m-CAFEs Applications of Targeted Killing and Editing Methods in Microbial Networks

Matthew A. Nethery[3*](manether@ncsu.edu), Claudio Hidalgo[3], Benjamin M. Rubin[2], Spencer Diamond[2], Trenton K. Owens[1], Jens Heller[1], Dawn M. Chiniquy[1], Jill Banfield[2], Jennifer A. Doudna[2], Trent R. Northen[1], Adam M. Deutschbauer[1], **Rodolphe Barrangou[3]** and N. Louise Glass[1]

[1]Lawrence Berkeley National Laboratory, Berkeley; [2]University of California, Berkeley; [3]North Carolina State University, Raleigh

https://genomicscience.energy.gov/research/sfas/lbnlmcafes.shtml

Project Goals: To elucidate the complex dynamics of microbial networks using phage and CRISPR-based tools for targeted killing and editing of individual microbes within a mixed community.

Abstract

The m-CAFEs collaborative strives to understand the function and biological relevance of individual microbes within the complex ecosystem of the soil microbiome, facilitating reproducibility through use of fabricated ecosystems (EcoFABs). Current technologies for manipulation of an individual species within a consortium are extremely limited and face two primary challenges: construct delivery and target specificity. Therefore, a major goal of the m-CAFEs program is to harness and augment current phage-based targeted killing methods, as well as to develop and enhance delivery of CRISPR-Cas tools for targeted killing and editing in order to elucidate the functions and roles of both cultivatable and uncultivatable microbes within the soil microbiome. Here, we present preliminary data on phage delivery to a mixed population for selective ablation, as well as chemical-based delivery of CRISPR-Cas constructs for targeted killing and editing. Enhancing these delivery and targeting methods will provide essential insights into the functional genomics and biological importance of individuals within the mixed microbial community.

This material by m-CAFEs Microbial Community Analysis & Functional Evaluation in Soils, (m-CAFEs@lbl.gov) a Project led by Lawrence Berkeley National Laboratory is based upon work supported by the U.S. Department of Energy, Office of Science, Office of Biological & Environmental Research under contract number DE-AC02-05CH11231