Novel Monomeric And Bright Infrared Fluorescent Proteins

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BACKGROUND

Genetically-encoded fluorescent proteins have revolutionized cell biology and gene expression studies. Biologists utilize a rainbow of fluorescent proteins, with colors extending across most of the visible spectrum. However, fluorescence imaging in live animals using these proteins has been impeded by the inability of visible light to penetrate the body. Imaging deep into biological tissue is a challenge because proteins in the blood and skin absorb the light wavelengths typically used to excite and visualize fluorescent proteins. Mammalian tissues are penetrable by near-infrared wavelengths but existing infrared technologies for live animal imaging are not optimal; they often consist of non-specific dyes or bulky, multimeric proteins that require the addition of exogenous cofactors. Thus a major limitation in the field of fluorescent imaging is the availability of a genetically-encoded fluorescent protein that is suitable for live animal research.

TECHNOLOGY DESCRIPTION

Fluorescent protein experts at UCSF have specifically engineered a novel monomeric infrared fluorescent protein (mIFP). As a genetically-encoded protein, mIFP allows researchers to follow expression of their protein of interest in specific cell types or cell stages within a live animal. mIFPs can be non-invasively imaged across spatial scales, from subcellular resolution up to strongly pigmented organs within the whole, intact animal.

Unlike other infrared proteins that require addition of exogenous cofactors, mIFP spontaneously incorporates endogenous biliverdin, a naturally occurring cofactor, and becomes fluorescent. As a small monomeric protein, mIFP is less likely than multimeric infrared proteins to interfere with the function or localization of the protein of interest. Researchers demonstrated that both nuclear and actin-binding proteins tagged with mIFP localize properly within the cell. Brightness is also important for optimal detection of fluorescent proteins. In validation studies, mIFP displayed an approximately ten-fold increase in brightness compared to another previously described infrared fluorescent protein.

APPLICATIONS

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OTHER INFORMATION

KEYWORDS

in vivo/live animal imaging, infrared fluorescence, fluorescent protein

CATEGORIZED AS

- Research Tools
  - Reagents

RELATED CASES

2013-064-0

mIFP broadens the potential uses for non-invasive whole body imaging to areas such as:

- Preclinical disease studies for tracking fluorescently labeled cancer cells, stem cells, or gene therapy targets
- Studying drug effects on tissue
- As a surgical or diagnostic tool, mIFPs could enhance the detection and excision of small populations of cancer cells deep in a whole animal.

ADVANTAGES

- Allows for visualization through thick tissue
- As a small, monomeric protein, mIFP is less likely to disrupt the function or localization of proteins of interest than larger, dimeric infrared fluorescent proteins.
- Approximately ten-fold brighter than other monomeric infrared proteins and equally bright as dimeric infrared proteins
- Less background due to cellular autofluorescence; better resolution and spatial concentration than non infrared fluorescent proteins
- Easily excited and detected by standard microscopy instruments

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,815,870	11/14/2017	2013-064

RELATED MATERIALS

- Yu, D., Baird, M. A., Allen, J. R., Howe, E. S., Klassen, M. P., Reade, A., et al. (2015). a naturally monomeric infrared fluorescent protein for protein labeling. Nature Methods, 12(8), 763–765.
- Yu D, Dong Z, Gustafson WC, Ruiz-González R, Signor L, Marzocca F, Borel F, Klassen MP, Makhijani K, Royant A, Jan YN, Weiss WA, Guo S, Shu X. Rational design of a monomeric and photostable far-red fluorescent protein for fluorescence imaging in vivo. Protein Sci. 2015 Nov 9.

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