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IDENTIFICATION OF METHYLOTROPH QUORUM SENSING SIGNALS USING AN INVERSE STABLE ISOTOPIC LABELING APPROACH

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Methylotrophic bacteria use one-carbon compounds such as methanol or methane gas as their only source of energy and carbon. Understanding how these organisms interact within the context of their microbiome may help us understand their important role in sequestering methane, a greenhouse gas. Many bacteria use quorum sensing (QS) systems as their method of communication[1]. Through quorum sensing, bacteria are able to modify their gene expression depending on the cell density of their species. In this project, we have optimized a new procedure for rapidly identifying the QS signals used by methylotrophs in which we grow the bacteria on a 13C carbon source and feed them 12C-methionine, a QS signal precursor. We have run experiments to optimize the growth media of the bacteria and the amount of methionine added to create the labeling system. We found that many of the strains grow best with 0.01% (m/v) yeast extract and 0.5 μM ^{12}C-methionine. Using our optimized mass-labeling procedure, we have identified a QS signal used by *Methylorubrum rhodinum* strain DSM 2163. We also determined that *Methylorubrum populi* BJ001 produces the same signals as *Methylorubrum exorquens* PA1, which are 7*Z*-C_{14}-homoserine lactone and 2*E*,7*Z*-C_{14}-homoserine lactone. We foresee this method being applied in the future to identify other natural products synthesized by methylotrophs and other bacteria that grow on chemically defined media.

References

1. Waters CM, Bassler BL. Quorum sensing: cell-to-cell communication in bacteria. Annu Rev Cell Dev Biol. 2005;21:319-46. doi: 10.1146/annurev.cellbio.21.012704.131001. PMID: 16212498.