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Advanced work flow for efficient multiplexing synthesis of genes in high fidelity – Next generation of gene synthesis

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This presentation will describe our synthetic biology project aiming a streamlining process of multiplex high fidelity gene synthesis using microchip oligo building blocks. This process features miniaturization, computation bioinformatics design, optimized work flow, low material consumption, long and high sequence accuracy, low error DNA constructs through efficient production process. Specifically, our work established a simple and easy to use flow column method (immobilized cellulose-binding-mutS column) to remove error-containing sequences from the final oligo gene-building blocks which are designed as such that they can be processed by ligation and PCR to give defined long (kb) DNA constructs. The reported workflow required about an hour of bench time for oligo processing, and attained less than 1 error per kb DNA, which is translated to ~80% success rate of full length EGFP (720 bp) gene cloning. The workflow hands more than ten genes in parallel. Has the potential for application in pathway gene cluster synthesis.

Biography

Xiaolian Gao is a Professor of Biology and Biochemistry at University of Houston. Her major research interests are related to Large Scale Biology. Her lab uses chemical and biophysical methods in combination to address questions of biomolecules concerning how their structures, molecular dynamics, intermolecular interactions, and molecular recognition play roles in biological processes. In synthetic biology, she has led projects of miniaturized parallel production using digital photochemistry for programmable oligonucleotide synthesis on microchips, which was now advanced to become a revolutionary technology for massive production of oligonucleotides that fulfill the needs of rapid progress of today's DNA technologies, including gene/genome synthesis, sequencing of the various nucleic acid molecules. In a recent report, collaborators and her students have established robust laboratory work flow for accurate multiplex gene synthesis. She is also a proficient Structural Biologist for using NMR methods to elucidate structures of ligand-DNA complexes.

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