

# Lawrence Berkeley National Laboratory

## Recent Work

### Title

Analysis and fermentation base-lining to validate cyanobacterial-based polysaccharide production as a viable feedstock for bio-product development.:

### Permalink

<https://escholarship.org/uc/item/3q5736xh>

### Authors

Tanjore, Deepti  
Sundstrom, Eric  
Hubbard, Stephen  
[et al.](#)

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**CRADA Final Report**

**November 9, 2016  
PI: Todd Pray**

**CRADA No. FP2153**

**LBNL Report Number \_\_\_\_\_**

1. Parties: HelioBiosys, Inc.
2. Title of the Project: Analysis and fermentation base-lining to validate cyanobacterial-based polysaccharide production as a viable feedstock for bio-product development.
3. Summary of the specific research and project accomplishments

HelioBiosys Inc. has developed a cyanobacterial consortium capable of surviving in seawater with no supplemental nitrogen. This consortium naturally excretes polysaccharides into the culture medium, creating the potential for a low-cost source of sugars for use as a fermentation feedstock or biomaterial. In collaboration with HelioBiosys Inc, researchers at the Advanced Biofuels Process Demonstration Unit (ABPDU) conducted research to validate recovery and downstream applications, focusing on three key areas: process development for recovery of the excreted polysaccharides and saccharification to monomeric sugars, compositional analysis of the polysaccharides, and fermentation of monomeric sugars resulting from saccharification.

4. Deliverables:

Deliverable Achieved	Party (LBNL, Participant, Both)	Delivered to Other Party?
Production of cyanobacterial culture consortium up to 20L scale	Participant	Yes
Process developed for recovery, purification, and saccharification of cyanobacterial polysaccharides	LBNL	Yes
Characterization and quantification of sugars produced by the cyanobacterial culture consortium	LBNL	Yes
Demonstrated growth in shake flask fermentation studies`	LBNL	Yes

5. Identify publications or presentations at conferences directly related to the CRADA?

None at the time of this report.



6. List of Subject Inventions and software developed under the CRADA:

N/A

7. A final abstract suitable for public release:

Researchers at Heliobiosys Inc. and the Advanced Biofuels Process Demonstration Unit at Lawrence Berkeley National Lab have successfully demonstrated recovery, saccharification, and fermentation of polysaccharides excreted by a cyanobacterial consortium. These polysaccharides do not require fresh water or arable land for production and have potential applications as fermentable sugar, as bio-based plastics, and as thickeners and gels. A scalable recovery processes was developed: recovery via membrane separation and diafiltration. Characterization of the polysaccharides excreted by the cyanobacterial consortium reveals a mixture of 5 and 6-carbon sugars including significant fractions of glucose, xylose, arabinose, galactose, and mannose. Fermentation baselining with Rhodosporidium toruloides reveals performance indistinguishable from a pure glucose control condition. Protocols developed as part of this collaboration will now be employed for scale-up testing of the complete cultivation and recovery system in a further collaboration between Heliobiosys Inc., Lawrence Berkeley National Laboratory, and Sandia National Laboratory, with a focus on de-risking cultivation conditions, downstream applications, and overall process economics.

8. Benefits to DOE, LBNL, Participant and/or the U.S. economy.

Proof of concept data generated from this project has enabled Heliobiosys to successfully compete for a DOE Small Business Vouchers Pilot (SBV). Under the SBV program Heliobiosys will receive \$200,000 in research funding to scale cyanobacterial cultivation at Sandia National Laboratory and further improve recovery, characterization, and fermentation at LBNL. This CRADA has enabled LBNL to develop partnerships with Sandia National Lab and has resulted in improved capacity for marine cyanobacteria, algae and polysaccharide research at LBNL. This research has significantly advanced the technology readiness level of the Heliobiosys process, which could ultimately result in commercialization of a novel feedstock for biofuels, biochemicals, and biomaterials that does not rely on arable land or freshwater.

9. Financial Contributions to the CRADA:

DOE Funding to LBNL	\$ 20,000
Participant Funding to LBNL	\$0
Participant In-Kind Contribution Value	\$5,000
Total of all Contributions	\$25,000

