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Novel molecular tools have been constructed which allow for in situ detection of N-acyl homoserine lactone (AHL)-mediated quorum sensing in Pseudomonas aeruginosa biofilms. The reporter responds to AHL activation of LasR lay expression of an unstable version of the green-fluorescent protein (Gfp). Gfp-based reporter technology has been applied for non-destructive, single-cell-level detection of quorum sensing in laboratory-based P. aeruginosa biofilms. It is reported that a synthetic halogenated furanone compound, which is a derivative of the secondary metabolites produced by the Australian macroalga Delisea pulchra, is capable of interfering with AHL-mediated quorum sensing in P. aeruginosa. It is demonstrated that the furanone compound specifically represses expression of a PlasB-gfp reporter fusion without affecting growth or protein synthesis. In addition, it reduces the production of important virulence factors, indicating a general effect on target genes of the las quorum sensing circuit. The furanone was applied to P. aeruginosa biofilms established in biofilm flow chambers. The Gfp-based analysis reveals that the compound penetrates microcolonies and blocks cell signalling and quorum sensing in most biofilm cells. The compound did not affect initial attachment to the abiotic substratum. It does, however, affect the architecture of the biofilm and enhances the process of bacterial detachment, leading to a loss of bacterial biomass from the substratum.

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