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Synthetic Translation-Sensing Riboswitches

Translational coupling is a form of gene regulation in which the translation of one protein influences another. It is widely used in prokaryotes to control the production of genes within a metabolic pathway, or in bacteriophages to efficiently regulate translation within their extremely compact genomes.

Researchers at Arizona State University have developed a class of synthetic translational couplers termed translation-sensing riboswitches that detect protein translation and use that stimulus to regulate the expression of unrelated proteins. These riboswitches enable expression of multiple genes to be coupled and could be highly useful in a variety of applications. The riboswitches can serve as imaging tools for investigating post-transcriptional regulation in prokaryotes as well as provide a means to activate or deactivate entire metabolic pathways in response to a single molecular event. Utilizing the riboswitches upstream of genes or integrating them into more complex genetic circuits enables RNA-based regulation without requiring any changes to the output protein sequence.

Translation-sensing riboswitches represent a powerful, genetically compact new tool for tuning the expression of multiple genes. Furthermore, they are the first regulators of their kind that can operate successfully without modifying the sequences of their input or output genes. These properties make translation-sensing riboswitches uniquely useful in a variety of applications.

Potential Applications

- Bioimaging – direct monitoring of translation in vivo
- Regulating biochemical pathways for metabolic engineering

o Biofuels, bioplastics, fine chemicals, nutraceuticals, etc.

- Diagnostics – a means of amplification
- Tools for programming regulatory networks in vivo

Benefits and Advantages

- Tighter and more robust performance

- Doesn’t require changes to the input or output protein sequence

For more information about the inventor(s) and their research, please see Dr. Green’s department webpage