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Scientific Letters

II TOXRUN
International Congress 2023
27-28 April, 2023 | Porto, Portugal

Poster 45

Methylparaben as a concerning environmental pollutant compromising drinking water quality

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Abstract

Background: Drinking water distribution systems are known to harbor biofilms, even after disinfection, which constitute a source of microorganisms that may remain in the drinking water (DW) delivered through a consumer's tap [1]. Nevertheless, the presence of parabens (an anthropogenic contaminant) in DW is another problem that may affect microbial characteristics and the susceptibility to chlorine, compromising DW disinfection [2]. **Objective:** This work is pioneer in evaluating the effects of methylparaben (MP) at concentrations found in DW (15 µg/L) on biofilm characteristics and their susceptibility to disinfection. **Methods:** Dual-species biofilms formed by bacteria isolated from DW (*Acinetobacter calcoaceticus* and *Stenotrophomonas maltophilia)* were grown for 7 days on polypropylene (PPL) in the absence and presence of 15 µg/L of MP [3]. Then, MP-exposed and non-exposed biofilms were characterized in terms of culturability, density, viability, biofilm structure (thickness) and composition (content of extracellular polysaccharides) [3]. To evaluate the effect of MP exposure on biofilm susceptibility to chlorine disinfection, MP-exposed and non-exposed dual-species biofilms were treated with free chlorine solutions at 5 and 50 mg/L for 30 min. Then, those biofilms were characterized in terms of cell culturability, density and viability. **Results:** MP exposure increased cell proliferation of dual-species biofilms formed on PPL (an increase of 36% and 63% in the number of culturable and total cells, respectively) in relation to non-exposed biofilms ($P < 0.05$). MP also altered biofilm viability, structure and composition. The thickness of MP-exposed biofilms increased by 45%, while the polysaccharides content decreased by 43%. Moreover, the results showed that MP- exposed dual-species biofilms formed on PPL were more tolerant to chlorine action than non-exposed counterparts. **Conclusions:** MP exposure induces the proliferation of biofilm cells and affects biofilm structure (thickness) and composition (polysaccharides content). MP presence in DW was found to compromise chlorination efficacy, especially in systems containing PPL.

Keywords: biofilms; drinking water; methylparaben; water disinfection; tolerance

Acknowledgments

This research was funded by LA/P/0045/2020 (ALiCE), UIDB/00511/2020, UIDP/00511/2020 (LEPABE) - FCT/MCTES (PIDDAC); by the A. R. Pereira PhD scholarship (2021.06226.BD); HealthyWaters (NORTE-01-0145-FEDER-000069)- NORTE 2020/ERDF and the I. B. Gomes contract 2022.06488.CEECIND.

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