidation reduction potential."

Free radicals are among the most damaging molecules in the body and are highly unstable molecules that are oxidizing agents and are electron deficient. They are a principal cause of damage and disease in the body. Oxygen free radicals contribute significantly to a broad variety of harmful conditions in the body ranging from life-threatening conditions such as heart disease, stroke and cancer, to less severe conditions such as sunburns, arthritis, cataracts, and many others. Free radicals MUST get electrons from somewhere and will steal them from whatever molecules are around, including normal, healthy tissues.

Damage to tissues results when free radicals strip these electrons from healthy cells. If the damage goes on unchecked, this will lead to disease. For example, the oxidation of LDL cholesterol particles in arterial walls by free radicals triggers an immune system response that results in atherosclerosis, the principal cause of heart disease. The negative ions in alkaline water from an electrolysis machine are a rich source of electrons that can be donated to these free radicals in the body, neutralizing them and stopping them from damaging healthy tissues. Specifically, these ions have the potential to engage in the chemical reactions necessary to neutralize oxygen free radicals.

Vitamin C and E, grape seed extract and alpha lipoic acid, for example, are all powerful electron donors. The vegetable-rich diet we recommend is alkaline and helps donate electrons to the body. Alkaline, electron-rich water falls in the same category. It can help with your body's need for electrons to counteract free radicals.

Another benefit of drinking alkaline water is that it assists in the absorption of minerals. We know that if the body is not absorbing enough minerals, it will rob minerals from the body's mineral reserves, chiefly calcium from the bones.

It is well known that many chronic diseases result in excess acidity of the body (metabolic acidosis). We also know that the body tends to become more acidic due to modern dietary habits and lifestyles and the aging process itself. By drinking high negative ORP alkaline water, you combat metabolic acidosis and improve absorption of nutrients.

The blood is carefully buffered to keep it in a narrow range between pH 7.35 to 7.45. The body keeps blood pH stable by utilizing alkaline buffers, chiefly bicarbonate, to neutralize acidic liquids (such as colas, which have a pH as low as 2.5) and other acidic products and byproducts. But as the blood stream receives these acidic substances, the alkaline buffers get used up.

Drinking alkaline water helps reduce the burden on the limited alkaline buffers which are needed for the body's natural detoxification processes.

Question: Is there research that actually shows the benefits of drinking alkaline water?

Answer: A number of studies are summarized below. One study described below suggests that alkaline water encourages "friendly" anaerobic microflora in the human intestinal tract, and discourages "unfriendly" aerobic organisms. The researcher (see Vorobjeva NV below) writes: "Many diseases of the intestine are due to a disturbance in the balance of the microorganisms inhabiting the gut. The treatment of such diseases involves the restoration of the quantity and/or balance of residential microflora in the intestinal tract. It is known that aerobes and anaerobes grow at different oxidation-reduction potentials (ORP). The former require positive E(h) values up to +400 mV. Anaerobes do not grow unless the E(h) value is negative between -300 and -400 mV. In this work, it is suggested that prerequisite for the recovery and maintenance of obligatory anaerobic microflora in the intestinal tract is a negative ORP value of the intestinal milieu. Electrolyzed reducing water with E(h) values between 0 and -300 mV produced in electrolysis devices possesses this property. Drinking such water favours the growth of residential microflora in the gut. A sufficient array of data confirms this idea."

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A sample of studies on the health benefits of alkaline electron-rich water.

Huang KC, Yang CC, Lee KT, Chien CT. Reduced hemodialysis-induced oxidative stress in end-stage renal disease patients by electrolyzed reduced water. Kidney Int. 2003 Aug;64(2):704-14.

BACKGROUND : Increased oxidative stress in end-stage renal disease (ESRD) patients may oxidize macromolecules and consequently lead to cardiovascular events during chronic hemodialysis. Electrolyzed reduced water (ERW) with reactive oxygen species (ROS) scavenging ability may have a potential effect on reduction of hemodialysis-induced oxidative stress in ESRD patients. METHODS: We developed a chemiluminescence emission spectrum and high-performance liquid chromatography analysis to assess the effect of ERW replacement on plasma ROS (H2O2 and HOCl) scavenging activity and oxidized lipid or protein production in ESRD patients undergoing hemodialysis. Oxidized markers, dityrosine, methylguanidine, and phosphatidylcholine hydroperoxide, and inflammatory markers, interleukin 6 (IL-6), and C-reactive protein (CRP) were determined. RESULTS: Although hemodialysis efficiently removes dityrosine and creatinine, hemodialysis increased oxidative stress, including phosphatidylcholine hydroperoxide, and methylguanidine. Hemodialysis reduced the plasma ROS scavenging activity, as shown by the augmented reference H2O2 and HOCl counts (Rh2o2 and Rhocl, respectively) and decreased antioxidative activity (expressed as total antioxidant status in this study). ERW administration diminished hemodialysis-enhanced Rh2o2 and Rhocl, minimized oxidized and inflammatory markers (CRP and IL-6), and partly restored total antioxidant status during 1-month treatment. CONCLUSION: This study demonstrates that hemodialysis with

ERW administration may efficiently increase the H2O2- and HOCl-dependent antioxidant defense and reduce H2O2- and HOCl-induced oxidative stress.

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Shirahata S, Kabayama S, Nakano M, Miura T, Kusumoto K, Gotoh M, Hayashi H, Otsubo K, Morisawa S, Katakura Y. Electrolyzed-reduced water scavenges active oxygen species and protects DNA from oxidative damage. Biochem Biophys Res Commun. 1997 May 8;234(1):269-74.

Active oxygen species or free radicals are considered to cause extensive oxidative damage to biological macromolecules, which brings about a variety of diseases as well as aging. The ideal scavenger for active oxygen should be 'active hydrogen'. 'Active hydrogen' can be produced in reduced water near the cathode during electrolysis of water. Reduced water exhibits high pH, low dissolved oxygen (DO), extremely high dissolved molecular hydrogen (DH), and extremely negative redox potential (RP) values. Strongly electrolyzed-reduced water, as well as ascorbic acid, (+)-catechin and tannic acid, completely scavenged O.-2 produced by the hypoxanthine-xanthine oxidase (HX-XOD) system in sodium phosphate buffer (pH 7.0). The superoxide dismutase (SOD)-like activity of reduced water is stable at 4 degrees C for over a month and was not lost even after neutralization, repeated freezing and melting, deflation with sonication, vigorous mixing, boiling, repeated filtration, or closed autoclaving, but was lost by opened autoclaving or by closed autoclaving in the presence of tungsten trioxide which efficiently adsorbs active atomic hydrogen. Water bubbled with hydrogen gas exhibited low DO, extremely high DH and extremely low RP values, as does reduced water, but it has no SOD-like activity. These results suggest that the SOD-like activity of reduced water is not due to the dissolved molecular hydrogen but due to the dissolved atomic hydrogen (active hydrogen). Although SOD accumulated H2O2 when added to the HX-XOD system, reduced water decreased the amount of H2O2 produced by XOD. Reduced water, as well as catalase and ascorbic acid, could directly scavenge H2O2. Reduced water suppresses single-strand breakage of DNA b active oxygen species produced by the Cu(II)-catalyzed oxidation of ascorbic acid in a dose-dependent manner, suggesting that reduced water can scavenge not only O2.- and H2O2, but also 1O2 and .OH.

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Vorobjeva NV. Selective stimulation of the growth of anaerobic microflora in the human intestinal tract by electrolyzed reducing water. Med Hypotheses. 2005;64(3):543-6.

96-99% of the "friendly" or residential microflora of intestinal tract of humans consists of strict anaerobes and only 1-4% of aerobes. Many diseases of the intestine are due to a disturbance in the balance of the microorganisms inhabiting the gut. The treatment of such diseases involves the restoration of the quantity and/or balance of residential microflora in the intestinal tract. It is known that aerobes and anaerobes grow at different oxidation-reduction potentials (ORP). The former require positive E(h) values up to +400 mV. Anaerobes do not grow unless the E(h) value is negative between -300 and -400 mV. In this work, it is suggested that prerequisite for the recovery and maintenance of obligatory anaerobic microflora in the intestinal tract is a negative ORP value of the intestinal milieu. Electrolyzed reducing water with E(h) values between 0 and -300 mV produced in electrolysis devices possesses this property. Drinking such water favours the growth of residential microflora in the gut. A sufficient array of data confirms this idea. However, most researchers explain the mechanism of its action by an antioxidant properties destined to detox the oxidants in the gut and other host tissues. Evidence is presented in favour of the hypothesis that the primary target for electrolyzed reducing water is the residential microflora in the gut.

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Chen H, Kimura M, Zhu Z, Itokawa Y, Evaluation on ionized calcium as a nutrient. The 11th symposium on Trace Nutrients Research, Japan Trace Nutrients Research Society, p131-138, 1994.

Summary: To clarify effect of ionized calcium water for drinking water in rats, 36 Male Wister rats weighing about 50g were randomly divided into 6 groups, and given following diet and drinking water : (1) Ca-sufficient diet, tap-water; (2) Ca-sufficient diet, tap-water;(3) Ca-sufficient diet, calcium lactate added-ionized calcium-water : (4) Ca-deficient diet, calcium lactate added-water ; (5) Ca deficient diet, calcium lactate added-water :(6) Ca-deficient diet, calcium lactate added ionized calcium-water. The diets were given by paired-feeding method 4 weeks and drinking water was ad libitum. The significant change of calcium concentration in the rats were was follows; Ca concentration of plasma, spleen, of plasma, spleen, kidney, testis and tibia in Ca deficient groups (4), (5), (6) were significantly low compared with these in Ca sufficient groups (1),(2),(3) Ca concentration in brain of groups (4),(5),(6) was low compared to these in groups (2), Ca concentration in heart and muscle of group (4) was low compared to Ca deficient groups (1),(2),(3), but these in group (5) drank Ca added-water was recovered and these in group (6) drank ionized-Ca-water was higher than these in any other groups. Ca concentration of liver in groups (4) were significantly lower than that in group (1),(3) and Ca concentration of liver in Ca deficient rats (groups (5),(6)) drank Ca-added-water were high compared to these in group (4). In 24 hours urine discharge of group (2) was high compared with groups (4), (5), (6). These results suggest that ionized Ca in drinking water may be active for intestinal absorption.

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Vormann J, Worlitschek M, Goedecke T, Silver B, Supplementation with alkaline minerals reduces symptoms of patients with chronic low back pain, J Trace Elem. Med. Biol. Vol. 15, pp. 179-183, 2001

Abstract: The cause of low back pain is heterogeneous, it has been hypothesized that a latent chronic acidosis might contribute to these symptoms. It was tested whether a supplementation with alkaline minerals would influence symptoms in patients with low back pain symptoms. In an open prospective study 82 patients with chronic low back pain received daily 30 g of a lactose based alkaline multimineral supplement (Basica) over a period of 4 weeks in addition to their usual medication. Pain symptoms were quantified with the "Arhus low back pain rating scale" (ARS). Mean ARS dropped highly significant by 49% from 41 to 21 points after 4 weeks supplementation. In 76 out of 82 patients a reduction in ARS was achieved by the supplementation. Total blood buffering capacity was significantly increased from 77.69 ± 6.79 to 80.16 ± 5.24 mmol/L (mean ± SEM, n=82, $p < 0.001$) and also blood pH rose from 7.456 ± 0.007 to 7.470 ± 0.007 (mean ± SEM, n=75, $p < 0.05$). Only intracellular magnesium increased by 11% while other intracellular minerals were not significantly changed in sublingual tissue as measured with the EXA-test. Plasma concentrations of potassium, calcium, iron, copper, and zinc were within the normal range and not significantly influenced by the supplementation. Plasma magnesium was slightly reduced after the supplementation (-3%, $p < 0.05$). The results show that a disturbed acid-base balance may contribute to the symptoms of low back pain. The simple and safe addition of an alkaline multimineral preparate was able to reduce the pain symptoms in these patients with chronic low back pain.