abstract

Synthetic biology provides a means for articulating concepts into new products and products. Its toolbox is extensive, including the ability to create synthetic genomes and tailor their regulation. Early successes augmented the cell's biosynthetic capacity and rewired its regulation, transforming our ability to produce products ranging from small molecules to fully functional therapeutic proteins at high yield. Also, the theoretical formalisms of metabolic engineering provided a basis for optimally routing its biochemical flux. These activities focused largely on the cell's intracellular biochemical network and relied less on molecular cues from its immediate surroundings. The emergence of quorum sensing (QS) as a model for signal transduction has enabled a reexamination of metabolic flux and regulation by hardwiring population-scale biological function to extracellular cues. Regulatory and fabrication modules are feasible, owing to a few relatively simple QS signal transduction cascades. QS provides a context for entirely new products and processes that consider the individual or small populations of cells. We will describe the construction of bacterial cells that swim towards and interrogate receptor density on nearby cancer cells. Indeed, new opportunities are emerging by understanding and manipulating such communication networks that exist between cells, however there are limited means for actuating and control. By connecting biological systems and their molecular based communication networks to those of microfabricated devices, new synergies are envisioned. We are developing new strategies for the assembly of biological components into innovative new structures that are also embedded within or on microfabricated devices. These methods are used to interrogate QS and other biological signaling phenomena by intimately connecting to microfabricated devices for bi-directional communication and control.

biosketch

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