P2: 27

The modelling of the polymicrobial communities using the species-specific biofilm inhibition by furanones

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Many investigations confirm that opportunistic bacteria like *Staphylococcus, Micrococcus, Pseudomonas* form so called mixed biofilms, where the cells of two or more bacterial species are co-embedded in matrix. We asked whether pathogenic bacteria are able to embed into the pre-formed biofilm, forming polymicrobial biofilm and avoid the antimicrobials and immune system. We found that the derivatives of 2(5H)-furanone exhibit different activity to various bacteria with MBIC varying from 2.5 to 50 mg per l. Using these compounds, we produce the mixed biofilm consisted of either *S.aureus* with *P. aeruginosa*, *M. luteus* with *B. subtilis* or *S. epidermidis* with *B. subtilis*, where the biofilm formation by the first bacterial species is inhibited by furanone, consequently, the biofilm matrix is produced only by the second bacteria. Using these systems, we show explicitly that *S. aureus* and *P. aeruginosa* which antagonize in the absence of antimicrobials, produce the polymicrobial biofilm and successfully survive when the biofilm formation by *S. aureus* was inhibited. Moreover, being in the biofilm, *S. aureus* became less sensitive to the ciprofloxacin and ampicillin.