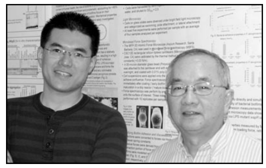
Structural Insights Into Biofilms



Lau (l) and Lam

Biofilms may seem like low life, but their influence is manifest. They complicate industrial processes, and account for ~80% of all infections. They also modulate worldwide geochemical cycles. That level of influence calls for thorough study. But little effort has been made to understand the mechanical and structural properties that link bacterial genotypes with biofilm phenotypes. Now Joseph Lam of the University of Guelph, Ontario, Canada, and colleagues show that the genetic background controlling lipopolysaccharide production helps determine the architecture of mature biofilms of *Pseudomonas aeruginosa* by affecting cellular mechanics at an early stage. "Specifically, mutations affecting core oligosaccharide biosynthesis caused changes in adhesive, cohesive, and viscoelastic properties of *P. aeruginosa* during early biofilm formation, as well as structural parameters of established biofilms," says Lam. "Properties exhibited at an early stage can also determine structural organization of the biofilm matrix at a later stage. As such, the genotype of bacteria and phenotype of biofilms may be linked by these "physical heterogeneities." New methods of impeding biofilm development might include ways to alter microcolony cohesion. "This will allow immune surveillance, antimicrobial agents, or hydrodynamic shear to become more effective at getting rid of biofilms."

(P. C. Y. Lau, T. Lindhout, T. J. Beveridge, J. R. Dutcher, and J. S. Lam. 2009. Differential lipopolysaccharide core capping leads to quantitative and correlated modifications of mechanical and structural properties in *Pseudomonas aeruginosa* biofilms. J. Bacteriol. 191:6618–6631.)

Glycerol Fermentation in Unexpected Organisms: Potential New Source of Ethanol

Gonzalez

Previously, organisms incapable of producing 1,3-propanediol (1,3-PDO), were thought to be incapable of fermenting glycerol. Now Ramon Gonzalez of Rice University, Houston, Tex., et al. show that this is not so, as *Paenibacillus macerans,* which cannot produce 1,3-PDO, can nonetheless ferment glycerol, producing large quantities of ethanol. That is useful, because as a byproduct of biodiesel and bioethanol production, glycerol is plentiful and inexpensive. This is the first demonstration of this phenomenon in a gram-positive organism; previously, this group found it to occur in *Escherichia coli*, a gram-negative species. "We will continue to investigate the fermentative metabolism of glycerol in these organisms, and to this end we are using systems biology techniques–gene arrays, proteomics, and metabolic flux analysis," says Gonzalez.

(A. Gupta, A. Murarka, P. Campbell, and R. Gonzalez, 2009. Anaerobic fermentation of glycerol in *Paenibacillus macerans*: metabolic pathways and environmental determinants. Appl. Environ. Microbiol. 75:5871–5883.)

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