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What's the difference between Bleach (sodium hypochlorite) and Activated environmental Solutions (AES) Anolyte?

It is already a known fact that hypochlorous acid (HOCl) is a strong oxidizer, disinfectant, antimicrobial, etc. This technology was originally discovered by Michael Farraday when he developed his Laws of Electrolysis in 1834. Conducting electrical current across two electrodes in a salt brine solution may produce chlorine gas, sodium hypochlorite (bleach or NaOCl), hypochlorous acid, sodium hydroxide, hydrogen gas, ozone, and traces of other nascent oxidants. Although they are similar, hypochlorous acid and hypochlorite are still very different. It would be like comparing grape juice to wine.

Water chemistry dictates the chlorine species present in aqueous solutions. At a pH of between 5-6, the chlorine species is nearly 100% hypochlorous acid (HOCl). As the pH drops below 5, it starts to convert to Cl2 (chlorine gas). Above a pH of 6, it starts to convert to the hypochlorite ion (OCl-). A tremendous amount of published data exists to show that hypochlorous acid, not the hypochlorite (bleach) ion, is the efficacious species of chlorine. Note Section 2.7, specifically the subsections on Chlorine Chemistry and Pathogen Inactivation and Disinfection Efficacy which is in the EPA Alternative Disinfectants and Oxidants Guidance Manual at http://water.epa.gov/lawsregs/rulesregs/sdwa/mdbp/upload/2001_07_13_mdbp_alternative_disinfectants_guidance.pdf. Quoting the EPA manual:

"Hypochlorous acid is a weak acid (pKa of about 7.5), meaning it dissociates slightly into hydrogen and hypochlorite ions as noted in Equation 2: HOCl <=> H+ + OCl- Equation 2; between a pH of 6.5 and 8.5 this dissociation is incomplete and both HOCl and OCl- species are present to some extent (White, 1992). Below a pH of 6.5, no dissociation of HOCl occurs, while above a pH of 8.5, complete dissociation to OCl- occurs. As the germicidal effects of HOCl is much higher than that of OCl-, chlorination at a lower pH is preferred."

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"pH. The germicidal efficiency of hypochlorous acid (HOCl) is much higher than that of the hypochlorite ion (OCl-). The distribution of chlorine species between HOCl and OCl- is determined by pH, as discussed above. Because HOCl dominates at low pH, chlorination provides more effective disinfection at low pH. At high pH, OCl- dominates, which causes a decrease in disinfection efficiency."

"Bacteria Inactivation. Chlorine is an extremely effective disinfectant for inactivating bacteria. A study conducted during the 1940s investigated the inactivation levels as a function of time for E. coli, Pseudomonas aeruginosa, Salmonella typhi, and Shigella dysenteriae (Butterfield et al., 1943). Study results indicated that HOCl is more effective than OCl- for inactivation of these bacteria. These results have been confirmed by several researchers that concluded that **HOCl is 70 to 80 times more effective than OCl- for inactivating bacteria**. (Culp/Wesner/Culp, 1986)."

In addition to the data in the EPA Manual, protolysis curves showing the chlorine species at various pH values can be found in any water chemistry book as well as in published journal articles and on many websites.

This biggest problem since Farraday's discoveries has been the challenge to create hypochlorous acid at a near neutral pH instead of creating chlorine gas or hypochlorite, and to do so consistent and repeatable manner. Hypochlorous acid is a meta-stable molecule. It wants to revert back to salt water or convert to hypochlorite. The Soviet Union has been working on the process since the early 1970's. Small-scale laboratory models have been available for many years. The lab models could be adjusted to create a few gallons of the desired solutions before the solution parameters and pH drifted. However, they were reliable enough to create enough solution to conduct research. There have been hundreds of peer-reviewed research journal articles written about electrolyzed water (check Google Scholar). **AES has developed equipment which is able to create the hypochlorous acid solutions (AES Anolyte) in volumes required by commercial and industrial applications at consistent solution properties and at concentrations no one else has been able to achieve.**

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