

# Cellular Stains

Selection guide for live and fixed cell staining

# Find stains that fit your workflow

	Live/intact cell imaging	Stain live cells, then fix	Stain live cells, then fix & permeabilize	Stain fixed cells or tissue sections
<b>Nuclear Stains</b>	<ul style="list-style-type: none"> <li>•NucSpot® Live</li> <li>•RedDot™1 Far-Red</li> <li>•Hoechst dyes</li> </ul>	<ul style="list-style-type: none"> <li>•NucSpot® Live</li> <li>•Hoechst dyes</li> </ul>	<ul style="list-style-type: none"> <li>•NucSpot® Live</li> <li>•Hoechst dyes</li> </ul>	<ul style="list-style-type: none"> <li>•NucSpot® Live</li> <li>•RedDot™2 Far-Red</li> <li>•NucSpot® Nuclear Stains</li> <li>•Hoechst or DAPI</li> </ul>
<b>Membrane/Cell Surface Stains</b>	<ul style="list-style-type: none"> <li>•CellBrite®, CellBrite® NIR, &amp; CellBrite® Fix</li> <li>•CellBrite® Steady</li> <li>•MemBrite® Fix</li> <li>•CF® Dye WGA or Con A</li> <li>•CF® Dye Cholera Toxin</li> </ul>	<ul style="list-style-type: none"> <li>•CellBrite®, CellBrite® Fix, &amp; CellBrite® NIR</li> <li>•MemBrite® Fix Surface Stains</li> <li>•CF® Dye WGA or Con A</li> <li>•CF® Dye Cholera Toxin</li> </ul>	<ul style="list-style-type: none"> <li>•CellBrite® Fix</li> <li>•MemBrite® Fix</li> <li>•CF® Dye WGA or ConA</li> <li>•CF® Dye Cholera Toxin</li> </ul>	<ul style="list-style-type: none"> <li>•CellBrite® &amp; CellBrite® NIR</li> <li>•CF® Dye WGA or Con A</li> <li>•CF® Dye Cholera Toxin</li> </ul>
<b>Organelle &amp; Cytoskeleton Stains</b>	<ul style="list-style-type: none"> <li>•ViaFluor® Microtubule Stains</li> <li>•MitoView™ Dyes</li> <li>•LysoView® Stains</li> <li>•LipidSpot® Lipid Droplet Stains</li> </ul>	<ul style="list-style-type: none"> <li>•MitoView™ Green</li> <li>•MitoView™ Fix 640</li> <li>•LipidSpot® Lipid Droplet Stains</li> </ul>	<ul style="list-style-type: none"> <li>•LipidSpot® Lipid Droplet Stains</li> <li>•MitoView™ Fix 640</li> </ul>	<ul style="list-style-type: none"> <li>•CF® Dye Phalloidins</li> <li>•MitoView® Green</li> <li>•Mitochondrial mAbs &amp; other organelle antibodies</li> <li>•LipidSpot® Lipid Droplet Stains</li> </ul>
<b>Whole Cell/Cytoplasm</b>	<ul style="list-style-type: none"> <li>•ViaFluor® SE Cell Proliferation &amp; Tracing Dyes</li> <li>•Calcein-AM</li> </ul>	<ul style="list-style-type: none"> <li>•ViaFluor® SE Cell Proliferation &amp; Tracing Dyes</li> </ul>	<ul style="list-style-type: none"> <li>•ViaFluor® SE Cell Proliferation &amp; Tracing Dyes</li> </ul>	
<b>Vesicle &amp; Endocytic Tracking</b>	<ul style="list-style-type: none"> <li>•CF® Dye Transferrin</li> <li>•CF® Dye Cholera Toxin</li> <li>•CF® Dye Dextran</li> <li>•SynaptoRed™/SynaptoGreen™</li> </ul>	<ul style="list-style-type: none"> <li>•CF® Dye Transferrin</li> <li>•CF® Dye Cholera Toxin</li> <li>•CF® Dye Dextran</li> <li>•AM &amp; HM Nerve Terminal Dyes</li> </ul>	<ul style="list-style-type: none"> <li>•CF® Dye Transferrin</li> <li>•CF® Dye Cholera Toxin</li> </ul>	
<b>Apoptotic Cell Stains</b>	<ul style="list-style-type: none"> <li>•NucView® Caspase-3 Substrates</li> <li>•CF® Dye Annexin V Conjugates</li> <li>•Oxazole Yellow (YO-PRO®-1)</li> <li>•Oxazole Blue (PO-PRO™-1)</li> </ul>	<ul style="list-style-type: none"> <li>•NucView® Caspase-3 Substrates</li> <li>•CF® Dye Annexin V Conjugates</li> </ul>	<ul style="list-style-type: none"> <li>•NucView® Caspase-3 Substrates</li> </ul>	<ul style="list-style-type: none"> <li>•CF® Dye TUNEL Assay</li> </ul>
<b>Viability/Dead Cell Stains</b>	<ul style="list-style-type: none"> <li>•Live-or-Dye™ Fixable Viability Stains</li> <li>•Live-or-Dye NucFix™ Red</li> <li>•Dead cell nuclear stains</li> </ul>	<ul style="list-style-type: none"> <li>•Live-or-Dye™ Fixable Viability Stains</li> <li>•Live-or-Dye NucFix™ Red</li> </ul>	<ul style="list-style-type: none"> <li>•Live-or-Dye™ Fixable Viability Stains</li> <li>•Live-or-Dye NucFix™ Red</li> </ul>	

# Overview of organelle & cytoskeleton stains

## Membrane & Cell Surface

- Lipophilic carbocyanine dyes for live or fixed cells
- Lectin conjugates for staining cell surface glycoproteins in live or fixed cells
- Covalent membrane & surface stains for fixable live cell staining

## Lipid Droplets

Neutral lipid stains for live or fixed cells

## Cytoskeleton

- Live cell microtubule stains
- Phalloidin conjugates for fixed cells

## Nucleus

Blue, green, and red stains with various properties for labeling fixed, dead, or live cells

## Lysosomes

Membrane-permeant, weakly basic dyes become protonated at low pH, causing them to accumulate and fluoresce in the acidic environment of lysosomes

## Mitochondria

Membrane-permeant dyes that accumulate in mitochondria due to their charge & lipophilicity; some dyes respond to mitochondrial membrane potential

## Vesicle Trafficking

- Lipophilic styryl dyes for dynamic labeling of vesicles
- Fluorescent toxins and ligands for receptor-mediated endocytosis
- Fluorescent dextrans for fluid phase tracing

## Cytoplasm

- Stable, covalent live cell cytoplasmic stains for cell division analysis by flow or tracking cells in culture
- Non-covalent cytoplasm stains for cell viability & dye efflux assays

# Cellular Stains Comparison Guides

Find stains for different applications, cellular targets, and organisms at a glance

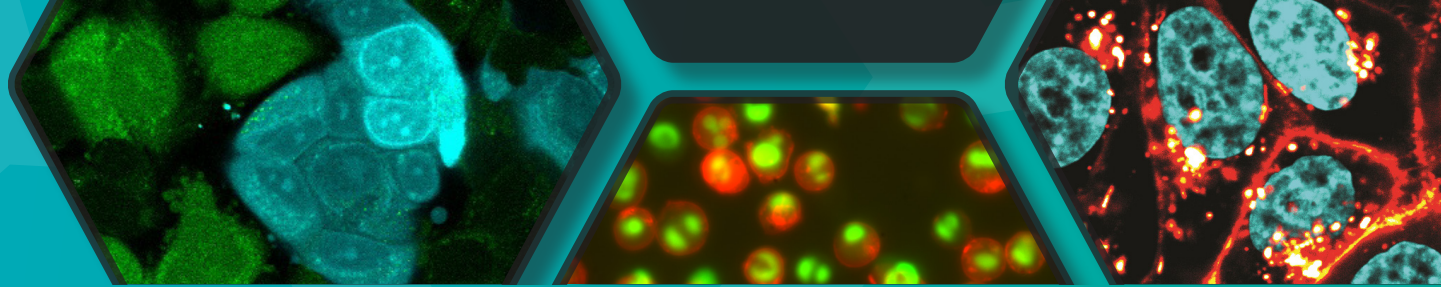
## Live Cell Stains

Product	Localization	Fixable	Can perm?	Stains fixed cells	Toxic	Stability <sup>1</sup>	Colors	Applications / Notes
Hoechst or DAPI	Nucleus	Yes	Yes	Yes	No	Days	Blue (352/461 nm)	• No-wash, non-toxic, stable for several days
NucSpot® Live Nuclear Stains	Nucleus	Yes	Yes	Yes	No	Days	Green (500/515 nm) Far-red (650/675 nm)	• No-wash, non-toxic for real-time imaging
RedDot™1 Far-Red Nuclear Stain	Nucleus	No	No	No	Yes	< 4 hrs	Far-red (662/694 nm)	• No-wash nuclear staining (compare to Draq5™) • Toxic after several hours
ViaFluor® Live Cell Microtubule Stains	Microtubules	No	No	No	Low	Days	Blue (408/452 nm) Green (500/515 nm) Far-red (650/675 nm)	• No-wash, live cell microtubule stains • Low toxicity, stain for 48 hours or longer
ViaFluor® SE Cell Proliferation & Tracing Dyes	Cytoplasm	Yes	Yes	No	No	Days	Blue (408/452 nm) Green (493/532 nm)	• Stable, whole-cell labeling of live cells • Non-toxic for tracking multiple cell divisions • Excellent choice for cell tracing/co-cultures
Calcein-AM	Cytoplasm & cell viability	No	No	No	No	≤ 24 h	Green (494/517 nm)	• Short-term, whole-cell labeling of live cells • For cell viability or dye efflux assays
CellBrite® Cytoplasmic Membrane Dyes	Membranes <sup>4</sup>	Yes <sup>2</sup>	No <sup>3</sup>	Yes <sup>2</sup>	No	Days to weeks <sup>4</sup>	8 Colors Blue to Near-IR	• Lipophilic dyes for stable, non-toxic membrane labeling • Fix before or after labeling <sup>2,3</sup> • Stable cell labeling for cell tracking/transplantation <sup>3</sup>
CellBrite® Fix Membrane Stains	Membrane & cell surface <sup>4</sup>	Yes	Yes	No	No	Days <sup>4</sup>	Green (480/513 nm) Red (542/571 nm) Far-red (638/667 nm)	• Covalent membrane labeling • More uniform staining than lipophilic dyes • Stain yeast and bacteria
MemBrite® Fix Cell Surface Stains	Cell surface <sup>4</sup>	Yes	Yes	No	No	Days <sup>4</sup>	12 colors Blue to Near-IR	• Covalent, rapid, and uniform labeling of surface proteins • Stain yeast and gram-positive bacteria
CellBrite® Steady Membrane Staining Kits	Cell surface	No	No	No	No	Days	5 colors Blue to Near-IR	• Long-term cell surface labeling without internalization • STORM-compatible options available
LipidSpot™ Lipid Droplet Stains	Lipid droplets	Yes <sup>2</sup>	Yes	Yes	No	Days	Green (427/585 nm) Red/Far-red (610/663 nm)	• Neutral lipid droplet stains • Fix/permeabilize before or after staining <sup>2</sup>
SynaptoGreen™ & SynaptoRed™ Nerve Terminal Dyes	Vesicles	Yes <sup>6</sup>	Yes <sup>6</sup>	No	No	Minutes to hours	Green (~480/600 nm) Red (~510/750 nm)	• Cationic styryl dyes for tracking endocytic vesicles • Dye options with fixable amine group • Equivalent to FM® dyes
CF® Dye Cholera Toxin Conjugates	Lipid rafts	Yes	Yes	Yes	No	≤ 24 h	6 colors <sup>8</sup> Green to Near-IR	• Binds GM1 ganglioside in lipid rafts • For cell surface labeling or neuronal tracing • Staining can be heterogeneous in cultured cells
CF® Dye Transferrin Conjugates	Endocytic tracer	Yes	Yes	No	No	≤ 24 h	7 colors <sup>8</sup> Green to Near-IR	• Transferrin receptor ligand • Traffics to recycling endosomes
CF® Dye Dextrans	Fluid phase tracer	Yes	No	No	No	≤ 24 h	Wide selection <sup>8</sup> Green to Near-IR	• For fluid phase endocytosis or permeability tracing • Available with a range of molecular weights
CF® Dye WGA, ConA, or PNA	Cell surface glycoproteins <sup>5</sup>	Yes	Yes	Yes	Possibly	≤ 24 h	Wide selection <sup>8</sup> UV to Near-IR	• Lectins that bind to cell surface glycoproteins <sup>4,5</sup> • Staining and biological effects vary by cell type • Also see Stains for Mammalian Cells, Bacteria, & Yeast
LysoView™ Dyes	Lysosomes	No	No	No	No	Days	Blue, Green, Orange, Far-red	• No wash, live cell staining of lysosomes
MitoView™ Dyes	Mitochondria & cell viability	No <sup>7</sup>	No	No <sup>7</sup>	No	Days	Blue, Green, Far-red, Near-IR	• No wash, live cell staining of mitochondria • MitoView™ 633 is responsive to mitochondrial potential
MitoView™ Fix 640	Mitochondria & cell viability	Yes	Yes	No	No	Days	Far-red (644/665 nm)	• Fixable mitochondrial stain • No wash, non-toxic, stable live cell staining
JC-1	Mitochondria & cell viability	No	No	No	No	Days	Green (510/527 nm) Red (585/590 nm)	• Stains cytoplasm green, healthy mitochondria red • Ratiometric mitochondrial membrane potential dye
Rhodamine 123, TMRM, TMRE	Mitochondria & cell viability	No	No	No	No	Days	Green (505/534 nm) Red (549/574 nm)	• Preferred dyes for quantitative mitochondrial membrane potential measurement

1. Stability of staining is a general guideline only, actual stability may depend on cell type/experimental system.
2. Formaldehyde fixation only, does not tolerate alcohol/solvent treatment
3. Dyes have poor tolerance for detergent, but cells can be stained after fixation with good results.
4. Surface staining is internalized by endocytosis, becoming mostly intracellular after several hours.
5. In fixed cells, lectins also stain intracellular glycoproteins in the ER/Golgi.

6. HM and AM dye options have formaldehyde-fixable amine groups and can be used with a low-detergent permeabilization protocol.
7. Cells can be fixed before or after MitoView™ Green staining, but dye localization will not be as specific as in live cells. We recommend mitochondrial marker antibodies for fixed cell staining.
8. We regularly add new CF® dye options for bioconjugates on request; contact techsupport@biotium.com to inquire.





## Nuclear Stains

Product	Stains live cells	Fix after staining	Permeabilize after staining	Fix before staining	Non-toxic	Color (Ex/Em) (with DNA)	Applications / Notes
Hoechst or DAPI	Yes	Yes	Yes	Yes	Yes	Blue (352/461 nm)	<ul style="list-style-type: none"> <li>Stain nuclei of live or fixed cells with blue fluorescence</li> <li>No-wash, non-toxic, stable for several days</li> <li>Can use DAPI in antifade mounting medium</li> </ul>
Thiazole Green (SYBR® Green)	Yes	No <sup>1</sup>	No <sup>1</sup>	No <sup>1</sup>	No	Green (497/520 nm)	<ul style="list-style-type: none"> <li>Structurally identical to SYBR® Green</li> </ul>
Live-or-Dye NucFix™ Red	Dead cell-selective	Yes	Yes	No	Yes	Red (520/593 nm)	<ul style="list-style-type: none"> <li>Excellent tolerance for fixation/permeabilization</li> <li>Washing required before/after staining</li> </ul>
NucSpot® Nuclear Stains	Dead cell-selective	No	No	Yes	Yes	Multiple colors Green to Near-IR	<ul style="list-style-type: none"> <li>Avoids crosstalk from DAPI/Hoechst photoconversion</li> <li>Also selectively stains dead cells in live cultures</li> </ul>
NucSpot® Live Nuclear Stains	Yes	Yes	Yes	Yes	Yes	Green (500/515 nm) Far-red (650/675 nm)	<ul style="list-style-type: none"> <li>Nuclear-specific far-red staining in live or fixed cells</li> <li>No-wash, non-toxic for real-time imaging</li> </ul>
RedDot™1 Far-Red Nuclear Stain	Yes	No	No	No	No	Far-red (662/694 nm)	<ul style="list-style-type: none"> <li>No-wash nuclear staining of live cells (compare to Draq5™)</li> <li>Toxic after several hours, for end-point assay only</li> </ul>
RedDot™2 Far-Red Nuclear Stain	Dead cell-selective	No	No	Yes	Yes	Far-red (665/695 nm)	<ul style="list-style-type: none"> <li>Far-red fluorescent nuclear counterstain or dead cell stain</li> <li>Compare to Draq7™</li> </ul>
Cell-Membrane Impermeant Nucleic Acid Dyes	Dead cell-selective	No	No	No <sup>1</sup>	Yes	Multiple colors Blue to Far-Red	<ul style="list-style-type: none"> <li>PI, EthD-III, dimeric cyanine dyes, etc.</li> <li>Not nuclear-specific in fixed cells without RNase digestion</li> </ul>

1. Not nuclear-specific in fixed cells

## Stains for Spheroids, Matrigel®, & 3D Cultures

Product	Target	Color (Ex/Em)	Applications / Notes
Hoechst dyes	All cell nuclei	Blue (352/461 nm with DNA)	• See Nuclear Stains
CellBrite® Cytoplasmic Membrane Dyes	Cell membranes	8 colors, Blue to Near-IR	• See Live Cell Stains; used for labeling cells before or after spheroid formation
MitoView™ 633	Mitochondria	Far-red (622/648 nm) <sup>1</sup>	• See Live Cell Stains
NucView® 488 Caspase-3 Substrate	Apoptotic cells	Green (500/530 nm with DNA)	• See Dead Cell & Apoptosis Stains; tolerates fixation and optical clearing
Calcein-AM	Viable cells (whole cell stain)	Green (494/517 nm)	• See Live Cell Stains; commonly used to stain cells in Matrigel® and spheroids
Cell-impermeant nucleic acid dyes	Necrotic cells <sup>2</sup>	Blue to far-red	• See Dead Cell & Apoptosis Stains
ViaFluor® SE Cell Proliferation Dyes	Live cells	Blue (408/452 nm) Green (493/532 nm)	• See Live Cell Stains; typically used to label cells before seeding in Matrigel®

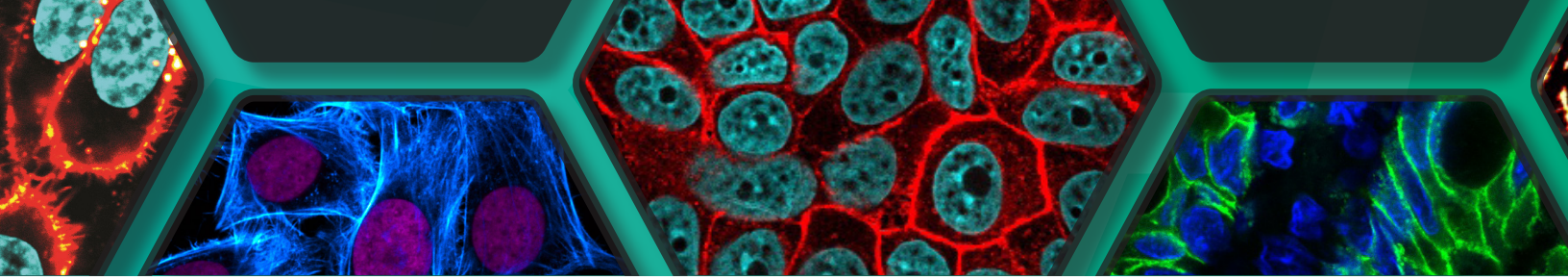
1. Polarized mitochondria; also has visible red fluorescence in the Cy<sup>3</sup> channel and is not recommended for use with other red dyes. 2. Necrotic cell stains also stain late apoptotic cells with leaky cell membranes.

## Stains for Fixed Cells & Tissue Sections

Product	Target	Also stains live cells?	Color (Ex/Em)	Applications / Notes
CF® Dye Phalloidin	F-actin	No	Wide selection <sup>3</sup> , UV to Near-IR	• Widely used actin filament stain for fixed/permeabilized cells <sup>1</sup>
CF® Dye Bungarotoxins	Nicotinic acetylcholine receptor	Yes	Wide selection <sup>3</sup> , UV to Near-IR	• Labels neuromuscular junctions
CellBrite® Cytoplasmic Membrane Dyes	Cell membrane	Yes	8 colors, Blue to Near-IR	<ul style="list-style-type: none"> <li>Lipophilic dyes for stable, non-toxic membrane labeling</li> <li>Fix before or after labeling<sup>1,2</sup></li> </ul>
LipidSpot™ Lipid Droplet Stains	Lipid droplets	Yes	Green (427/585 nm) Red/Far-red (610/663 nm)	<ul style="list-style-type: none"> <li>Neutral lipid droplet stains</li> <li>Fix/permeabilize before or after staining<sup>1</sup></li> </ul>
CF® Dye WGA, ConA, or PNA conjugates	Glycoproteins	Yes	Wide selection <sup>3</sup> , UV to Near-IR	<ul style="list-style-type: none"> <li>Bind to cell surface glycoproteins</li> <li>May stain intracellular targets in permeabilized cells</li> <li>Staining varies by cell/tissue type</li> </ul>
CF® Dye Cholera Toxin Conjugates	GM1 ganglioside in lipid rafts	Yes	6 colors <sup>3</sup> , Green to Near-IR	<ul style="list-style-type: none"> <li>For cell surface labeling or neuronal tracing</li> <li>Expression/staining can be heterogeneous in cultured cells</li> </ul>
Organelle marker antibodies	Mitochondria, nuclear envelope, nucleoli, Golgi and more	No	Wide selection <sup>3</sup> , Blue to Near-IR	<ul style="list-style-type: none"> <li>Best options for staining organelles in fixed cells</li> <li>Visit <a href="http://www.biotium.com">www.biotium.com</a> to see our CF® dye-labeled primary antibodies</li> </ul>
MitoView™ Green	Mitochondria	Yes	Green	<ul style="list-style-type: none"> <li>Can stain fixed cells if suitable mitochondria antibody not available<sup>1</sup></li> <li>Fixed cell staining not as specific as live cell staining</li> </ul>

1. Formaldehyde fixation only, does not tolerate alcohol/solvent treatment.  
2. Dyes have poor tolerance for detergent, but cells can be stained after fixation/permeabilization with good results.

3. We regularly add new CF® dye options for bioconjugates on request; contact [techsupport@biotium.com](mailto:techsupport@biotium.com) to inquire.



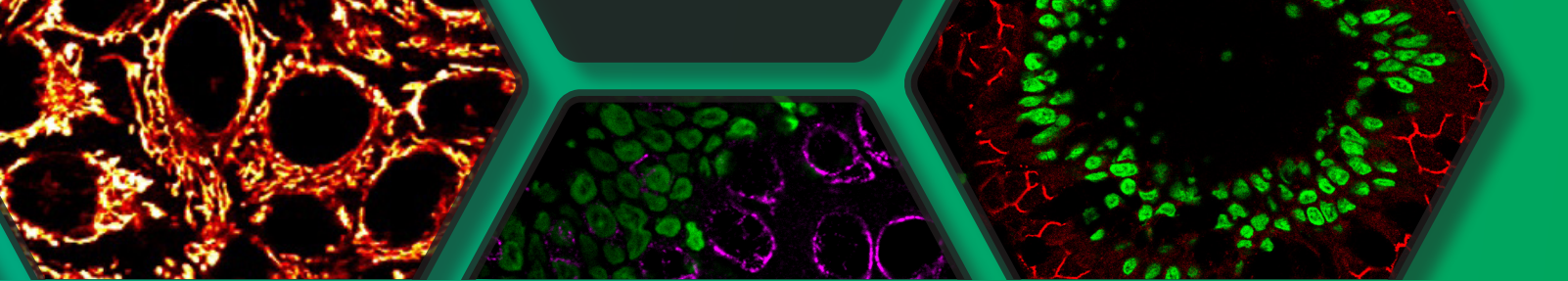
## Dead Cell & Apoptosis Stains

Product	Target <sup>1</sup>	Nuclear-specific	Fix after staining	Permeabilize after staining	Color (Ex/Em)	Applications / Notes
Oxazole Yellow (YO-PRO <sup>®</sup> -1)	Early apoptotic cells Cell-impermeant DNA/RNA dye	No	No	No	Green (491/509 nm) <sup>2</sup>	<ul style="list-style-type: none"> <li>Equivalent to YO-PRO<sup>®</sup>-1 Iodide</li> <li>Reported to selectively stain early apoptotic cells</li> <li>No-wash staining, compatible with real-time imaging</li> </ul>
Oxazole Yellow Homodimer (YOYO <sup>®</sup> -1)	Early apoptotic cells Cell-impermeant DNA/RNA dye	No	No	No	Green (491/509 nm) <sup>2</sup>	<ul style="list-style-type: none"> <li>Equivalent to YOYO<sup>®</sup>-1 Iodide</li> <li>Reported to selectively stain early apoptotic cells</li> <li>No-wash staining, compatible with real-time imaging</li> </ul>
NucView <sup>®</sup> Caspase-3 Substrates	Apoptotic cells Caspase activity	Yes	Yes	Yes	Blue (429/469 nm) <sup>2</sup> Green (500/530 nm) <sup>2</sup> Orange (528/563 nm) <sup>2</sup>	<ul style="list-style-type: none"> <li>Detect caspase-3 activity in intact cells</li> <li>No-wash staining for endpoint or real-time analysis</li> <li>NucView<sup>®</sup> 488 validated in &gt;100 cell types &amp; 200+ papers</li> </ul>
CF <sup>®</sup> Dye Annexin Conjugates	Apoptotic cells Phosphatidylserine	No	Yes	No	Wide selection UV to Near-IR	<ul style="list-style-type: none"> <li>Annexin V with CF<sup>®</sup> dyes &amp; other labels</li> <li>Available preservative-free for real-time cell imaging</li> </ul>
CF <sup>®</sup> Dye TUNEL Assay	Apoptotic cells DNA strand breaks	Yes	N/A	N/A	Green, Red, Far-red	<ul style="list-style-type: none"> <li>Excellent tolerance for fixation/permeabilization</li> <li>Washing required before/after staining</li> </ul>
Oxazole Blue (PO-PRO <sup>™</sup> -1)	Necrotic cells Cell-impermeant DNA/RNA dye	No	No	No	Blue (435/455 nm) <sup>2</sup>	<ul style="list-style-type: none"> <li>Equivalent to PO-PRO<sup>™</sup>-1 Iodide</li> <li>No-wash staining, compatible with real-time imaging</li> </ul>
Oxazole Blue Homodimer (POPO <sup>™</sup> -1)	Necrotic cells Cell-impermeant DNA/RNA dye	No	No	No	Blue (435/455 nm) <sup>2</sup>	<ul style="list-style-type: none"> <li>Equivalent to POPO<sup>™</sup>-1 Iodide</li> <li>No-wash staining, compatible with real-time imaging</li> </ul>
Live-or-Dye <sup>™</sup> Fixable Viability Stains	Necrotic cells (cytoplasm) Cell-impermeant reactive dyes	No	Yes	Yes	10 Colors UV to Near-IR	<ul style="list-style-type: none"> <li>Excellent tolerance for fixation/permeabilization</li> <li>Washing required before/after staining</li> </ul>
NucSpot <sup>®</sup> Nuclear Stains	Necrotic cells Cell-impermeant DNA dye	Yes	No	No	7 Colors Green to Near-IR	<ul style="list-style-type: none"> <li>Nuclear counterstains or dead cell stains</li> <li>No-wash staining, compatible with real-time imaging</li> </ul>
TO Iodide (TO-PRO <sup>®</sup> -1)	Necrotic cells Cell-impermeant DNA/RNA dye	No	No	No	Green (515/531 nm) <sup>2</sup>	<ul style="list-style-type: none"> <li>Equivalent to TO-PRO<sup>®</sup>-1 Iodide</li> <li>No-wash staining, compatible with real-time imaging</li> </ul>
Thiazole Orange Homodimer (TOTO <sup>®</sup> -1)	Necrotic cells Cell-impermeant DNA/RNA dye	No	No	No	Green (520/541 nm) <sup>2</sup>	<ul style="list-style-type: none"> <li>Equivalent to TOTO<sup>®</sup>-1 Iodide</li> <li>No-wash staining, compatible with real-time imaging</li> </ul>
Live-or-Dye NucFix <sup>™</sup> Red	Necrotic cells Cell-impermeant DNA/RNA dye	Yes <sup>3</sup>	Yes	Yes	Red (520/593 nm) <sup>2</sup>	<ul style="list-style-type: none"> <li>Covalent, red fluorescent dead cell nuclear stain</li> <li>The only fixable dead cell nuclear stain</li> <li>Wash after staining required</li> </ul>
Ethidium Homodimer III (EthD-III)	Necrotic cells Cell-impermeant DNA/RNA dye	No	No	No	Red (522/593 nm) <sup>2</sup>	<ul style="list-style-type: none"> <li>Developed at Biotium as an alternative to EthD-I</li> <li>45% brighter than EthD-I when bound to DNA</li> </ul>
Ethidium Homodimer I (EthD-I)	Necrotic cells Cell-impermeant DNA/RNA dye	No	No	No	Red (528/617 nm) <sup>2</sup>	<ul style="list-style-type: none"> <li>High-affinity membrane-impermeant DNA/RNA stain</li> <li>&gt;30-fold fluorescence enhancement upon binding DNA</li> </ul>
Propidium Iodide	Necrotic cells Cell-impermeant DNA/RNA dye	No	No	No	Red (535/617 nm) <sup>2</sup>	<ul style="list-style-type: none"> <li>Can be excited at 488 nm for the PE channel</li> <li>Useful for cell cycle analysis in fixed cells (with RNase)</li> </ul>
RedDot <sup>™</sup> 2 Far-Red Nuclear Stain	Necrotic cells Cell-impermeant DNA/RNA dye	Yes	No	No	Far-red (665/695 nm) <sup>2</sup>	<ul style="list-style-type: none"> <li>Compare to Draq7<sup>™</sup></li> <li>No-wash staining, compatible with real-time imaging</li> </ul>
Thiazole Red (TO-PRO <sup>®</sup> -3)	Necrotic cells Cell-impermeant DNA/RNA dye	No	No	No	Far-red (642/661 nm) <sup>2</sup>	<ul style="list-style-type: none"> <li>Equivalent to TO-PRO<sup>®</sup>-1 Iodide</li> <li>No-wash staining, compatible with real-time imaging</li> </ul>
Thiazole Red Homodimer (TOTO <sup>®</sup> -3)	Necrotic cells Cell-impermeant DNA/RNA dye	No	No	No	Far-red (642/660 nm) <sup>2</sup>	<ul style="list-style-type: none"> <li>Equivalent to TOTO<sup>®</sup>-3 Iodide</li> <li>No-wash staining, compatible with real-time imaging</li> </ul>
7-AAD	Necrotic cells Cell-impermeant DNA/RNA dye	No	No	No	Far-red (546/647 nm) <sup>2</sup>	<ul style="list-style-type: none"> <li>Far-red dye for the PE-Cy<sup>®</sup>5 flow cytometry channel</li> <li>Useful for cell cycle analysis in fixed cells</li> </ul>
NucSpot <sup>®</sup> Far-Red	Necrotic cells Cell-impermeant DNA/RNA dye	No	No	No	Far-red (597/667 nm) <sup>2</sup>	<ul style="list-style-type: none"> <li>For flow cytometry in the PE-Cy<sup>®</sup>5 or APC channel</li> <li>Less bleed into the PE-Texas Red<sup>®</sup> channel than 7-AAD</li> </ul>
PathoGreen <sup>™</sup> HistoFluorescent Stain	Degenerating neurons	No	N/A	N/A	Green (497/520 nm)	<ul style="list-style-type: none"> <li>For fixed neuronal cells &amp; tissue sections</li> </ul>

1. Necrotic cell stains also stain late apoptotic cells with leaky cell membranes; in fixed cells DNA/RNA dyes are not dead cell-selective and stain both nucleus and cytoplasm.

2. With DNA.

3. Shows nuclear staining in dead cells; stains nucleus and cytoplasm in fixed cells.



## Stains for Mammalian Cells, Bacteria, & Yeast

Target	Product	Mammalian cells	Yeast	Gram+ bacteria	Gram- bacteria	Applications / Notes	
Membrane & Cell Surface	CellBrite® Cytoplasmic Membrane Dyes	Yes	No	No	No	• See Live Cell Stains	
	CellBrite® Steady Membrane Dyes	Yes	No	No	No		
	CellBrite® Fix Membrane Stains	Yes	Yes	Yes	Yes		
	MemBrite® Fix Cell Surface Stains	Yes	Yes	Yes	No		
	Wheat Germ Agglutinin (WGA)	Yes	Yes <sup>1</sup>	Yes	No		
	Concanavalin A (Con A)	Yes	Yes	No	No		
	SynaptoGreen™ C4 (FM® 1-43)	Yes	Yes <sup>2</sup>	Yes	Yes		
	SynaptoRed™ C2 (FM® 4-64)	Yes	Yes <sup>2</sup>	Yes	Yes		
	Calcofluor White	No	Yes	Yes	No	• Blue fluorescent fungi cell wall chitin stain (Ex/Em 360/430 nm)	
DNA	Hoechst dyes	Yes	No <sup>3</sup>	Yes	Yes	• See Nuclear Stains	
	DAPI	Yes	No <sup>3</sup>	Yes	Yes		
	NucSpot® Live Dyes	Yes	No	Yes	No		
		RedDot™1 Far-Red Nuclear Stain	Yes	Yes <sup>4</sup>	Yes	Yes	• Green fluorescent DNA stain (Ex/Em 496/528 nm) • Stains live and dead bacteria
		DMAO	Yes <sup>4</sup>	No <sup>3</sup>	Yes	Yes	
		Thiazole Orange	Yes <sup>5</sup>	Yes	Yes	Yes	
	BactoView™ Live Dyes	Yes <sup>5</sup>	No <sup>3</sup>	Yes	Yes	• BactoView™ Green (Ex/Em 500/520 nm) • BactoView™ Red (Ex/Em 572/675 nm) • Stains live and dead bacterial DNA	
Dead Cells	Propidium Iodide (PI)	Yes	Yes	Yes	Yes	• See Dead Cell & Apoptosis Stains	
	Ethidium Homodimer I (EthD-I)	Yes	Yes	Yes	Yes		
	Ethidium Homodimer III (EthD-III)	Yes	Yes	Yes	Yes		
	Live-or-Dye NucFix™ Red	Yes	Yes <sup>6</sup>	No <sup>7</sup>	Yes		
	RedDot™2 Far-Red Nuclear Stain	Yes	Yes	Yes	Yes		
	Live-or-Dye™ Fixable Viability Dyes	Yes	Yes	Yes	Yes		
	NucSpot® Nuclear Stains	Yes	Yes	No <sup>7</sup>	Yes		
	BactoView™ Dead Stains	Yes	No data	Yes	Yes		
Organelles & Cytoskeleton	MitoView™ Dyes	Yes	Yes	Yes	Yes	• See Live Cell Stains	
	LysoView™ 405	Yes	No <sup>8</sup>	Yes	Yes		
	LysoView™ 488	Yes	No	Yes	No		
	LysoView™ 540	Yes	Yes	No	No		
	LysoView™ 633	Yes	Yes	No	No		
	LysoView™ 650	Yes	No	No	No		
	LipidSpot™ 488 Lipid Droplet Stain	Yes	Yes	Yes	No		
	LipidSpot™ 610 Lipid Droplet Stain	Yes	No	Yes	No		
	Phalloidin Conjugates	Yes	Yes	No	No		• See Organelle & Cytoskeleton Stains for Fixed Cells
		ViaVac™ Red/Green	No <sup>9</sup>	Yes	No data		No data
Cytoplasm	ViaFluor® SE & CFSE Cell Proliferation Dyes	Yes	No	Yes	No	• See Live Cell Stains	

1. Stains bud scars of budding yeast.

2. Internalizes to vacuolar membranes.

3. Weak staining and not nuclear.

4. Staining is not nuclear.

5. BactoView™ Red shows weak mitochondrial staining, BactoView™ Green stains nucleus & cytoplasm.

6. Dead cell specific but not nuclear.

7. Stains live and dead cells.

8. Staining is not lysosomal.

9. Weak mitochondrial staining at high dye concentrations.

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# About Us

At Biotium, we are dedicated to developing cutting-edge fluorescent solutions for life science research. Our efforts have resulted in a growing number of unique and industry-leading fluorescence-based technologies for a wide array of biological research applications. Our products are available in the U.S. through our website, and worldwide through our extensive network of domestic and international distributors.

We license our technologies to a number of international biotechnology companies, and collaborate with academic laboratories to develop tools for the constantly evolving research community. We welcome inquiries about licensing the use of our dyes, technologies, or trademarks; email us at [btinfo@biotium.com](mailto:btinfo@biotium.com).

Biotium implements a Quality System, certified by QAS according to Standard QAS ISO 9001:2015.

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