

REVOLUTIONARY DIAGNOSTICS – NONTRADITIONAL APPROACHES FOR DEVELOPING BREAKTHROUGH CAPABILITIES AGAINST EMERGING THREATS

Simplified Cells As New Tools For Synthetic Biology And Biological Sensing

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A set of simplified cells (SIM cells) capable of controllably transitioning between growth and growth arrest have been developed to function as a new platform for biosensing and biomanufacturing applications. Using a synthetic auxotrophy for a non-canonical amino acid(ncAA), Boc-Lysine (BOC), a recoded strain of *Escherichia coli* has been developed capable of transitioning between unperturbed growth in the presence of BOC and a dormant state in its absence. Interestingly, the dormant SIM cell's machinery remains active allowing them to process genetic programs, react to external stimuli, and regenerate new SIM cells even after weeks of dormancy. We show that a variety of SIM cells can be generated through the introduction of stop codons into essential proteins using multiplex automated genome engineering (MAGE) and that the control of escape frequency makes them a potential safe agent for endosymbiotic and environmental biological sensing. This technology showcases a set of tools for reprogramming cellular design and the construction of biological chassis with smart and stable systems ideal for environmental sensing, biomanufacturing, and healthcare diagnostic applications.