ION BIOSCIENCES

BAPTA JF™549

A High-Performance Red Calcium Indicator for Optogenetics and Live-Cell Calcium Imaging

Calcium signalling plays a pivotal role in a wide array of physiological processes, from cardiac contraction and neurotransmission to immune responses and gene expression. The ability to monitor intracellular calcium dynamics with precision has significantly evolved with the advent of next-generation fluorescent indicators. BAPTA JF™549, built on the Janelia Fluor® dye platform, stands out as a robust and sensitive tool designed for researchers demanding accuracy, brightness, and photostability in live-cell imaging.

Next-Generation Dye for Advanced Applications

BAPTA JF™549 is a red-shifted, single-wavelength calcium indicator that pairs the high-affinity calcium chelator BAPTA with the cutting-edge JF549 fluorophore. This combination enables rapid and reversible calcium binding, making it ideal for high-speed and long-duration imaging experiments.

Key chemical and optical characteristics

Excitation/Emission:	546 nm / 569 nm
Calcium Affinity (Kd):	~310 nM
Format:	AM ester for intracellular delivery
Solubility:	DMSO
Compatibility:	TRITC filter sets and Cy3 detection systems
Storage:	-20°C

VALIDATED PERFORMANCE IN DIVERSE EXPERIMENTAL SYSTEMS

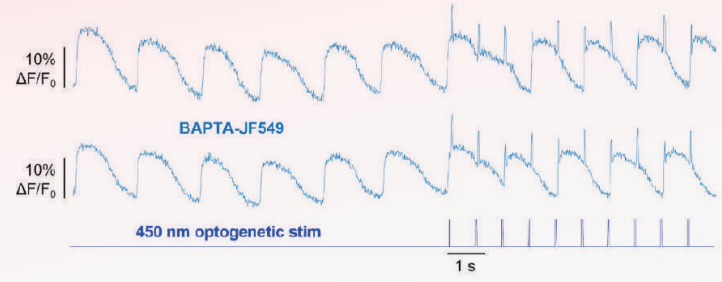
BAPTA JF™549 has been rigorously tested in multiple biological models, showcasing its versatility and exceptional performance across both in vitro and ex vivo systems.

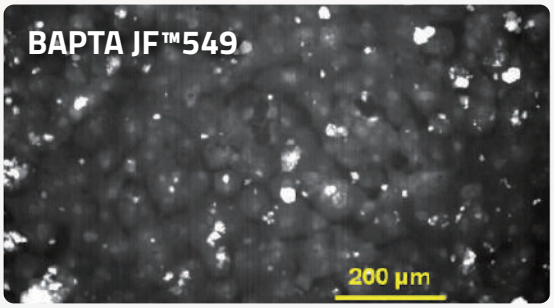
Optogenetic Stimulation of Cardiomyocytes

In a study conducted by a top 20 pharmaceutical company, human iPSC-derived cardiomyocytes were lentivirally transduced with channelrhodopsin for optogenetic control and imaged 6 days later. Cells were loaded with BAPTA JF™549 following ION Biosciences' standard protocol.

- Functional calcium recordings were captured at 100 frames per second using excitation at 561 nm and 595/31 nm emission.
- Cells initially exhibited spontaneous beating followed by controlled optogenetic stimulation (10 pulses with 700 ms intervals).
- Action potentials were reliably triggered by every other stimulus, demonstrating robust dye responsiveness and signal fidelity.
- Although brief crosstalk from stimulation light was observed, there was no extended perturbation of the fluorescent signal, affirming the indicator's photostability and fast kinetics.

This application illustrates the dye's utility in high-speed cardiac imaging and optogenetic studies, offering reliable tracking of beat-to-beat calcium oscillations.





Data source: Top 20 Pharmaceutical Company

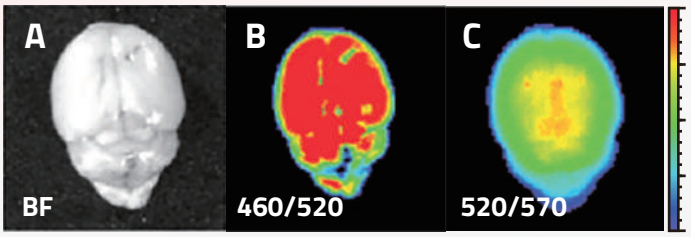
Stratech

Reduced Autofluorescence at Red Wavelengths in Brain Tissue

One of the advantages of BAPTA JF™549 is its red-shifted emission, which minimizes background noise from tissue autofluorescence—a major challenge in brain imaging.

- In vivo studies of CNS tissues have shown that autofluorescence significantly decreases at longer wavelengths, enhancing signal clarity.
- Data adapted from Moreno et al. (2020) supports the notion that dyes emitting in the red/NIR spectrum—such as BAPTA JF™549—provide clearer images in neural tissues due to reduced background fluorescence.

This makes BAPTA JF™549 especially suitable for brain slice imaging, in vivo microscopy, and CNS drug discovery workflows.

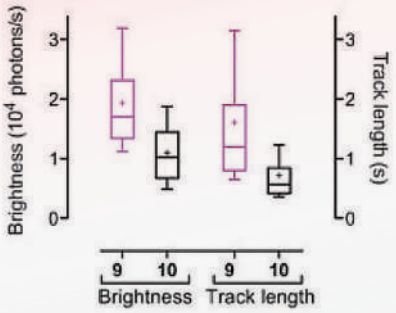


Data Source: *Adapted from Moreno, M. J., Ling, B., & Stanimirovic, D. B. (2020). In vivo near-infrared fluorescent optical imaging for CNS drug discovery. Expert Opinion on Drug Discovery, 15(8), 903–915.*

Superior Brightness and Photostability

Compared to older-generation dyes such as tetramethylrhodamine (TMR), BAPTA JF™549 demonstrates significantly higher brightness and longer photostability.

- In a benchmark study (Grimm et al., 2015), JF-based dyes outperformed conventional fluorophores in terms of signal intensity and resistance to photobleaching.
- This translates into longer imaging sessions without loss of signal, critical for time-lapse experiments and high-resolution analysis.

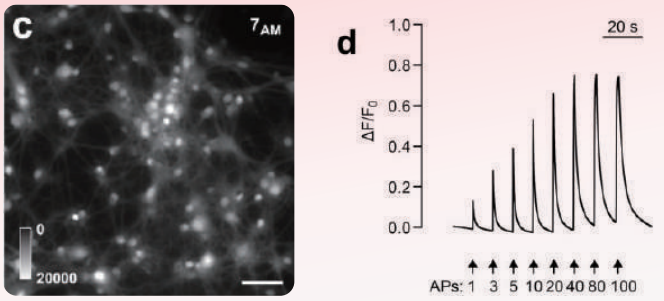


Data Source: *Grimm, Jonathan B et al. "A general method to improve fluorophores for live-cell and single-molecule microscopy." Nature methods vol. 12,3 (2015).*

Fast Calcium Transient Detection in Neurons

BAPTA JF™549's kinetic responsiveness has also been validated in hippocampal neurons, where rapid calcium spikes are fundamental to synaptic signalling.

- As reported by Deo et al. (2019), JF-based indicators like BAPTA JF™549 can capture fast calcium transients that traditional dyes may miss.
- This underscores its value in neuroscience research, particularly for studying neuronal firing, dendritic activity, and plasticity.



Data Source: *Adapted from Deo, Claire, et al. "Isomeric tuning yields bright and targetable red Ca2+ indicators." Journal of the American Chemical Society 141.35 (2019): 13734-13738.*

Conclusion: *Precision Meets Versatility*

Whether used in cardiac cells, brain slices, or primary neurons, BAPTA JF™549 provides a high-performance, red-emitting solution for calcium imaging. Its superior photophysical properties—brightness, stability, and spectral window—make it ideal for both single-cell and high-throughput studies.

Red-shifted emission: Reduces tissue autofluorescence

Fast response: Ideal for optogenetic and fast transient events

High brightness and photostability: Enables long-term, high-resolution imaging

Applicable to neurons, cardiomyocytes, and brain tissues

Compatible with multicolor and high-speed imaging systems

For researchers seeking a trusted, validated calcium indicator with cutting-edge performance, BAPTA JF™549 is a compelling choice backed by both peer-reviewed data and industrial application.