Title : Comparison of the antibacterial efficacy between Sodium Hypochlorite and Hypochlorous Acid generated from pure and waste brines

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ABSTRACT

This study aimed to evaluate the inhibitory and bactericidal efficacy of hypochlorous acid (HOCl) against *Escherichia coli* and *Listeria monocytogenes*. HOCl was produced from wastewater brine generated during frozen edamame processing through electrolysis, in which an electric current is passed through a brine solution (NaCl + H_2O) to dissociate sodium chloride and generate hypochlorous acid. The antimicrobial efficacy of this solution was compared with that of a 10% sodium hypochlorite (NaOCl) solution and HOCl produced from pure brine. Antimicrobial activity was assessed by determining the Minimum Inhibitory Concentration (MIC) using the agar well diffusion and broth macrodilution methods, as well as the Minimum Bactericidal Concentration (MBC). At a concentration of 6,000 ppm, the 10% NaOCl solution demonstrated the highest antimicrobial efficacy. According to the agar well diffusion assay, 10% NaOCl produced the largest inhibition zone diameters against *E. coli* and *L. monocytogenes*, measuring 17.70 ± 1.00 mm and 20.67 ± 1.15 mm, respectively, with an MBC of 375 ppm. While HOCl produced from pure brine exhibited the inhibition zones of 12.00 ± 1.00 mm against *E. coli* and 11.67 ± 0.58 mm against *L. monocytogenes*, and an MBC ranging from 750 to 1,500 ppm. In contrast, HOCl generated from wastewater brine showed the lowest antimicrobial efficacy, producing inhibition zones of 9.67 ± 0.58 mm and 8.00 ± 0.00 mm, respectively, with an MBC of 3,000 ppm. The reduced efficacy of HOCl was attributed to the degradation of free chlorine, the primary active disinfecting agent. Titration analysis indicated that freshly produced HOCl had an initial chlorine concentration of 6,000 ppm on the first day. However, after one month of storage, the chlorine concentration decreased substantially to 170.21 ppm, corresponding to a degradation rate of 97.16%. These findings suggest that to achieve maximum disinfection efficacy, HOCl should be used immediately after production.

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