Applied and Environmental Microbiology®

SPOTLIGHT

Articles of Significant Interest in This Issue

Novel Regulation of Mannitol and Sorbitol Utilization in *Lactobacillus plantarum*

Lactobacillus plantarum is a versatile bacterium that occupies a wide range of environmental niches. The utilization of limited carbon sources in harsh environments is important for *L. plantarum* to survive. Yang et al. (e02035-18) demonstrated that a bifunctional aldehyde-alcohol dehydrogenase-encoding gene, *adhE*, was responsible for *L. plantarum* to utilize mannitol and sorbitol to produce ethanol through cross-regulation by a novel DNA-binding activator, AcrR, and a repressor, Rex, which balances the level of NADH in the cell. This finding reveals the important role of *adhE* for *L. plantarum* to utilize mannitol or sorbitol to adapt to a variety of environments.

Antibiotic Resistance and Growth Costs in Natural Isolates of *Escherichia coli*

Antibiotic resistance is less likely to spread in the long term if it is countered by growth costs to bacteria in the absence of antibiotics. Allen et al. (e02111-18) measured the antibiotic-free growth of natural and clinical *Escherichia coli* isolates and compared this to the genetic and phenotypic information about their resistance profiles. They found that antibiotic-free growth was linked to the combination of antibiotics to which the bacteria were resistant and the number of resistance gene types they carried but not to their average resistance across antibiotics. This will help to predict selection against resistant bacteria in natural populations.

Transcriptomic and Functional Analyses in Biocide Risk Assessment

In this study, Forbes and colleagues (e02417-18) showed that exposure to very low concentrations of the biocide benzalkonium chloride had relatively extensive effects on the transcriptome of *Escherichia coli*, including changes in the expression of genes associated with efflux, cell permeability, and motility. Adapted bacteria showed reductions in functions, including biofilm formation and motility. MICs did not change, although minimum bactericidal concentrations for the biocide increased twofold. This supports the inclusion of phenotypic analyses in biocide risk assessment, since despite the observed changes in gene expression profiles, changes of relevance for decision making were comparatively small.

Intranuclear Photolyases Protect Fungal Cells from UV Damage

Solar UVB irradiation is highly detrimental to formulated fungal cells applied for insect pest control. Wang et al. (e02459-18) reported that two intranuclear photolyases can repair double-stranded DNA lesions in UVB-inactivated cells and hence reactivate the inactivated cells effectively under visible light. These authors also showed that there was no role for cryptochrome, a cytoplasmic partner, in the photorepair of impaired DNA in the inactivated cells. The essential roles of such characterized photolyases in the natural photoprotection of fungal cells from UVB damage highlight their potential use in the genetic improvement of fungal UVB resistance and the creation of application strategies for fungal insecticides.

https://doi.org/10.1128/AEM.03032-18
Published 6 February 2019

Modulation of Rumen Methanogenesis by Reducing Hydrogen Substrate Availability

In ruminants, microbial feed fermentation produces hydrogen, which is captured by methanogens to reduce CO_2 to methane, an important greenhouse gas. Popova et al. (e02657-18) showed that linseed and/or nitrate, two effective feed additives, mainly affected hydrogen producers and consequently reduced the amounts of hydrogen available for methanogenesis. Linseed also redirected hydrogen consumption towards propionate production, whereas nitrate stimulated the growth of nitrate reducers, an alternative hydrogen-consuming bacterial consortium. This work shows that a better understanding of the microbial interplay leading to methane production is essential for optimizing mitigation strategies.

A New Strategy for Gene Disruption in Hyperthermophilic Piezophiles

Piezophilic hyperthermophiles isolated from deep-sea hydrothermal vents grow optimally under high hydrostatic pressures (HHP) and high temperatures over 80°C. The genetic studies in this group of extremophiles, including the hyperthermophilic archaeon *Pyrococcus yayanosii*, have been hindered by a lack of thermostable and pressure-resistant selection markers. Song et al. (e02662-18) developed an HHP-inducible toxin-antitoxin gene cassette, enabling markerless gene disruption in *P. yayanosii*. This work has expanded the existing piezophilic genetic toolkit for deep-sea hyperthermophiles by construction of a novel genetic manipulation system without the use of auxotrophic mutants and counterselection with 5-fluoroorotic acid.