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The Psl economy in early P. aeruginosa biofilm development KUN ZHAO, University of California, Los Angeles, BOO SHAN TSENG, University of Washington, FAN JIN, MAX GIBIANSKY, University of California, Los Angeles, JOE HARRISON, MATTHEW PARSEK, University of Washington, GERARD WONG, University of California, Los Angeles — Psl from P. aeruginosa (PAO1) is a mannose- and galactose-rich exopolysaccharide (EPS). It has been shown that Psl plays an important role in bacterial surface adhesion. Here, we examine role of Psl in controlling motility and microcolony formation during early biofilm development, by translating video microscopy movies into searchable databases of bacterial trajectories. We use a massively-parallel cell tracking algorithm to extract the full motility history of every cell in a large community. We find that at early stages of growth, P. aeruginosa motility is guided by Psl and self-organize in a manner analogous to a capitalist economic system, resulting in a power law bacterial distribution where a small number of bacteria are extremely "rich" in communally produced Psl. By comparing overproducers and underproducers of Psl, we find that local Psl levels determine post-division cell fates: High local Psl levels drive the formation of sessile microcolonies that grow exponentially.

Kun Zhao
University of California, Los Angeles

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