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Oral Communication 1

The effects of methylparaben exposure on drinking water bacteria virulence and tolerance to antibiotics

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Abstract

Background: Parabens, widely used as preservatives in personal care products, pose an increased global concern due to their impact on environmental microbial communities, particularly in drinking water (DW), and potential risks to public health. Among different parabens detected in drinking water distribution systems (DWDS), methylparaben (MP) is the most prevalent at elevated concentrations, raising serious health concerns [1]. **Objective:** This study evaluated the effects of MP exposure at environmentally relevant concentrations of MP (15 µg/L) on bacterial tolerance to antibiotics and virulence. **Methods:** *Acinetobacter calcoaceticus* and *Stenotrophomonas maltophilia* both isolated from a DWDS were exposed to MP for a long period. The susceptibility to antibiotics (ceftazidime - CEF; levofloxacin - LEV; minocycline - MINO; and trimethoprim-sulfamethoxazole - TMP-SMX) was evaluated in the 5th and 10th weeks by the disk diffusion susceptibility methods according to the Clinical and Laboratory Standards Institute. Bacterial virulence was studied in terms of outer membrane vesicles (OMVs) production and properties [2], their ability to form biofilms and invade hosts cells [3 - human gingival fibroblasts (HGF). **Results:** Increased tolerance to TMP-SMX and CEF was observed to *A. calcoaceticus* after MP exposure for 5 and 10 weeks, respectively. The exposure to MP for 7 days was also able to change the properties of bacterial released OMVs, which are critical to bacterial virulence. MP-exposed *A. calcoaceticus* biofilm cells generated larger OMVs, while planktonic cells released smaller OMVs compared to their non-exposed counterparts. In *S. maltophilia*, MP exposure led to an increase in lipid content of biofilm-derived OMVs but resulted in a reduction in both lipid content and OMV concentration in planktonic cells. Additionally, MP exposure significantly enhanced biofilm formation in both species, further reinforcing bacterial virulence. Notably, MP-exposed *A. calcoaceticus* planktonic cells demonstrated an increased capacity to invade HGF, suggesting that MP contamination may exacerbate bacterial virulence. **Conclusions:** These findings reveal how MP exposure can drive bacterial adaptation by increasing antibiotic tolerance and enhancing interconnected virulence mechanisms - including OMV production, biofilm formation, and host cell invasion - posing significant health risks in DWDS.

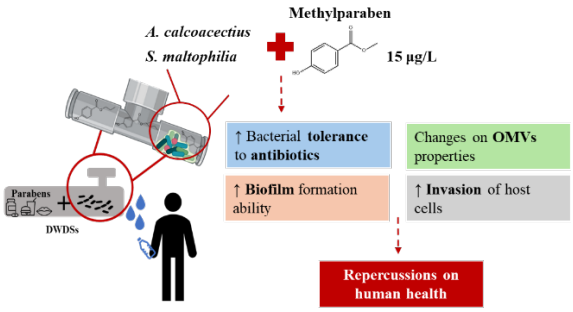

Figure 1. Effects of methylparaben exposure on drinking water bacterial pathogenicity.

Keywords: biofilms, host invasion, methylparaben

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