Efficacy of Ozonated Water, Chlorine, Chlorine Dioxide, Quaternary Ammonium Compounds and Peroxyacetic Acid Against Listeria monocytogenes Biofilm on Polystyrene Surfaces

Genus	Species	Surface/Material	Treatment	Effect
Listeria	L. monocytogenes	Polystyrene	Ozonated water (1.0, 2.0, and 4.0 ppm for 1 min)	0.9, 3.4, and 4.1 Log reduction

Listeria monocytogenes contaminated processing equipment and the general packing environment have been implicated in deadly foodborne listeriosis outbreaks, highlighting the significance of proper sanitization and disinfection of food contact surfaces. This study aims to comprehensively evaluate antimicrobial efficacy of commercially available, economical sanitizers at practical concentrations against L. monocytogenes biofilm formed on polystyrene surfaces under different conditions. Ozonated water 1-min treatment at 1.0, 2.0, and 4.0 ppm resulted in â^¼0.9, 3.4, and 4.1 log reduction of L. monocytogenes single strain biofilm grown on polystyrene surfaces, respectively. However, its efficacy was dramatically diminished in multi-strain L. monocytogenes biofilm and was further compromised by aged biofilm and in the presence of organic matter. Quaternary ammonium compounds (QAC) at 100/400 ppm, chlorine at 100/200 ppm, chlorine dioxide at 2.5/5.0 ppm and peroxyacetic acid (PAA) at 80/160 ppm resulted in 2.4/3.6, 2.0/3.1, 2.4/3.8, and 3.6/4.8 log reduction of L. monocytogenes single strain biofilm, respectively. Antimicrobial efficacies of all tested sanitizers against 7-day-old biofilm were much lower when compared to 2-day-old biofilm, with PAA being the least influenced by the age of the biofilm. Organic matter conditioning with diluted milk or apple juice dramatically impacted the antimicrobial efficacy of all sanitizers. PAA treatment of 1 min at 160â€“200 ppm resulted in a 3.2â€“3.5 log reduction against 7-day-old biofilm in the presence of organic matter, thus showing its effectiveness in eradicating L. monocytogenes biofilm on polystyrene surface. Collectively, data highlight the importance of timely and thoroughly cleaning food contact surfaces before disinfection and provides practical information and guidance for the food industry in selecting the most effective sanitizer in their sanitizing regimes to eliminate L. monocytogenes biofilm.