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Incorporation of Fluorescent Dipeptidomimetics into Peptides and Proteins

There is tremendous diversity in the structure and function of peptides and proteins, thus peptide and protein engineering is an area of intense interest. There are many means to accomplish peptide and protein engineering, but the overarching goal is to design and engineer the chemical structure to improve the molecular properties and achieve increased stability, better biological activity, improved reporting ability, etc.

Researchers at the Biodesign Institute of Arizona State University have developed novel modified ribosomes to mediate site-specific incorporation of peptides and peptidomimetics into proteins. Among other applications, these ribosomes enable the creation of novel fluorescent dipeptidomimetics and fluorescent proteins using in vitro translation systems. These novel engineered fluorescent peptidomimetics and proteins can be used for a variety of applications, mostly notably sensor and reporting applications.

This technology is a fundamental discovery for making modified peptides and proteins that is likely to enable numerous applications in a variety of fields.

Potential Applications

- Sensing
  - Biological sensors (in vitro and in vivo detection of intracellular ions and second messengers, measuring membrane potential, detecting receptor activation measuring metabolic functions, etc.)
- Reporting
  - Fluorescence microscopy applications (live cell/tissue imaging)
  - Flow cytometry applications
  - Multiplex labeling experiments
- Incorporation into smart/nanomaterials

Benefits and Advantages

- Enhanced fluorescent intensity - one protein gave a 20-fold enhanced intensity relative to wild-type blue fluorescent protein
- Stable structural analogues of GFP-chromophore
- Do not require activation by posttranslational modification to exhibit fluorescence
- Some engineered proteins had red-shifted emission spectrum
- Enhanced photostability

For more information about the inventor(s) and their research, please see Dr. Hecht's departmental webpage