Exploring synergistic and antibiofilm interactions of cationic polymers.

As a result of antimicrobial resistance, we edge closer to a post-antibiotic era and the development of novel antimicrobials is urgently required. Biofilm formation plays a significant role in bacterial persistence and resistance to antibiotics, with up to 80% of bacterial infections being linked to biofilm forming bacteria. Antimicrobial peptides are small peptides that target bacteria, with limited development of resistance. However their widespread clinical application is limited. Polymer chemistry, specifically reversible-addition fragmentation chain transfer (RAFT) polymerisation, can be utilised to synthesis an alternative polymer-based system that mimics key aspects of the natural peptides. These polymers are proving to be a promising platform for the development of novel antimicrobials as their antimicrobial effects and toxicity can be tuned, while keeping production costs low. We synthesised ammonium containing polymers, that have previously been shown to exhibit antimicrobial and antibiofilm activity against *Pseudomonas aeruginosa*. To better understand the extent of the polymer activity we tested the antimicrobial effects using MIC assays against a panel of 5 bacterial and fungal pathogens of concern, in different media to mimic clinically relevant conditions (synthetic wound fluid, airway synthetic liquid and synthetic cystic fibrosis media). We then determined the antibiofilm properties of the polymers by using a Calgary device. Following this, promising polymers were taken forward to investigate synergy between the polymers and existing antimicrobials. Future work will investigate synergistic combinations of polymer and antimicrobial to test for antibiofilm activity in high validity biofilm models.