TECHNOLOGY

Research Tool for Identification of Conditionally Enriched Protein Expression in Bacterial Cells

OVERVIEW

Background

Changes in environmental conditions can drastically change the protein content of cells. The amount of specific proteins (i.e., their expression levels) can increase or decrease quickly in response to these environmental changes in order to insure cell survival. This rapid process happens at the translational and post-translational levels. One mechanism bacteria use to reduce the stress associated with failed peptide synthesis is the transfer-messenger RNA (tmRNA) system. The tmRNA recognizes peptides in the process of synthesis that have stalled in the ribosome. The tmRNA then binds to the ribosome, ejecting the messenger RNA (mRNA) encoding the stalled protein while marking the incomplete peptide for degradation by the cell with a short peptide tag. During times of high stress, proteins that are unnecessary, difficult to synthesize, or potentially lethal in the stressed environment may be more likely to be tagged by the tmRNA system. The ability to identify these proteins after exposure to specific stressors, such as antibiotics, can help increase understanding the critical components of cell stress survival and antibiotic resistance.

Innovative Technology

Researchers at the University of Maryland have developed synthetic versions of the tmRNA system for the use in biological research. This system replaces the degradation signal encoded by the tmRNA with various epitopes for purification of the conditionally enriched proteome (i.e. 6X His tag). Instead of marking proteins for degradation during translation by the tmRNA system, the tmRNA tags the proteins with a common epitope allowing for isolation of these proteins from other cellular components for identification through proteomics or other basic methods. Another version of the synthetic tmRNA system replaces the degradation signal with short peptide motifs enabling fluorescent or electron microscopy imaging.

APPLICATIONS

· Proteomics research
· Systems biology research
· High-resolution imaging

ADVANTAGES

· High scalability with tmRNA systems naturally existing in all sequenced bacteria
· Interfaces with existing translational processes
· Direct tagging during translation allows for time-course studies
· Synthetic tmRNA system can use fluorescent tags for visualization studies

CONTACT INFO

UM Ventures
0134 Lee Building
7809 Regents Drive
College Park, MD 20742
Email: umdtechtransfer@umd.edu
Phone: (301) 405-3947 | Fax: (301) 314-9502

Additional Information

INSTITUTION

University of Maryland, College Park

PATENT STATUS

Pending

LICENSE STATUS

Available for non-exclusive license

CATEGORIES

- Research Tools, Antibodies, & Reagents

EXTERNAL RESOURCES

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