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Drew Tack

OPTIMIZATION OF E. COLI SOLUPRO ® USING SYNTHETIC BIOLOGY TO GENERATE HIGH-PERFORMANCE MICROBES FOR SCALABLE PRODUCTION OF PROTEIN THERAPEUTICS

Drew Tack, AbSci, USA
dtack@absci.com

Recombinant protein technology is revolutionizing medicine, manufacturing, and agriculture, but efficient production and proper folding of many recombinant proteins is often challenging. Absci's SoluPro® *E. coli* strains enable the industrial-scale production of high-value proteins in a robust and well-studied bacterial host. We have developed a hybrid approach to tackle the most challenging protein production problems: experimentally we use quantitative, high throughput assays to collect large-scale genotype-phenotype datasets and to identify the best protein production strains; and computationally, we use AI models trained on our data to identify and predict genetic elements and configurations that improve protein folding and production. Leveraging our own AI models, we can rapidly optimize SoluPro® strains for robust production of diverse human-derived and newly engineered proteins, often achieving multiple-fold improvements in the expression of properly folded antibody fragments, full length antibodies, human serum proteins, and hormones. Additionally, we have developed Bionic ™ SoluPro® strains and technologies that enable site-specific incorporation of nonstandard amino acids into target proteins (consequently Bionic™ proteins) during production. These nonstandard amino acids provide facile means for precise chemical modifications of the Bionic proteins, while still achieving desirable yields. We combine deep learning AI with advanced synthetic biology and strain engineering technologies to engineer bacterial hosts capable of producing proteins with complex folding and disulfide bond configurations, providing transformational efficiencies over conventional approaches and enabling creation of new Bionic protein modalities.