Do marine natural products interfere with prokaryotic AHL regulatory systems?
Recent studies indicate that a taxonomically diverse range of marine eukaryotes produce metabolites which inhibit phenotypic traits in bacteria, with no or minimal effects on growth. In this review, we present evidence for the existence of such eukaryotic interference with a conserved prokaryotic signalling system. We demonstrate that halogenated furanones, a class of secondary metabolites produced by the Australian subtidal red alga DeLisea pulchra, interfere with the acylated homoserine lactone (AHL) regulatory system in several Gram-negative bacteria. Furanones were found to interfere with the AHL mediated expression of bioluminescence, swarming (surface) motility, and exoenzyme synthesis in different bacterial species. Furthermore, adhesion and swarming in a range of marine bacteria, for which the identity of the signalling molecules is not yet determined, were inhibited by furanones at concentrations that did not affect growth. Evidence for these effects were obtained in both field and laboratory experiments. Competition experiments in the presence of different concentrations of AHLS and furanones showed that the expression of swarming and bioluminescence in laboratory strains is competitively inhibited in a fashion that suggests that both classes of compounds have affinity for the same receptor site in the AHL regulatory system. Finally, by performing structure- function experiments on the inhibition of AHL systems by a range of different furanones, we identified the structural prerequisites responsible for interference.

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