LuxI/LuxR-Type Quorum Sensing System in K61, Dickeya Species Novel: Growth and AHL Production in MgSO4-Rich Brine

Wang, Jingjing (School: Iolani School)

Quorum sensing (QS) is a density-dependent mechanism of gene regulation and bacterial communication, allowing bacterial communities to benefit from cooperative group behavior and is commonly observed in genus Dickeya. K61, a novel Dickeya sp., is, therefore, hypothesized to utilize quorum sensing. Through this research, it is tested and proved that K61 uses acyl-homoserine lactone based QS (AHL-QS), involving a LuxI/LuxR-type quorum sensing gene cassette, esaI/esaR, and potential multiple LuxR-type solos. In the current study, it is also concluded that K61 is epsotolerant and that its QS system changes in MgSO4-rich brine in terms of types of AHLs produced. This research focuses on the changes in AHL production under variable concentrations of a magnesium sulfate (MgSO4)-rich brine, analogous to the brine that was present on Mars during the Hesperian Age, 3.7 - 2.9 Ga. Tolerance of MgSO4-rich brine, or epsotolerance, was chosen as an experimental condition due to the many implications MgSO4 has in a medical, agricultural, and astrobiological context, with significant potential and negative implications for the forward contamination of Mars, given the high natural abundance of these salts on the planet. This study finds that K61 could survive in as high as 25% MgSO4 brine and that it produces C6-oxo-, C6-, C8-, C14-oxo-, and C14-HSLs in 10% MgSO4 brine instead of C6-oxo-, C6-, C7-, C10-, and C12-HSLs in no MgSO4-rich brine.

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