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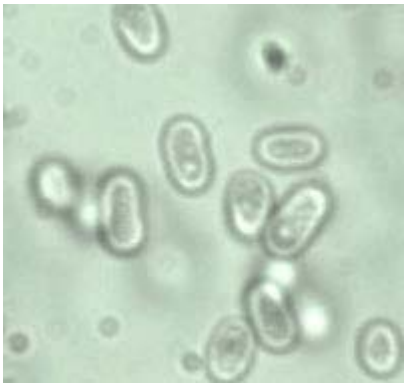
EMSL Science Made Possible

More Proteins Visible with New Genome Annotation Approach

Scientists can identify more genes with greater confidence with new protein data

A new proteomic analysis technique, developed by researchers on the Department of Energy's EMSL Membrane Biology Scientific Grand Challenge, has substantially contributed to annotation of gene sequences. Researchers from Washington University in St. Louis, St. Louis University, Purdue University, and Pacific Northwest National Laboratory developed an approach that synergistically sequenced the DNA of cyanobacteria *Cyanothece* 51142 and determined the proteins that the microbe produced at different times of its life cycle. The proteomics research was done at EMSL using state-of-the-art instrumentation, and the resulting data was compared to determine which of the DNA sequences produced the proteins.



Simultaneous proteomic and genomic technique leads to discovery of rare, linear chromosome in cyanobacteria.

In this way, the team determined where genes resided on the genome of the cyanobacteria and found a previously missed linear chromosome, common in more complex organisms. The blue-green algae, which conducts photosynthesis during the day and nitrogen fixation at night, could make significant contributions in producing ethanol and hydrogen, reducing the need for fossil fuels. "This is the first time anything like this has been found in photosynthetic bacteria. It's extremely rare for bacteria to have a linear chromosome," said team leader Himadri Pakrasi, who leads the EMSL Grand Challenge.

Scientific impact: This new approach can provide insights into microbial genes and proteins, microbial functions, and microbial communities, which could hold the key to reactions of interest in the energy, environmental, and health arenas. This work is part of EMSL's crosscutting work to predict biological functions from molecular and chemical data.

Societal impact: Understanding microbial functions, such as in cyanobacteria, can be valuable in producing hydrogen and ethanol, turning these microbes into fuel factories.

For more information, contact EMSL Communications Manager Mary Ann Showalter (509-371-6017).

Citation: Welsh EA, M Liberton, J Stockel, T Loh, T Elvitigala, C Wang, A Wollam, RS Fulton, SW Clifton, JM Jacobs, R Aurora, BK Ghosh, LA Sherman, RD Smith, RK Wilson, and HB Pakrasi. 2008. "The Genome of *Cyanothece* 51142, A Unicellular Diazotrophic Cyanobacterium That Is Important In The Marine Nitrogen Cycle." *Proceedings of the National Academy Sciences Early Edition*, September 15.

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