TANDEM ACTIVITY-BASED SENSING AND LABELING STRATEGY FOR REACTIVE OXYGEN SPECIES IMAGING

Tech ID: 34720 / UC Case 2021-069-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,571,801	03/10/2026	2021-069

BRIEF DESCRIPTION

Reactive oxygen species (ROS), including hydrogen peroxide and peroxynitrite, play dual roles as essential signaling molecules and high-stress markers of cellular damage. However, imaging these volatile species in live biological systems is often hindered by diffusion and poor signal localization. Researchers at UC Berkeley have developed a "tandem" activity-based sensing and labeling strategy that overcomes these challenges. This technology utilizes selective chemical probes that, upon reacting with a specific ROS, undergo a transformation that simultaneously triggers a fluorescent signal and anchors the probe to nearby cellular proteins. By "trapping" the signal at the site of its production, this dual-action mechanism allows for high-resolution, localized imaging of oxidative stress and signaling events within complex cellular environments.

SUGGESTED USES

- Disease Pathology Research: Imaging ROS fluctuations in cancer, neurodegeneration, and inflammatory diseases to understand how oxidative stress drives disease progression.
- Drug Toxicity Screening: Utilizing the probes in high-throughput assays to detect off-target oxidative stress caused by new pharmaceutical candidates.
- Metabolic Studies: Monitoring real-time ROS production in mitochondria or other organelles to study cellular energy production and aging.
- Diagnostic Imaging: Developing localized "turn-on" sensors for identifying areas of high inflammation or oxidative damage in tissue samples.
- Agricultural Science: Studying how plants respond to environmental stressors like drought or heat by tracking ROS signaling pathways.

ADVANTAGES

- Superior Localization: Unlike traditional "diffusible" probes, the tandem labeling mechanism prevents the signal from washing away, ensuring that the fluorescence represents the exact site of ROS production.
- High Selectivity: Engineered to distinguish between different types of reactive species, such as hydrogen peroxide versus organic peroxides, providing specific chemical insights.
- Reduced Background Noise: The "turn-on" fluorescent mechanism ensures that only active ROS events are visualized, significantly improving the signal-to-noise ratio.
- Live-Cell Compatibility: Designed to operate under physiological conditions, allowing for the observation of dynamic biological processes in living cells.
- Versatile Chemical Handles: The platform can be adapted with various fluorophores or protein-targeting groups to suit different imaging modalities and biological questions.

RELATED MATERIALS

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Thiophosphorodichloridate Reagents For Chemoselective Histidine Bioconjugation
- Puromycin Activity-Based Sensing Probes For Molecular Imaging And Histochemistry
- Activity-Based Ratiometric FRET Probe Detects the Changes in Labile Copper Pools
- Homoallylamines As Formaldehyde-Responsive Triggers With Imaging Applications
- Diagnostic Colorimetric Assay

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INVENTORS

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OTHER INFORMATION

CATEGORIZED AS

- **Biotechnology**
  - Health
  - Proteomics
- **Imaging**
  - Software
- **Research Tools**
  - Reagents
  - Screening Assays
- **Sensors & Instrumentation**
  - Biosensors
  - Scientific/Research

RELATED CASES

2021-069-0

- Urea-Oxaziridine Library Synthesis And Applications
- Fluorescent Probe for Selective Imaging of Carbon Monoxide in Living Cells Using Palladium-Mediated Carbonylation

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