

Improved red indicator for cellular calcium assays

Researchers in Prof. Karl Deisseroth's laboratory have engineered a cytosolic, red genetically encoded calcium indicator (GECI) with high signal change at single cell resolution. Currently, red GECIs (such as jrGECO1a) are limited because they accumulate in the lysosome, thus reducing their signal. To overcome this problem, this new GECI (sRGECO) has improved cellular trafficking so that it will remain in the cytosol. This results in far superior base-line fluorescence, decay kinetics, signal-to-noise ratio, and changes in signal amplitude. In addition, as a red indicator, sRGECO's excitation wavelength can penetrate deeper with less cell damage than wavelengths for green indicators. Because calcium is one of the most versatile and universal signaling agents, this GECI could be used in a wide variety of long-term, repetitive and unbiased functional assays of specific cell types. Cytosolic sRGECO opens up new landscapes for understanding functional mechanisms in neurons, muscle, cardiac cells or embryonic stem cells in vitro or in vivo.

Stage of Research

The inventors have engineered the sRGECO indicator and performed kinetic studies on rat neurons to determine base-line fluorescence, decay kinetics, signal-to-noise ratio and changes in the signal amplitude. By all four parameters, the sRGECO was far superior to the jrGECO.

Applications

- **Visualizing cellular activity** - real time assays calcium dependent cells of single cells or wide networks, for analysis of neurons, muscle cells or cardiac cells with end-user applications in:
 - research
 - drug discovery
 - in vivo imaging

- optogenetics

Advantages

- **Improved signal in vitro and in vivo:**
 - this engineered GECI does not accumulate in the lysosome like previous red GECI's, resulting in far superior base-line fluorescence, decay kinetics, signal-to-noise ratio and changes in the signal amplitude
 - visualize cellular activity in real time
- **Versatile and universal signaling agent** with effects on neurons, tumor cells, stem cells, cardiac cells and other muscle cells
- **Advantages of red GECI over green:**
 - **less tissue damage** - excitation wavelength for red GECI causes less tissue damage with the potential for long-term imaging
 - **deep indicator** - penetrance of red indicator is much deeper

Patents

- Published Application: [20180372762](#)
- Issued: [11,531,035 \(USA\)](#)

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