ACTIVITY-BASED RATIOMETRIC FRET PROBE DETECTS THE CHANGES IN LABILE COPPER POOLS

Tech ID: 30289 / UC Case 2019-129-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,241,902	03/04/2025	2019-129

BRIEF DESCRIPTION

Monitoring trace metals within living organisms is vital for understanding cellular metabolism and diagnosing various genetic and metabolic disorders. Researchers at UC Berkeley have developed advanced fluorescent molecular probes designed to detect and measure copper levels, specifically targeting monovalent copper ions, directly inside live cells. The technology utilizes the principles of Förster resonance energy transfer, employing a molecular framework where two distinct light-emitting components are linked together. When the probe encounters monovalent copper, a specific binding event triggers a structural shift that alters the distance or orientation between these components, resulting in a measurable change in the color of the emitted fluorescence. This non-invasive tracking method allows scientists to observe the real-time dynamics, trafficking, and accumulation of copper within complex cellular environments without disrupting natural biological functions.

RELATED MATERIALS

SUGGESTED USES

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Biomedical Research: Mapping the distribution and movement of copper ions in cellular models to study the underlying mechanisms of neurodegenerative disorders, such as Alzheimer's disease, Wilson's disease, and Menkes disease.

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Diagnostic Assays: Developing high-throughput screening tools to identify abnormal copper regulation and transport defects in patient tissue samples.

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Drug Discovery: Testing candidate pharmaceuticals to evaluate their efficacy in correcting metal imbalances or mitigating heavy metal toxicity inside living cells.

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Environmental Toxicology: Assessing the biological impact and toxicity profiles of environmental copper contamination on human and animal cell models.

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OTHER INFORMATION

KEYWORDS

fluorescent, copper probe, oxidative stress, cancer, ratiometric, activity-based sensing

CATEGORIZED AS

» **Biotechnology**
» Health
» Other
» **Medical**
» Diagnostics
» **Sensors & Instrumentation**
» Medical
» Scientific/Research

RELATED CASES

2019-129-0

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Nutritional Studies: Investigating how dietary factors and supplements influence the absorption and intracellular bio-availability of essential copper nutrients.

ADVANTAGES

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High Specificity: Distinctly responds to monovalent copper ions while remaining unaffected by other abundant intracellular metal ions such as zinc, iron, or calcium, minimizing false-positive readings.

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Live-Cell Compatibility: Enables real-time, non-destructive visualization of metal fluctuations within active living structures rather than requiring fixed or destroyed cell samples.

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Ratiometric Readout: Capitalizes on the Förster resonance energy transfer mechanism to provide a ratio-based signal, which naturally corrects for variations in probe concentration, cell thickness, and laser intensity.

»

Exceptional Sensitivity: Capable of detecting trace physiological concentrations of copper, providing highly precise measurements even in low-abundance cellular compartments.

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Membrane Permeability: Engineered to easily pass through cellular membranes while exhibiting low toxicity, ensuring the probe integrates smoothly into standard cell culture workflows.

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Puromycin Activity-Based Sensing Probes For Molecular Imaging And Histochemistry
- Homoallylamines As Formaldehyde-Responsive Triggers With Imaging Applications
- Diagnostic Colorimetric Assay
- Tandem Activity-Based Sensing and Labeling Strategy for Reactive Oxygen Species Imaging
- Fluorescent Probe for Selective Imaging of Carbon Monoxide in Living Cells Using Palladium-Mediated Carbonylation

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