

## Catabolism of Lignin Oligomers by Soil-Derived Microbiomes

Steven W. Singer<sup>1,2\*</sup>([SWSinger@lbl.gov](mailto:SWSinger@lbl.gov)), Mee-Rye Park<sup>1,2</sup>, Ji Peng<sup>2,3</sup>, Jeffrey G. Pelton<sup>4</sup>, Ning Sun<sup>2,3</sup>, Blake A. Simmons<sup>1,2</sup>

<sup>1</sup>Joint BioEnergy Institute, Emeryville, CA, 94608; <sup>2</sup>Biological Systems and Engineering Division, Lawrence Berkeley National Laboratory, Berkeley, CA, 94720; <sup>3</sup>Advanced Biofuels Process Demonstration Unit, Emeryville, CA 94608; <sup>4</sup>QB3 Institute, University of California-Berkeley, Berkeley, CA 94720

<http://jbei.org>

**Project Goals: The Joint BioEnergy Institute (JBEI) performs fundamental research to improve the conversion of biomass to biofuels and bioproducts. A critical aspect of current research is to maximize the carbon in plant biomass that is converted by microbial hosts. To achieve this goal, we are developing strategies to convert aromatic-rich fractions obtained from lignin to biofuels and bioproducts.**

### Abstract

Overcoming the recalcitrance of lignin and developing conversion strategies for aromatics are key goals to maximize conversion of carbon in plant biomass. Biomass pretreatment solubilizes and depolymerizes lignin, generating mixtures of oligomeric and monoaromatic molecules. While monoaromatics are metabolized by a variety of bacteria, the metabolism of aromatic oligomers remains largely undescribed. Identifying bacteria that metabolize these oligomers will improve biomass conversions that include lignin as a substrate. Ionic liquid pretreatment with cholinium-ionic liquids generated aromatic-rich fractions that contained size-defined mixtures of monoaromatics and oligomers. *Pseudomonas putida* rapidly consumed the monoaromatics in these mixtures but did not metabolize the oligomers. Enrichment of microbiomes derived from soil generated microbial consortia that consumed the oligomers, as demonstrated by the disappearance of aromatic molecules in the molecular weight range of 300-2000 Da in gel permeation chromatograms and the reduction of characteristic aromatic peaks in the 2D-HSQC NMR spectra. Individual microbiomes consumed the oligomers at different rates and targeted variable bond linkages, indicating that a diverse range of bacteria were involved in the deconstruction of these oligomers. Current efforts are focused on identifying the microbes and enzymes involved in the metabolism of aromatic oligomers and developing methods to elucidate the molecular structures of these oligomers.

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