Electrochemical activation (ECA) Technology as Disinfectant against SARS-CoV-2

INTRODUCTION

Electrochemical activation (ECA) technology is a technology to produce meta-stable substances by passing water or dilute saline solution through an electric field in an electrolytic cell, which generates two solutions of opposite charge. Depending on the applied voltage, resolved substances within the water and the water itself can be oxidized at the positive charged electrode (anolyte) or reduced at the negative charged electrode (catholyte) side. This was produced in a special electro-chemical activation device in which a container anode and cathode chambers is divided by a semi permeable membrane[1,2].

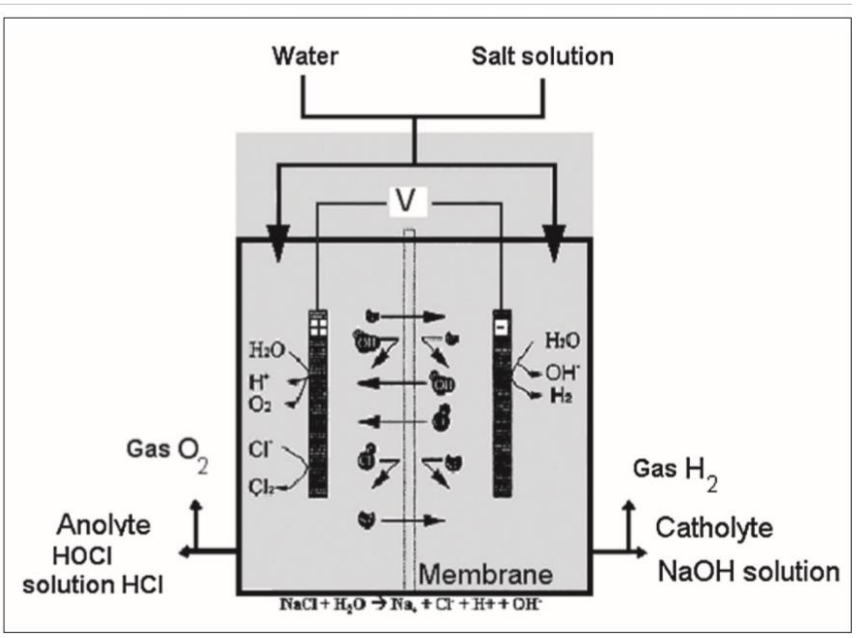

Figure 1: Device for electro-chemical activation of water[2]

The result of membrane electrolysis are two solutions, hypochlorous Acid (HOCL) and sodium hydroxide (NAOH). Hypochlorous acid solution has been listed by the United States Environmental Protection Agency (EPA) as a disinfectant against SARS-CoV-2 whereas NAOH is a highly corrosive substance used mainly in manufacturing of variety of everyday product such as surfactant or detergent.

This rapid literature review was conducted to determine the efficacy of electrochemical activation water as disinfectant for SARS-CoV-2 infection on clothing, humans, and the surface of healthcare facilities.

EVIDENCE ON EFFECTIVENESS AND SAFETY

Based on the systematic search conducted from scientific databases such as Medline via OVID, PubMed and also general search engine, there were no published articles retrieved on the effectiveness of ECA as a disinfectant of SARS-CoV-2.

ECA has a unique mechanism of biocidal action which is distinct from chemicals. There is evidence of efficacy of anolyte water produced by ECA technology in the field of aquaculture, poultry farming and the food industry[7]. Besides that, microbial contamination of multiple hospital washbasin U-bends and drain outlets can be consistently minimised by automated ECA treatment[2].

A study done by Moorman et al to assess the efficacy of neutral electrolysed water for inactivation of human norovirus showed neutral electrolysed water at 250 ppm free available chlorine produced a 4.8 and 0.4-$\log_{10}$ reduction in norovirus genome copy number after 1 min in suspension and on stainless steel, respectively. Increasing the contact time on surfaces to 5, 10, 15, and 30 min reduced human norovirus genomic copies by 0.5, 1.6, 2.4, and 5.0 $\log_{10}$ and Tulane virus infectious titers by 2.4, 3.0, 3.8, and 4.1 $\log_{10}$ PFU, respectively[5].

The antimicrobial efficacy of ECA water is attributed to pH, chlorine content (balance of chlorine gas), hypochlorous acid, and hypochlorite ion, and oxidation-reduction potential. Hypochlorous acid is a more effective biocide relative to its dissociated form, which is the active ingredient of bleach. Manipulating the pH-dependent aqueous chemistry of ECA water to a near neutral pH ensures that the hypochlorous acid molecule predominates. In line with the Ministry of Health Guidelines on COVID-19 Management No.5/2020 update on 24 March 2020, hypochlorous-based disinfectant such as sodium hypochlorite 1000 ppm is used for cleaning and disinfecting the surface of facilities and equipment.

CONCLUSION

There was no retrievable evidence on the use of ECA technology-based disinfectant on clothing, PPE or humans.
There was no retrievable evidence on the efficacy, safety and cost-effectiveness of ECA to prevent SARS-CoV-2 transmission. However, hypochlorous acid produced by this process has been listed as a disinfectant against SARS-CoV-2 by US EPA based on its efficacy against norovirus.

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Based on available evidence up to 15 May 2020

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Disclaimer: This rapid assessment was prepared to provide urgent evidence-based input during COVID-19 pandemic. The report is prepared based on information available at the time of research and a limited literature. It is not a definitive statement on the safety, effectiveness or cost effectiveness of the health technology covered. Additionally, other relevant scientific findings may have been reported since completion of this report.

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