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Evaluation of potential resistance development by cells adhered to antimicrobial surfaces

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Immobilization of antimicrobials onto a surface has been proposed as a promising approach to fight biomaterial-associated infections (BAI). In this study, three antimicrobials, currently under investigation for use in medical devices, were evaluated for the risk of inducing bacterial resistance after their immobilization. An antibiotic, a quaternary ammonium compound (QAC) and an antimicrobial peptide (AMP) were immobilized onto polydimethylsiloxane (PDMS) using a mussel-inspired coating strategy. Results showed that antimicrobial surfaces exhibited contact-killing activity and were able to impair biofilm establishment. However, and similar to previously reported studies, a complete biofilm eradication was not achieved. The potential development of resistance towards these antimicrobials immobilized were then evaluated by continuously recovering the cells adhered to these antimicrobial surfaces and allowing them to adhere to new modified surfaces for a total of 10 passages. As a control, the same procedure was performed for unmodified PDMS. After 10 days, the cells recovered from the un- and modified surfaces were used to determine the MIC and MBC of antimicrobials. No propensity for developing bacterial resistance was found for immobilized QAC or AMP as the same susceptibility pattern was obtained for cells recovered from unmodified or modified surfaces. Cells recovered from the surfaces modified with antibiotic, exhibited a higher MBC as compared to cells recovered from unmodified PDMS. This study highlighted the risk associated to the immobilization of antibiotics and the promising potential of QAC and AMP to be used in the design of materials able to prevent BAI.