Title Effectiveness of low concentration electrolyzed water to inactivate foodborne pathogens under different environmental conditions

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Abstract

Strong acid electrolyzed water (SAEW) has a very limited application due to its low pH value (< 2.7) and corrosive characteristics. Thus, we developed new low concentration electrolyzed water (LcEW). The efficacy of LcEW under various treatment conditions for the inactivation of different foodborne pathogens in pure culture was evaluated and compared with SAEW. The efficiency of LcEW and SAEW for the inactivation of predominant foodborne pathogens (*Escherichia coli* O157:H7, *Listeria monocytogenes*, *Staphylococcus aureus* and *Salmonella* Typhimurium) with different dipping times (1, 3, 5, 7 and 10 min), pH values (2.5, 4.0, 5.0, 6.0 and 9.0) and temperatures (4, 15, 23, 35 and 50 °C) were determined. Reductions of bacterial populations of 1.7 to 6.6 $\log_{10}$ CFU/mL in various treated conditions in cell suspensions were observed after treatment with LcEW and SAEW, compared to the untreated control. Dip washing (1 min at 35 °C) of lettuce leaves in both electrolyzed water resulted in 2.5 to 4.0 $\log_{10}$ CFU/g compared to the unwashed control. Strong inactivation effects were observed in LcEW, and no significant difference ($p > 0.05$) was observed between LcEW and SAEW. The effective form of chlorine compounds in LcEW was almost exclusively hypochlorous acid (HOCl), which has strong antimicrobial activity and leaves no residuals due to the low concentration of residual chlorine. Thus, LcEW could be widely applied as a new sanitizer in the food industry.