Efficacy of electrolyzed oxidizing water against *Listeria monocytogenes* and *Morganella morganii* on conveyor belt and raw fish surfaces

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Abstract

*Listeria monocytogenes* and *Morganella morganii* have been implicated in listeriosis outbreaks and histamine fish poisoning, respectively. Possible sources of contamination of food products include processing equipment, food handlers, and fish smokehouses. Treatment of food preparation surfaces and of whole fish during handling with agents such as, electrolyzed oxidizing (EO) water, could reduce biofilm formation on seafood products and in seafood processing plants. We examined the efficacy of EO water against *L. monocytogenes* and *M. morganii* biofilms using the MBEC™ Assay System (Innovotech Inc.), conveyor belt coupons, and raw fish surfaces. The MBEC™ Assay System was used to assess the activity of EO water against 24-h biofilms of 90 *L. monocytogenes* strains and five *M. morganii* strains. Biofilms were exposed to PBS or EO water for 0 (control), 5, 15, and 30 min. All bacterial isolates were susceptible (reduction of 7 log_{10}CFU) to treatment with EO water for 5 min based on results obtained using this assay system. EO water was used to treat four *L. monocytogenes* strains and one *M. morganii* strain attached to conveyor belt coupons and fish surfaces. Three *L. monocytogenes* strains and one *M. morganii* strain on belt coupons were reduced by 1–2.5 log_{10}CFU/cm² by exposure (5 min) to EO water compared to exposure to sterile distilled water. Strain to strain variability in susceptibility to EO water was evidenced by the fact that numbers of one *L. monocytogenes* strain were not reduced by EO water treatment of belt surfaces. EO water was not effective against *L. monocytogenes* and *M. morganii* on fish surfaces as growth occurred during cold storage. These results suggest that exposure of conveyor belts to EO water for a minimum of 5 min...
could assist in the removal of some biofilms. Removal of food residue with continuous or intermittent spraying of food processing equipment (e.g., conveyor belts, slicers) could reduce or prevent further biofilm formation. Additional sanitizers must be investigated for activity against bacteria associated with raw fish.

Highlights
► Examined efficacy of EO water against attached *L. monocytogenes* and *M. morganii*. ► Three of four *L. monocytogenes* isolates on conveyor belts susceptible to EO water. ► *M. morganii* cells attached to conveyor belts susceptible to EO water. ► EO water not effective against *L. monocytogenes* and *M. morganii* on raw fish.

Keywords
EO water; *L. monocytogenes; M. morganii; Conveyor belt; Raw fish

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