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SPOTLIGHT

Articles of Significant Interest Selected from This Issue by the Editors

Pentose Uptake and Degradation in the Thermoacidophilic Archaeon *Sulfolobus acidocaldarius* MW001

With the development of versatile genetic systems and an increased understanding of cellular metabolism, archaea have received growing interest for use in biotechnological applications. Due to its thermoacidophilic lifestyle, as well as its hexose and pentose cofermentation abilities, *Sulfolobus acidocaldarius* offers interesting potential for (ligno)cellulose degradation. However, the pentose transport and degradation pathways still need to be elucidated. Wagner et al. (e01273-17) discovered a novel carbohydrate uptake transporter 2 (CUT2)-type ABC transporter and demonstrated the exclusive activity of the aldolase-independent Weimberg pathway for L-arabinose and D-xylose in *S. acidocaldarius* MW001. These results, along with the identification of pentose-inducible promoters, will expedite the metabolic engineering of *S. acidocaldarius* as a platform organism for (ligno)cellulose degradation.

Multi-Omics Reveals *Leptospirillum ferriphilum* Lifestyle and Adaptations in Biomining

Biomining presents a sustainable, environmentally friendly alternative to traditional methods for metal extraction, and few microbial species are as important in this process as the moderately thermophilic iron oxidizer *Leptospirillum ferriphilum*. A newly sequenced closed genome of this species' type strain was coupled with transcriptomic and proteomic characterization of its growth on ferrous iron and during bioleaching of chalcopyrite. This study by Christel et al. (e02091-17) reveals novel genomic features, including a nitrogenase complex, and deepens our understanding of the role of *L. ferriphilum*^{T} in sulfide mineral oxidation and its adaptations to the harsh conditions found therein.

Will the Marine Nitrogen Fixer *Trichodesmium* Be a Nitrogen Sink in a Future Nutrient-Limited Ocean?

Trichodesmium is among the most biogeochemically significant microorganisms in the ocean, as it supplies new nitrogen that supports ocean food webs. Walworth et al. (e02137-17) adapted *Trichodesmium* cultures to high-CO_2 conditions for 7 years, followed by exposure to iron and/or phosphorus (co)limitation. Under these "future ocean" conditions, *Trichodesmium* fundamentally shifts nitrogen metabolism away from nitrogen fixation and towards upregulation of organic nitrogen scavenging, particularly the abundant organic nitrogen source trimethylamine. Such a shift towards nitrogen uptake rather than fixation may substantially reduce nitrogen supplies to marine food webs in a future ocean, with potential global implications for ocean carbon and nitrogen cycling.

https://doi.org/10.1128/AEM.02616-17

A Shared Natural Product Biosynthetic Pathway from Cyanobacteria and Proteobacteria

The biosynthetic pathway for the production of swinholide, an actin-disrupting compound, has been found from terrestrial and axenic *Nostoc* sp. UHCC 0450 cyanobacteria. Swinholides have been found only from marine sources, and the biosynthetic pathway for the production of a swinholide variant was recently discovered from sponge-symbiotic proteobacteria. This discovery by Humisto et al. (e02321-17) of a swinholide biosynthetic gene cluster in a cyanobacterium highlights that bacteria belonging to distantly related phyla can produce similar natural products. Additionally, related *trans*-AT polyketide synthase genes were found from *Anabaena* sp. UHCC 0451 for the production of scytophycin.

Biological Containment of Recombinant *Bacillus* Spores

Bacterial spores have been shown to be suitable for the display of heterologous antigens and functional enzymes, providing applications for vaccines and industrial processes. The advantage of spores is their stability and ease of production. However, the release of recombinant spores into the environment presents a potential regulatory issue. To address this, Hosseini and colleagues (e02334-17) have validated a method for genetic manipulation in *Bacillus subtilis* that renders the strain thymine dependent. In the absence of thymine, the cell cannot persist in the environment and will die. A further attribute of this system is that in the construction of the strain, no antibiotic resistance genes are introduced into the genome.