Food as a Source for Quorum Sensing Inhibitors: Iberin from Horseradish Revealed as a Quorum Sensing Inhibitor of Pseudomonas aeruginosa

Foods with health-promoting effects beyond nutritional values have been gaining increasing research focus in recent years, although not much has been published on this subject in relation to bacterial infections. With respect to treatment, a novel antimicrobial strategy, which is expected to transcend problems with selective pressures for antibiotic resistance, is to interrupt bacterial communication, also known as quorum sensing (QS), by means of signal antagonists, the so-called QS inhibitors (QSI). Furthermore, QSI agents offer a potential solution to the deficiencies associated with use of traditional antibiotics to treat infections caused by bacterial biofilms and multidrug-resistant bacteria. Several QSI of natural origin have been identified, and in this study, several common food products and plants were extracted and screened for QSI activity in an attempt to isolate and characterize previously unknown QSI compounds active against the common opportunistic pathogen Pseudomonas aeruginosa. Several extracts displayed activity, but horseradish exhibited the highest activity. Chromatographic separation led to the isolation of a potent QSI compound that was identified by liquid chromatography-diode array detector-mass spectrometry (LC-DAD-MS) and nuclear magnetic resonance (NMR) spectroscopy as iberin—an isothiocyanate produced by many members of the Brassicaceae family. Real-time PCR (RT-PCR) and DNA microarray studies showed that iberin specifically blocks expression of QS-regulated genes in P. aeruginosa.

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