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Tunable Synthetic Transcriptional Regulators that are Responsive to Environmental Triggers

Engineered proteins derived from elastin-like polypeptides regulate toxic intermediates in metabolic pathways to precisely control gene expression for biomanufacturing and chemical production applications.

Currently, the regulation of toxic intermediates in metabolic pathways uses native regulators that are responsive to a given intermediate identified via transcriptional profiling. The current standard is limited to what nature currently provides and complex directed evolution schemes to alter.

Researchers at Purdue University have developed a series of engineered proteins derived from elastin-like polypeptides (ELPs) fused to transcription factors to control gene expression. This technology regulates toxic intermediates in metabolic pathways that can produce valuable chemicals. By using non-native transcription factors, it precludes the possible disruption of native processes and targets regulation to selected genes via the promoter sequence. Preliminary studies indicate that the reversible aggregation of ELPs fused to non-native transcription factors effectively function to control gene expression. As the degree of cellular health controls intracellular ionic strength and pH, designing synthetic regulators to recognize intracellular indicators of cellular health leads to the potential of precise programming to autoregulate expression of targeted pathway genes for biomanufacturing and other applications.

Advantages:

-Expands the regulation of toxic intermediates with universal stress-responsive ELPs

-Easily tailored

-Allows for target regulation of specific genes via non-native transcription factors and promoters

-Does not interact with native processes

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Potential Applications:

-Gene expression

-Biomanufacturing

-Microbial chemical factories

-Pharmaceuticals

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Intellectual Property:

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