LumiSTAR
Biotech for revolution in *light*

智盛生物科技有限公司
Pentagon Technology Limited.
www.pentagontek.com

LumiSTAR provides various protein-based genetically encoded indicators with viral delivery and expression systems. The products have superior properties as following:

- Easy operation & less toxicity
- Steady expression for long term recording (Up to 1 month)
- Real-time observation & dynamic functional test
- Various wave-length window for simultaneous observation on different organelles
- Compatible with ChR2 for all-optical control and measurement (K-GECO & NIR-GECO)
- Customized design is available

LumiSTAR's Tool Box:

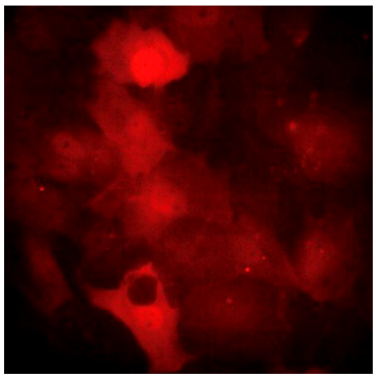
Ca^{2+} indicator
- Cytosol
- Mitochondria
- ER/SR

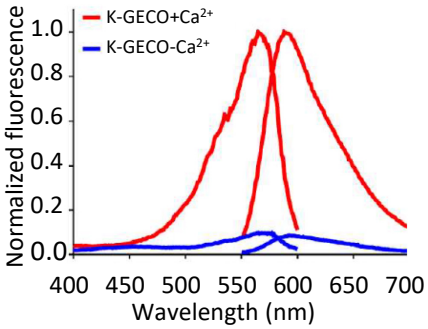
ROS indicator
- Cytosol
- Mitochondria
- Peroxisome

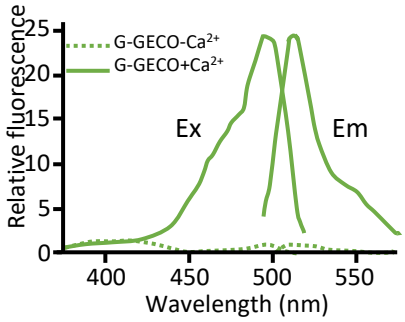
Calcium Indicators

The use of genetically encoded Ca^{2+} indicators (GECIs) has proven to be an indispensable tool for studying the spatio-temporal dynamics of cellular Ca^{2+} signals in vivo and in vitro. They have been adopted as chronic probes for simultaneously monitoring neuronal activity in contexts ranging from dissociated neurons in vitro to brain activity in behaving animals. Numerous examples of imaging calcium transients in other cell types, such as cardiomyocytes and pancreatic beta cells, for studying Ca^{2+}-mediated signal transduction can also be found in literature.

Calcium Indicators – Cytosol





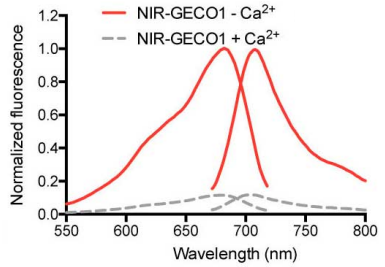


Drug screening/ Functional assays	Cell/sub-cellular localization	*Excitation window (nm)	*Emission window (nm)	Kd
K-GECO	Cytosol	568	594	165 nM
G-GECO	Cytosol	498	512	620 nM

Calcium Indicators – Near Infrared

Near-infrared (NIR) indicators create a new spectral window out of visible light. Now you can probe more organelles at the same time with extra advantages:

- Minimize auto-fluorescence
- Reduce phototoxicity
- Probe deep tissues



Drug screening/ Functional assays	Cell/sub-cellular localization	*Excitation window (nm)	*Emission window (nm)	Kd
NIR-GECO1	Cytosol	678	704	885 nM
NIR-GECO2G	Cytosol	640	685	480 nM

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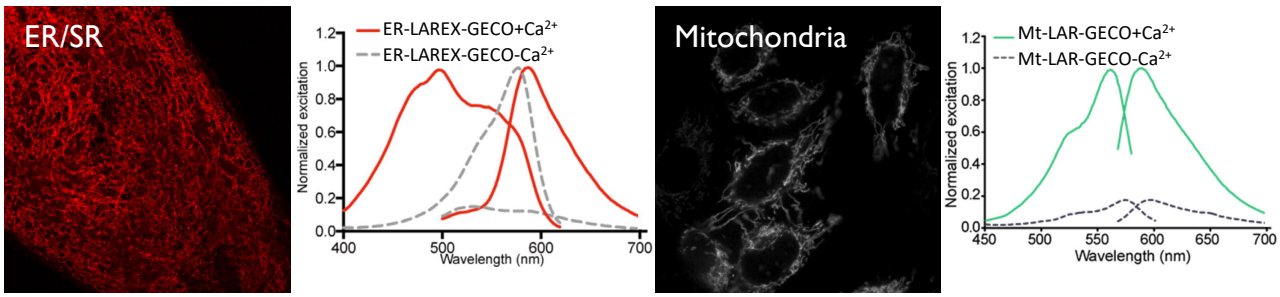
Calcium Indicators – ER/SR & Mitochondria

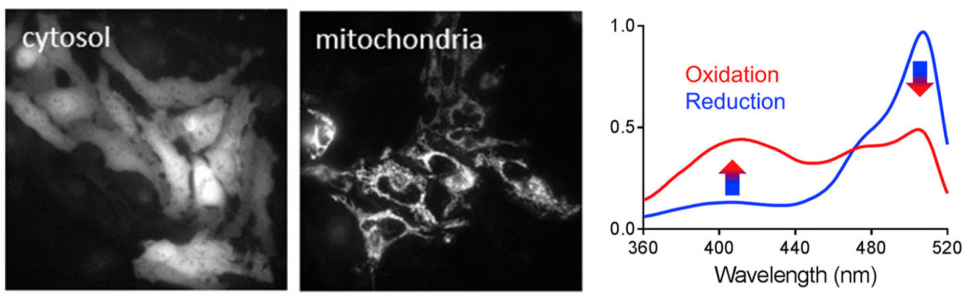
Sub-cellular compartments such as the mitochondria, the endoplasmic reticulum (ER), and the SR, have calcium ion (Ca^{2+}) concentrations ranges spanning from low micromolar to high millimolar. In compartments with high Ca^{2+} concentrations, fluorescent indicators which are optimized for the detection of cytoplasmic Ca^{2+} (typically in the 0.1 to 10 μM range) become saturated and unresponsive to physiologically relevant changes in Ca^{2+} concentration. To address this problem, substantial research effort has gone into developing low affinity Ca^{2+} indicators, including genetically encoded fluorescent proteins (FP). In contrast to synthetic dye-based indicators, FP-based indicators are delivered to the cell as their corresponding DNA coding sequences and can include additional sequences for expression in specific tissues or targeted to specific subcellular compartments.



Drug screening/ Functional assays	Cell/sub-cellular localization	*Excitation window (nm)	*Emission window (nm)	Kd
ER-LAREX-GECO	ER/SR	480	590	560 μM
	ER/SR	480,590 (ratio)	600- (ratio)	560 μM
Mt-LAR-GECO	Mitochondria	561	594	60 μM

ROS Indicators

Reactive oxygen species (ROS) are produced as an inevitable byproduct of oxidative phosphorylation in healthy and cancer cells. Cancer has higher ROS from increased metabolic activity, mitochondrial dysfunction, increased cellular receptor signaling and other oncogene activity, but cancer can tolerate it by increase the expression of ROS scavenger. Here we generated genetically encoded H_2O_2 sensor that has high sensitivity for ROS, allows for the ratiometric real-time analysis of ROS generation in living cells. roGFPs sensor can be excited by blue light with wavelength 405 and 488nm and detected at 510nm. The ratio of 405nm/488nm indicates the redox-status within the cells.

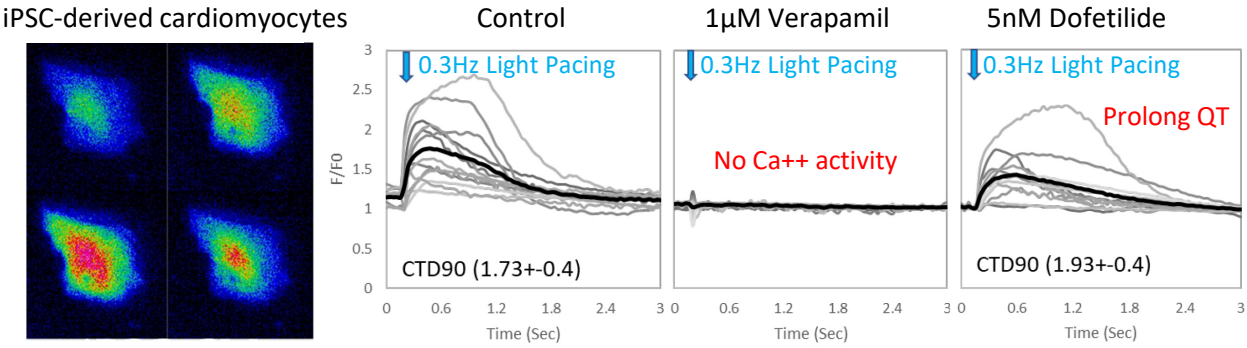


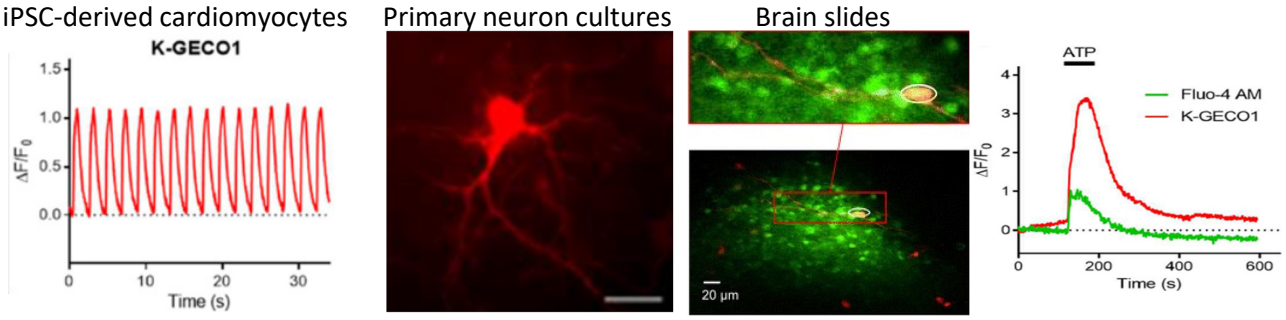
Drug screening/ Functional assays	Cell/sub-cellular localization	*Excitation window (nm)	*Emission window (nm)
ROS-ROGFP	Cytosol	405,488	510
MtROS-ROGFP	Mitochondria	405,488	510
perROS-ROGFP	Peroxisome	405,488	510

Examples of application:

K-GECO

Improved Red-shifted Cytosolic Ca^{2+} indicators
- Compatible with optogenetic operation

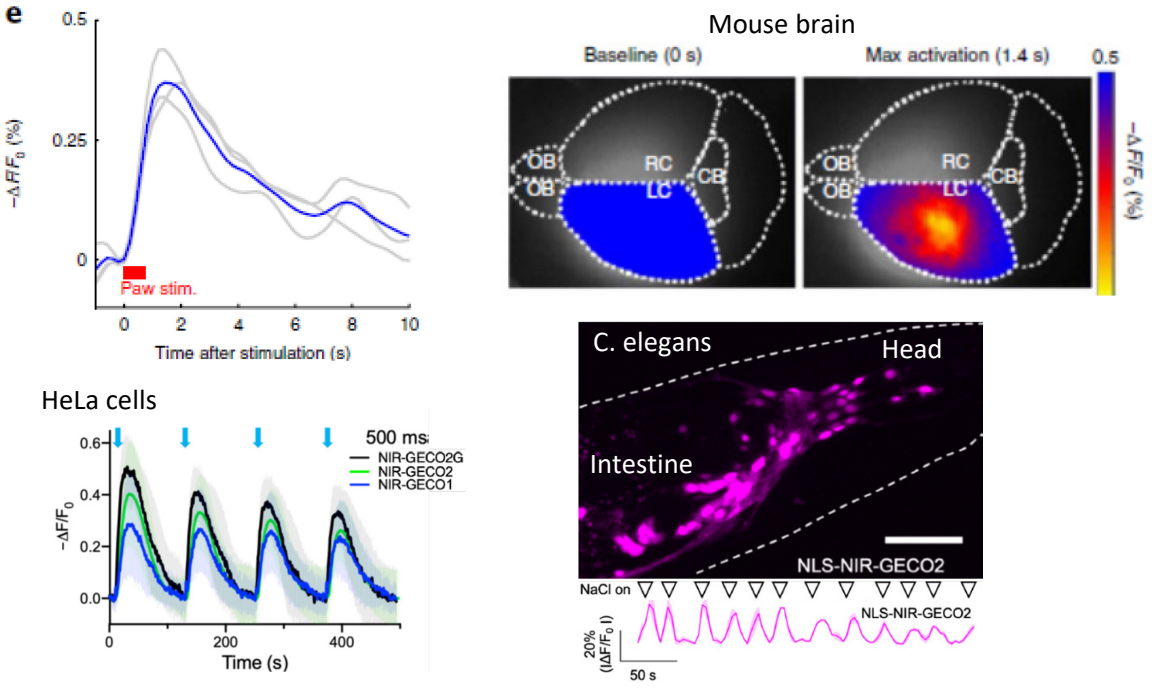




Shen Y. et al., (2018) A genetically encoded Ca^{2+} indicator based on circularly permutated sea anemone red fluorescent protein eqFP578. *BMC Biol.*

NIR-GECOs

Powerful tool for Ca^{2+} dynamic imaging of deep tissues

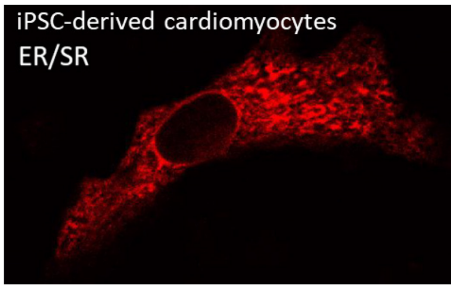


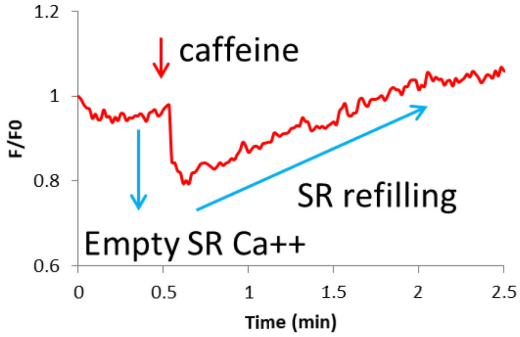
Qian Y. et al., (2019) A genetically encoded near-infrared fluorescent calcium ion indicator. *Nature method.*
Qian Y. et al., (2020) Improved genetically encoded near-infrared fluorescent calcium ion indicators for in vivo imaging. *PLoS Biol.*

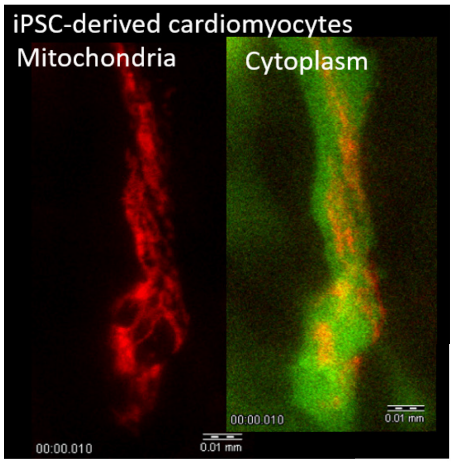
Examples of application:

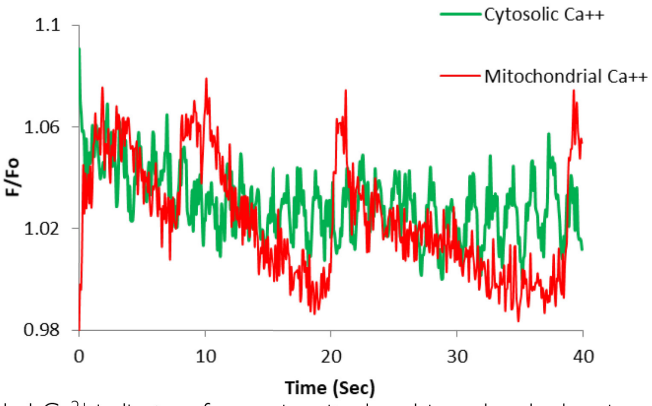
ER/SR & mitochondrial Ca^{2+} indicators

Low affinity GECIs are required in study organelle Ca^{2+}







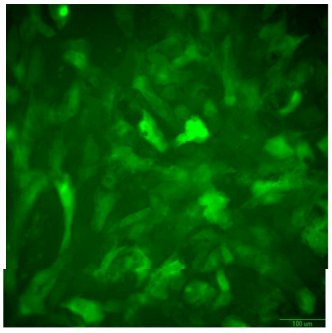


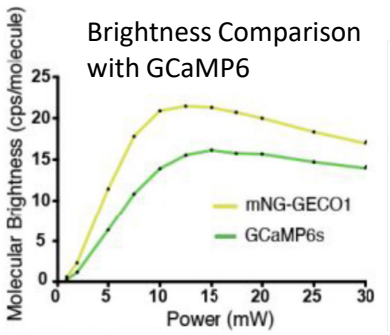
Wu J. et al., (2014) Red fluorescent genetically encoded Ca^{2+} indicators for use in mitochondria and endoplasmic reticulum. *Biochem J.*

mNG-GECO1 Coming Soon!

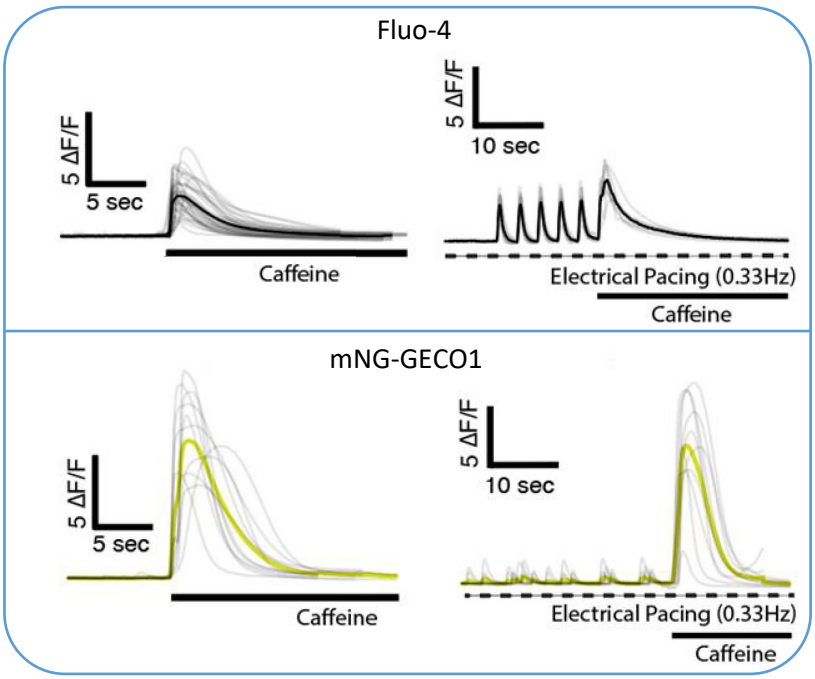
Brighter than GCaMP6 and less toxicity than Ca^{2+} chemical dye!

iPSC-derived cardiomyocytes





iPSC-derived cardiomyocytes: Comparison with Fluo-4



Zarowny L. et al., (2020) A bright and high-performance 1 genetically encoded Ca^{2+} indicator based on mNeonGreen fluorescent protein. *ACS Sens.*

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