ELECTROLYSED WATER

A Treatise in Education

Environmental Chemistry

In 1962 Rachael Carson published "Silent Spring". Her book addressed issues of long-term environmental degradation of the planet by thoughtless use of chemistry to exact direct results without considering the future consequences to living species including the human race. It sparked the birth of responsible chemistry and is the foundation of the relatively new concept called "Green" chemistry.

Green Chemistry

The responsible attempt to exact an intended result with chemistry to cause the least amount of harm to a biological community and its physical environment.

Super Electrolyzed Water is "Green" Chemistry

What is "Super Electrolyzed Water"?

The ingredients include a large volume of water with a small addition of a salt to increase water's conductivity. A direct current is applied to the ingredients resulting in the decomposition of water and salt into many variations and forms of the constituent parts of water and salt. The process yields two distinct concentrations of super acid (human friendly) and super alkaline water with amazing antiseptic, cleansing, and disinfecting qualities. The "Green" attribute comes from two natural substances electrically rearranged to target bacteria, spores, mold, fungus, virus, and other microorganisms and then reverting (efficacy one week with accelerated degradation thereafter) to their original forms – neutral water and salt.

How is it made?

In 1800, water was decomposed into its constituent parts (hydrogen and oxygen) using electrolysis. Soon thereafter, elements of potassium, sodium, calcium and others were discovered using electrolysis. Aluminum and sodium hydroxide (bleach) among other useful products were manufactured using electrolysis prior to 1900. The process and practical use has been around for more than two centuries.

Electrolysis is simply the passage of direct current through a solution with an electrolyte (a soluble ionic substance like salt) causing a chemical reaction at two electrodes resulting in separation and energizing of the constituent molecular parts. It is a Frankenstein approach to creating something powerful and useful. Is it useful? Batteries are simply reverse electrolysis (this is why battery electrodes are reverse of electrolysis electrodes) and new fuel cells and hydrogen fuel are available due to electrolysis.

The Sauveur CL unit uses two electrodes (titanium rods coated with inert platinum) as a power source supplied by a transformer that converts household power to a direct current charge (much like a source of power from your car battery). The electrodes are separated by a ceramic uniflow (one-way) diaphragm and are placed in the middle of a unit much like a coffee maker. Two compartments are created by placement of the electrodes and diaphragm. An electrolytic solution (water and salt) is made by adding 3.6 grams of salt to a gallon of distilled, tap or bottled water - salt will go into solution with a little shaking. A half gallon goes to each side of the compartments. It is interesting to note the solution does not flow to the other compartment – the diaphragm's job. The diaphragm is critical because as electrolysis begins; there is a great tendency for molecular change to neutralize itself – the "green" effect. The diaphragm keeps this reversal from happening and assures the dichotomy of the two distinctly different results.

Press the start button and in five minutes the result will be two half gallons of very powerful energized water having many combinations of extremely active and reactive elements and molecules - the result when kicking a chemical hornet's nest.

What is in the two half gallons?

The electrolyte solution before electrolysis had 3.6 grams of salt added to a gallon of water. Water weighs in at 1 gram per milliliter. One gallon is 4,000 milliliters; therefore, the active ingredient of salt by total volume is .09%. Hydrogen peroxide is 3% and bleach is generally 6%. The .09 is not a mistake. This is a very dilute solution and has hardly any perceptible taste – dilution factor is certainly a "green" attribute.

Assuming salt is medical grade and water is almost pure, the chemical composition of the solution is simply H2O (water) and free-floating chlorine ions (- charge) and sodium ions (+ charge). Electric current will flow through the solution by way of the free-floating ions. At the electrodes a variety of chemical actions take place including but not limited to: hydrogen, oxygen and chlorine gas release; concentration of hydrogen, hydroxyl and hydroxyl ions; production of ozone, hydrogen peroxide, hydrochloric acid, sodium hydroxide (lye or caustic soda); radicals (molecules with unpaired electrons) to mention the most effective for purposes of combating troublesome microorganisms.

The most distinguishing characteristic of the resulting solutions is "pH". PH (potential hydrogen) is measurement of the hydrogen ion in negative logarithms from 0 to 14. A pH of 7 is neutral and any change by 1 is a multiplier of 10 as a logarithm. So a change having a pH of 2 is a 100,000 count increase in the hydrogen ion making it proton-rich acidic water. The other direction to a pH of 12 reduces the pH hydrogen ion count from a neutral 7 pH by 100,000 hydrogen ions making this electron-rich alkaline water. The difference between pH2 and pH12 is a 10 billion-count reduction in the hydrogen ion.

Well, a lot happens in chemistry between pH2 and pH12. First, pH7 is neutral and when electrons are stripped with electrical current the water becomes proton rich on

the acid side and electron rich on the alkaline side. This removal of electrons on the acid side is called oxidation. The addition of the electrons on the alkaline side is called reduction. The alkaline solution has many electrons to give up which results in solubles coming out of solution (hard water with scaling, calcium deposits, etc.) and on the acid side hydrogen ions are hunting for an electron. Another measurement comes into play here and it is called ORP (oxidation-reduction potential). The ORP is a quantifying measurement in millivolts of electron activity. The higher the millivolt measurement, the more potential the solution has for pulling electrons away from cell membranes causing destabilization and leakage. A measurement above 1,000 mv will kill most microorganisms in short order. The Sauveur CL unit has an ORP on the acid side of 1,100mv to 1,200mv and can maintain above 1,000 for a week. This measurement is the quantifying limit for effective microorganism destruction and is not be confused with pH.

It is important to talk about acid water and acid in general. PH certainly measures the hydrogen ion concentration in solution but acid itself seems to be a scary word with danger close effects. Not so, unless you are willing to give up apple juice (pH3), lemon juice (pH2.3), margaritas (lime juice about pH2), carbonated beverages (pH 2-3)and vinegar (pH2.8) to name a few. Why then do acids like sulfuric and hydrochloric cause blistering and stinging respectively? It all has to do with a "counter ion" that bonds with the hydrogen ion. The bond will determine the acid strength depending on whether that acid is willing to give up the hydrogen ion easily or not. The easier the bond is broken, depending on the additive solution, the more strength the acid has. In regards to skin, damage will take place with sulfuric acid, as it is rapidly oxidizing and causing dehydration. In contrast, concentrated nitric acid gives no sensation when in contact with skin; but, it will leave a yellow/brown stain. It is not so willing to give up its hydrogen ion but is causing another subtle reaction with discoloration. So, enjoy that acid margarita and a few more as we chemically enlighten you. This stuff can be confusing.

Alkaline water – the other extreme – is rich in electrons and home to hydroxy ions with some used in sodium hydroxide (lye). It is a good cleaning solution but only for water-soluble particles and oils. Of course, the concentration is more complex than stated; but a troubling concern is some purveyors insist this water is healthy for the human body by negating the increased consumption of acid drinks and food. It is true that humans can drink this water without short-term problems but there is no empirical evidence that the long-term effect is good. In fact, two controlled tests (*Journal of Toxicological Science;* May 1997, 22:2, 141-52 and Dec 1998, 23:5, 411-17) show that drinking alkaline water may in fact be dangerous at least in animals. Think about it! Although the reduction capability may act as an antioxidant there are extreme radicals floating in this solution looking for something to attack. A human cell may be the target and the reduction effect will cause solubles including metal to precipitate in body solutions. Amino **acids,** for example, are necessary for digestion. Drinking additional alkaline water may compromise this reaction. The benefits if any can be argued both ways; but there is not enough good evidence to support the extra consumption. If a pro alkaline drinker can accurately predict six Powerball® numbers; then, this position will be retracted. Six numbers with one repeat number is nothing compared to the chemical processes in a human body. In this case, the Divine chemical process should be reserved

for decisions by your doctor who is the most informed person on your chemical condition. If you wish to add alkalinity to your system, drink lots of regular water and eat more vegetables. Where have we heard this before?

How does it work?

Keep in mind these two solutions have some very active radicals, molecules, elements among other hunters. Also, remember the dilution is .09%. The alkaline side is very good at removing or softening biofilm and other protective coatings around bacteria and virus clusters. The acid side is very good at killing these microorganisms once the protective layers have been penetrated. In most cases, an application of the alkaline water first with acid after drying is the most effective antiseptic application far greater than current alcohol use. Within ten seconds, most viral and bacteria clusters will be compromised. Alcohol will take up to a minute for the same effect and not cover even closely the spectrum of germicidal destruction bestowed by electrolyzed water.

Human and plant cell destruction seems to be negated by organic neutralization on contact and the fact that the dilution is so small. Only microorganisms are affected which include the good with the bad. It seems bad bacteria is dominant in survival and indeed is important upon death as the undertaker and scavenger of life's end product. Life, however, provides checks and balances to maintain equilibrium and when a bad microorganism gets the upper hand and starts to colonize, an application of electrolyzed water will reset the balance. It is important with increased human population to maintain a high level of protection against endemic problems to keep from going pandemic. Asia is certainly aware of this and has been preparing for decades to combat this possibility. As a side note, if the US was terrorized with biological or chemical attack and death was abundant with bad microorganisms in play, what could you use to keep the good and bad microorganisms in balance? Look around your house. Vinegar would help and diluting your bleach would as well. After that, you should have a source of electrolyzed water if in fact you wish to survive. Every household needs this protection if only to maintain a "greener" and healthier home.

So prove it works!

There is theory and then empirical evidence. The theory on electrolyzed water is compelling. It is also supported by research and actual use – empirical evidence. If "electrolyzed water" is searched on the internet, more than 70,000 references are addressed which does not include all research and dissertations regarding the subject. A nice use of the internet is the empirical evidence to support theory. It would be impossible to address all studies that support the use of electrolyzed water but research is there for those with target questions. Be careful about buying into the drinking of alkaline water - it is still a theory lacking proper research and testing.

Another interesting application used with electrolyzed water is the neutralization of the pH and relying on the underlying molecular hornets nest to do the job. Empirical evidence has proven even this is effective in lots of germicidal applications. However, it

is a compromise to extend the shelf life of the water. By compromise, it means the destructive effect of a radical change in pH (particular to the cell membrane) is not being applied – a critical component to the overall effectiveness of the water. In researching these neutral pH extended shelf-life water units, please note the expensive research by mostly pharmaceutical companies whereby they sell the water as a solution and not the equipment for self-production. Nevertheless, the water has proven a degree of effectiveness in many cases against microorganisms and other undesirables.

Lastly, on proof please refer to the Sauveur CL self-production unit. Make a solution of 3.6 grams of salt (table salt if you wish) and mix in one gallon distilled, bottled, or tap water. The taste test should reveal no distinguishable salt due to the .09% dilution. Process in the unit for five minutes and then drain in the catch containers. There should be no smell with the alkaline water and a definite smell of chlorine in the acid water. Dip your hands in the alkaline water and notice a softer feel than usual – the water cluster bonds have been reduced making for better hydration. After drying, your hands should feel softer. Now dip your hands in the acid water. The effect is not much different and on drying within ten seconds your hands will be cleaner than any application of alcohol germicide. Next spray some alkaline water in your mouth. There is a different taste but not unpleasant. The alkaline water should weaken the biofilm coating the plaque on your teeth and gums. After some seconds, repeat the spray with acid water. A distinct swimming pool taste will be apparent and plaque should be killed thus providing for healthier gums. Because the acid water is very active, it would be a good idea to spray with alkaline water after about 10 seconds to equalize the acid to common water and thus protect the enamel on the teeth. Lastly, take a pH meter if available and check the pH in the acid container. It should read 2.5 with a deviation of .5 and the alkaline side should read 11.5 with a deviation of .5. Make sure your pH meter is calibrated and take into account pH differences in the beginning water solution.

If these tests prove to be as stated above, the electrolyzed water is as represented and will be good with a shelf life of no more than one week.

Why has it taken so long for America to accept this water?

In reviewing the massive test results in all aspects of germicidal control including the control of some very nasty organisms, it is amazing this water is not readily acceptable as an antiseptic and disinfectant with little if any human cellular damage. The cost of production after purchasing the personal unit is only pennies on the gallon with no effect on environmental chemistry. It was used extensively in Japan and other foreign countries for decades and is only now taking some US headlines with cautious curiosity thinking about benefits.

One problem was the alkaline drinking water promotions. This clouded the real benefit of the germicidal control aspect not to mention the drinking water units were sold in a multilevel marketing environment without much knowledge behind each subsequent sale. The entire worthwhile benefit as and antiseptic and disinfectant was overlooked.

Yet even with all considered a recent story about American bureaucracy and the proclivity to act might put this in perspective. For example, diabetes is a terrible problem for many Americans and for years, Medicare insisted upon amputating troubled diabetic toes, feet, and other parts. The Podiatric medical community pushed for a diabetic shoe that would solve most of these problems and proved it with more than twenty years of exhaustive research. It took twenty years for Medicare to approve a diabetic shoe that could have saved thousands of amputees the problems they now are enduring.

Another story involves the acceptance of medical marijuana. How much time did it take to get general acceptance for the obvious medical benefits and use of marijuana for that purpose? Elvis has left the building. Have you finished that acid Margarita? Is it 4:20 yet?