Engineered Ribozyme to Introduce Unnatural Amino Acids into Proteins

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- Biotechnology

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There are many biotechnology applications where it is necessary to introduce an unnatural amino acid at a specific location within a protein. Such modifications can be used to generate protein-protein interaction maps, track single molecules within cells, create reagents for use in biotechnology, or improve the pharmacokinetic properties of macromolecular therapeutics. Current technologies based on protein tRNA synthases are restricted by these enzymes' specificity for their amino acid substrates, limiting the amino acid substrates that can be used. To use these proteins within a cell, bio-orthogonal tRNA-synthase molecules that bind, recognize, and charge a foreign tRNA must be identified for each organism. RNA enzymes, ribozymes, capable of charging tRNAs with an activated amino acid have been identified; however, they are not capable of selecting and charging a single type of tRNA within a cell.

To find a more efficient recognition system, researchers at Purdue University have engineered a ribozyme that can be readily programmed to recognize a specific tRNA and charge it with an unnatural amino acid. This ribozyme can be easily delivered to a cell via plasmid, along with its tRNA substrates. The ribozyme also accepts a wide variety of amino acid substrates. Using a ribozyme catalyst instead of a protein catalyst, bypasses the need to translate an introduced gene within a cell. This technology has potential use in protein engineering as the charged tRNA products can be used to site-specifically introduce an unnatural amino acid into a protein sequence.

Advantages:
-Specifically charges tRNA with a wide variety of amino acids
-Programmable tRNA selectivity
-Easily delivered to cells
-Bypasses translation

Potential Applications:
-Protein Engineering

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Intellectual Property:

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