

**Title** The development of alternative methods of disinfection

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### **Abstract**

Chlorine is the primary method for disinfection of drinking water in the United States; however, growing concerns about the potential hazards associated with carcinogenic chlorine disinfection by-products have resulted in increased efforts to develop alternative methods of water disinfection. In addition, it is sometimes difficult to maintain an adequate concentration of free chlorine throughout a drinking water distribution system due to intrusion events and the presence of biofilms.

Silver and copper are widely used as environmental biocides and as clinical antimicrobial agents. Copper has been extensively used as an algacide for many years, and is reported to be one of the most toxic metals to heterotrophic bacteria in aquatic environments. In this study, silver and copper, both individually and in combination, were able to significantly reduce the numbers of the bacterial pathogens *Salmonella typhimurium*, *Escherichia coli*, *Listeria monocytogenes*, and *Mycobacterium fortuitum* in aqueous solutions. Silver and copper together could potentially be used as a secondary disinfectant in water treatment because their residual effect is long lasting and no harmful byproducts are generated.

Besides water, produce can also be a source of microbial pathogens. Fruits and vegetables are the third leading source in microbial foodborne outbreaks, accounting for more than 10,000 cases of foodborne illness in the U.S. between 1990 and 2001. Alternative produce sanitizers in addition to chlorine were evaluated against foodborne 10 pathogens inoculated onto lettuce. Overall, Fit® (citric acid, grapefruit oil extract) and chlorine yielded the greatest reductions of the study organisms.

A large number of compounds are available for use as disinfectants; however, some are highly toxic, corrosive and produce harmful by-products. Natural antimicrobial products are another possible alternative. The efficacy of a natural peptide-based antimicrobial, Absolute Fx, was assessed against bacteria and viruses. Absolute Fx effectively inactivated the study organisms.