The Effect of the Nonionic Detergent NP-40 on Pigment Production and Biofilm Development in Pseudomonas uticensis

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Pseudomonas Uticensis is a gram-negative bacterium isolated for its potent antifungal properties. The brown pigmentation of its colonies and biofilms is due to the production of pyomelanin. In studies of the effects of the antimicrobial lipid, sphingosine on the growth of P. uticensis, the lipid was added to cultures dispersed in 0.1% Nonidet P-40 (NP-40), a nonionic detergent. After incubating overnight, cultures grew well, but none exhibited brown pigmentation. NP-40 was hypothesized to be the cause as its nonionic property may have interfered with hydrophobic biofilm production. Cultures were incubated in concentrations between 0-0.01% of NP-40 only, to determine the concentration of NP-40 at which pyomelanin production declines. Optical densities of the cultures at OD600 were largely the same between concentrations, indicating that NP-40 does not affect P. uticensis growth. The amount of pyomelanin in culture supernatants measured at A400 increased up to 0.0025% NP-40 before dropping off. A Congo Red binding assay, which measures biofilm matrix extracellular polysaccharide showed that NP-40 inhibits biofilm formation, thus decreasing pyomelanin production. When depleted of iron, and Pseudomonas quinolone signal (PQS) is added to cells, pyoverdine is produced, and pyomelanin production decreases, giving the cultures a fluorescent green color under ultraviolet light. Fluorescence of iron-starved cultures with PQS increases up to 0.0025% NP-40 before declining. When biofilm formation is inhibited by NP-40, pyoverdine also decreases. Future studies will focus on how NP-40 inhibits biofilm formation in P. uticensis and the detergent's effect on the antifungal properties of the bacteria.

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