Proteins That Fluoresce At Infrared Wavelengths Or Singlet Oxygen Upon Illumination

Tech ID: 22716 / UC Case 2008-303-0

BACKGROUND

The introduction of green and red fluorescent proteins has revolutionized gene expression studies. For applications involving highly pigmented or dense tissue, these proteins have certain shortcomings, such as interference from cellular auto fluorescence. Although used extensively in FRET systems, their usefulness measuring protein-protein interactions is limited to distances of angstroms. Initial attempts to generate fluorescent proteins (from cyanobacteria) that fluoresce at longer wavelengths did not result in constructs that could be easily expressed in mammalian cells. The addition of proteins that overcome these limitations and fluoresce in the infrared or generate singlet oxygen to aid in the investigation of protein-protein interactions over greater distances would provide an exciting addition to the fluorescent protein tool box available to the research community.

TECHNOLOGY DESCRIPTION

Dr. Roger Tsien recently developed a new family of fluorescent proteins that emit infrared light. Unrelated both genetically and structurally to GFPs and RFPs, these variants are dimeric in nature but have been monomerized and have been developed from a single bacterial species. The proteins represent truncated variants of the full-length proteins, which do not exhibit infrared fluorescence. When the truncated protein is loaded with specific co-factors, they have the ability to fluoresce in the infrared or generate singlet oxygen without the addition of exogenous small molecules. The co-factors necessary for IR emission or singlet oxygen generation are available in most cell types and bind spontaneously. This is an ongoing project and new variants continue to be developed and tested.

ADVANTAGES

- First genetically encoded labels that are excited by far-red light and fluoresce in the true infrared.
- First proteins that can generate singlet oxygen without exogenous small molecules at higher quantum yield than current systems (> 0.15 vs. 0.055 for ReAsh-Tetracystein).
- Easily expressed in mammalian cells.
- Easily excited by available and economical light sources and filter sets.
- Significantly less background from auto-fluorescence and without interference from most commonly used fluorophores.
- Singlet oxygen generation provides ability to detect protein-protein interactions over distances significantly greater than FRET systems (i.e. Tens of nm) and is independent of relative dipole orientation, usable in chromophore assisted light inactivation (CALI) and electron microscopy.
- Unrelated genetically and structurally to fluorescent proteins from *Aequorea* or *Discosoma* species.

STATE OF DEVELOPMENT

INTELLECTUAL PROPERTY INFO

RELATED MATERIALS

- See Science article.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	8,653,037	02/18/2014	2008-303

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OTHER INFORMATION

KEYWORDS

protein, Singlet Oxygen

CATEGORIZED AS

- **Research Tools**
  - Nucleic Acids/DNA/RNA

RELATED CASES

2008-303-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Personalized Protease fingerprinting for early cancer diagnosis
- Dual Reflectance-Fluorescence Guided Surgical System
- Molecules for Labeling Peripheral Nerves for use in Image Guided Surgery and Other Clinical Applications
- Proteins that Efficiently Generate Singlet Oxygen Background

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