Title: Using Metagenomic Stable Isotope Probing to Identify Genomic Signatures of Bacterial Life History Strategies

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Project Goals: The goal of this project was to identify genomic signatures of life history strategies of soil bacteria that influence their activity in soil carbon cycling.

Abstract text: Life history strategies are important determinants of microbial activity in soil carbon cycling. Life history strategies are defined by tradeoffs in energy allocation to population growth, nutrient acquisition, and cellular maintenance. In microbes, these tradeoffs influence the rate and efficiency by which cells utilize carbon substrates as well as the fate of that carbon. Measuring life history strategies *in situ* is difficult due to complex microbe-microbe and microbe-environment interactions, though metagenomics may provide a solution. We hypothesized that genomic signatures of life history strategies exist in soil bacteria and that these signatures relate to bacterial activity in soil carbon cycling. We used metagenomic-stable isotope probing (metagenomic-SIP) to link genes to patterns of carbon assimilation from diverse ^{13}C-labeled organic matter substrates over time. These carbon assimilation dynamics have previously been linked to life history strategies along the copiotroph-oligotroph life history continuum. This gene to function linkage allowed us to examine 11 genomic signatures predicted to vary along this copiotroph-oligotroph continuum. Out of these 11 signatures, we found that the abundance of transcription factor genes and secretion signal peptide encoding genes in the genomes explained significant variation in genome position along the copiotroph-oligotroph continuum. The other 9 genomic features evaluated were not significantly correlated with the copiotroph-oligotroph continuum but may distinguish bacterial lifestyles within these strategies. Our results demonstrate that genomic signatures can be used to distinguish life history strategies of soil bacteria active in soil carbon cycling.

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