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Research article

Antimicrobial activity and safety applications of electrolyzed water as a microbial disinfectant

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ABSTRACT

One of the promising new disinfectant agents that has recently been suggested as a replacement for traditional decontamination techniques like heat and chemical sanitizers is electrolyzed water. The purpose of this study was to investigate different characteristics of electrolyzed water in order to provide safety and to develop proper sanitation practical guidelines. The tests are carried out by evaluating the chemical, microbiological, and cytotoxicity properties of electrolyzed water. Furthermore, the potency of these disinfectants' sterilization techniques (soaking and spraying) was compared. The findings demonstrate that the electrolyte water has alkaline properties and a shelf life of 7 days. After 1-3 minutes of contact, electrolyzed water has the ability to kill all types of microbes, including bacteria and fungi. The electrolyte water toxicity test and phenol coefficient revealed that it has a low toxicity level and a phenol coefficient of 1-4 to indicator bacteria. Furthermore, immersion techniques up to 3-5 minutes were found to be more effective than spray techniques for surface and/or object disinfection. In conclusion, electrolyte water is impactful at disinfecting surfaces of objects and fabrics while also being safe for cleaning surfaces, clothing, and other equipment. This experiment leads to enhanced safety confidence and serves as a guideline for future better and more appropriate hygiene.

Keywords: Disinfectant, Electrolyzed Water, Anti-Microbial, Cytotoxicity, Chemical Physical Property

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INTRODUCTION

Infectious diseases caused by pathogenic microorganisms kill more people than any other single cause globally. Infections caused by pathogenic microorganisms are a major cause of concern in a variety of fields. There is currently a viral and bacterial disease outbreak. Many recommended procedures were invented in assessing the potential for reducing infectious disease transmission through hygiene practice, such as hand hygiene, contact surfaces should be barrier protected or cleaned and disinfected. Standard chemical solutions, such as sodium hypochlorite, chlorine dioxide, hydrogen peroxide, and organic acids, on the other hand, were irritating to the skin and dangerous to use. As a consequence, discovering alternative disinfectants to replace the old ones is essential.

Electrolyzed water is a clean technology that has recently gained popularity. The technology is based on the electrolysis of sodium chloride-containing water in an electrolysis chamber with anode and cathode electrodes separated by an ion permeable diaphragm. Its principle base on production of hypochlorous substances that are more effective than hypochlorite ions (OCl^-) obtained by dissociation from sodium hypochlorite and calcium hypochlorite ($Ca(OC)_2$) [1, 2]. There were two types at the time: high alkalinity (pH > 11) with low oxidation-reduction potential (ORP 800 mV) and high acidity (pH 2.5) with high ORP value (ORP > 1100 mV) and free chlorine concentration (FCC). Electrolyte water can now be easily produced. Its disinfectant properties were non-toxic, stable, cost-effective, low-cost, and user-safe [3].

The purpose of the study was to search into the chemical properties and stability of electrolyzed water. The bactericidal ability, cytotoxicity, phenol coefficient, and optimal disinfection technique (immersion and spray) of these disinfectants on different surface objects were therefore determined to ensure safety and to further proper hygiene practical guidelines under simulated appropriate in vitro laboratory conditions.

MATERIALS AND METHODS

Microorganisms and chemicals

Ten pathogenic bacteria and 2 pathogenic yeast used in vitro to test the electrolyzed water. The microbial pathogen used in this experiment was helpfully provided by the faculty of Medical technology, Rangsit University. To achieve log phase, the tested microbial strains were re-cultured on agar medium (Tryptic Soy