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THE INFLUENCE OF MICROBIAL ECOLOGY OF DRINKING WATER BIOFILMS ON THEIR RESISTANCE TO DISINFECTION

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ABSTRACT
The knowledge of the role of microbial ecology of drinking water (DW) biofilms on disinfection might help to improve our understanding of their resistance mechanisms and allow the development of effective strategies to apply in drinking water distribution systems (DWDS). In this study six opportunistic bacteria (*Acinetobacter calcoaceticus*, *Burkholderia cepacia*, *Methylobacterium* sp., *Mycobacterium mucogenicum*, *Sphingomonas capsulata* and *Staphylococcus* sp.) isolated from a DWDS were used to form single and multispecies biofilms. Those biofilms were exposed to sodium hypochlorite (SHC) at different concentrations for 1 h and biofilm control was assessed in terms of mass removal and metabolic activity, cultivability and viability reduction. Biofilm recovery was also assessed 24 h after SHC treatment. The results demonstrate that total biofilm mass removal (single and multispecies biofilms) was not achieved for the SHC concentrations tested. Total biofilm inactivation was only achieved for *A. calcoaceticus* and *Staphylococcus* sp. single species biofilms and for multispecies biofilms without *A. calcoaceticus*, when exposed to high SHC concentrations. From the single species biofilms, *Methylobacterium* sp. and *M. mucogenicum* had the highest resistance to SHC, while *Staphylocooccus* sp. and *A. calcoaceticus* formed the most susceptible biofilms. Multispecies biofims with all the six bacteria had the highest resistance to SHC, while those without *A. calcoaceticus* were the most susceptible. However, in general multispecies biofilms were more resistant to inactivation and removal than the single biofilms. The recovery results demonstrated that only biofilms without *A. calcoaceticus* were not able to recover their biomass from the SHC treatments. Also, those biofilms had a decreased ability to recover their viability. This study highlights the importance of *A. calcoaceticus* in the resistance and functional resilience of DW biofilms. Despite this bacterium being one of the most susceptible to SHC, its presence in multispecies biofilms increased their resistence to disinfection and their ability to recover from SHC exposure.