ProQC: Protein quality control system by synthetic decoupling of transcription and translation processes in Escherichia coli

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Tightly coupled transcription and translation system in prokaryotes can cause the production of non-functional polypeptides which are translated from early-terminated or degraded transcripts. In this study, a synthetic gene expression cassette was designed to improve the yield of the synthesis of full-length proteins in E. coli. We used toehold switches to decouple transcription and translation processes. By placing corresponding trigger sequences at 3'-end of mRNA, intact full-length mRNAs could only be translated. When fluorescence tags were attached at both N- and C-terminal ends, we found that equivalent fluorescent intensities from both ends were observed in our system. This result shows that decoupling of transcription and translation processes can be applicable to elevate the quality of gene expression, especially longer proteins.