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Genomic foundations of carbon fixation in bacteria living in hot springs

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Photosynthesis does not occur above 73°C, so organisms living above this temperature must obtain usable carbon by some other mechanism. It is generally assumed that carbon is fixed by thermophiles through the process of chemolithoautotrophy; however, primary production has never been demonstrated to occur in hot springs >73°C. We have shown that two organisms, Thermocrinis and Pyrobaculum, make up more than 90% of the cells in an 80°C Great Basin hot spring, Great Boiling Spring. We hypothesize that these organisms fix carbon in the hot spring via the reverse tricarboxylic acid (rTCA) cycle. To test this hypothesis we will: i) confirm that Thermocrinis and Pyrobaculum dominate in water from the spring; ii) determine whether key genes for the rTCA cycle, citryl co-A lyase (ccl), 2-oxoglutarate:ferredoxin oxidoreductase (korA), pyruvate:ferredoxin oxidoreductase (porA), are present and expressed in the spring; and iii) measure rates of carbon fixation in the spring. Linkage of the genetic data with carbon fixation rate data may help to provide an image of carbon fixation and cycling in Great Basin hot springs.
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Introduction

DNA Amplification

RNA Amplification

Discussion and Further Directions

Methods and Materials

References

Acknowledgments