P821 Biosurfactant-based coatings inhibit fungal and bacterial biofilm on medical-grade silicone

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Introduction and aim: Microbial biosurfactants have recently emerged as a potential new generation of anti-adhesive and anti-biofilm agents for medical device coatings with enhanced biocompatibility. Aim of the work was to evaluate the ability of AC7 and R89 biosurfactants (AC7BS, R89BS) medical-grade silicone disks coatings to inhibit biofilm formation of *Candida albicans*, *Staphylococcus aureus* and *Staphylococcus epidermidis*.

Methods: AC7BS and R89BS were extracted from *Bacillus subtilis* and *Pseudomonas aeruginosa* cell-free supernatants according to [1] and the composition of the crude extracts evaluated by ESI-MS analysis. The selected biomaterial was functionalized following two different strategies: direct BS physical absorption (silicone-BS disks) and plasma treatment followed by BS absorption (silicone/P-BS disks). Anti-biofilm activity against bacterial and fungal biofilm-producer strains was investigated by the crystal violet staining and MTT assays to evaluate, respectively, biofilm biomass and cells metabolic activity at different time-points (1.5h, 24h, 48h).

Results: Chemical characterization revealed that AC7BS is a mixture of surfactin and fengycin and R89BS is a mixture of mono- and di-rhamnolipids. Both coating strategies promoted a significant inhibition of biofilm formation for all the tested strains and, in general, treatments with R89BS resulted to be more effective. In particular, on silicone-R89BS disks, biomass and metabolic activity of fungal biofilms were respectively reduced up to 73% and up to 64% at the last time-point (48h). A significant inhibition was also observed on *S. aureus* biofilms, with similar values on biofilm biomass (up to 78% at 48h) and on metabolic activity (up to 72% at 48h). Interestingly, *S. epidermidis* biofilm formation was mostly reduced by R89BS in terms of metabolic activity (up to 53% at 48h) than of biofilm biomass (up to 7% at 48h). On silicone-AC7BS disks, fungal and bacterial biofilms were respectively inhibited up to 62% and 74% at 48h. On silicone/P-AC7BS disks, biomass and metabolic activity of fungal biofilm were averagely reduced of 52% at 1.5h and of 45% at 24h and on silicone/P-R89BS disks of 68% at 1.5h and 70% at 24h. *S. aureus* biofilm formation at 24h was inhibited of 51% on silicone/P-AC7BS disks and of 75% on silicone/P-R89BS disks. Regarding *S. epidermidis*, no relevant biofilm reduction at 24h was detected on silicone/P-AC7BS disks but an inhibition of 56% was observed on silicone/P-R89BS disks. Finally, AC7BS did not inhibit fungal and bacterial planktonic cells, indicating anti-adhesive but no antimicrobial activity. Similarly, R89BS had no activity against *C. albicans* and *S. epidermidis* planktonic cells, whereas for *S. aureus* an antibacterial action was observed. Assays for the evaluation of the activity of AC7BS and R89BS on pre-formed fungal and bacterial biofilms on silicone are in progress.

Conclusions: AC7BS and R89BS are able to significantly inhibit fungal and bacterial biofilm formation on silicone and plasma treatment prior to BS adsorption seems to be a promising method for BS functionalization of medical-grade silicone.

References: [1] Rivardo et al. (2009) Appl Microbiol Biotechnol. 83: 541-553.

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