

SYTOX® Orange Dead Cell Stain

for flow cytometry

Catalog no. S34861

Table 1 Contents and storage

Material	Amount	Concentration	Storage*	Stability
SYTOX® Orange dead cell stain	1 mL	250 µM in DMSO	<ul style="list-style-type: none"> • ≤-20°C • Desiccate • Store vial upright • Protect from light 	When stored as directed, the product is stable for at least 1 year from receipt.
*Before refreezing, seal the vial tightly. The DMSO solution may be subjected to many freeze-thaw cycles without reagent degradation.				
Number of reactions: Sufficient material is supplied for 1,000 tests, based on the protocol below.				
Approximate fluorescence excitation and emission maxima: 547/570 nm, bound to DNA.				

Introduction

SYTOX® Orange dead cell stain is a high-affinity nucleic acid stain that easily penetrates cells with compromised plasma membranes, but will not penetrate healthy cell membranes. After brief incubation with SYTOX® Orange nucleic acid stain, the nucleic acids of dead cells fluoresce bright orange when excited with 488 nm or 532 nm lasers. The emission of SYTOX® Orange dead cell stain easily allows dead cell discrimination with minimal compensation in neighboring channels (Figure 1, page 2). These properties, combined with its >100-fold fluorescence enhancement upon nucleic acid binding, make the SYTOX® Orange dead cell stain a simple and quantitative single-step, dead-cell indicator (Figure 2, page 2). SYTOX® Green dead cell stain is compatible with multicolor flow cytometry and can be combined with other dyes, including cell permeant nucleic acid stains such as Vybrant® DyeCycle™ Violet, for two-color visualization of live and dead cells.

Spectral Characteristics

The excitation and emission spectra of the SYTOX® Orange stain are given in Figure 1 on page 2. These spectra were obtained in the presence of DNA; upon binding DNA, the SYTOX® Orange stain exhibits a fluorescence enhancement of greater than 100-fold. The SYTOX® Orange/DNA complex has excitation and emission maxima of 547 nm and 570 nm, respectively.

Figure 1 Fluorescence excitation and emission spectra of the SYTOX® Orange nucleic acid stain bound to DNA.

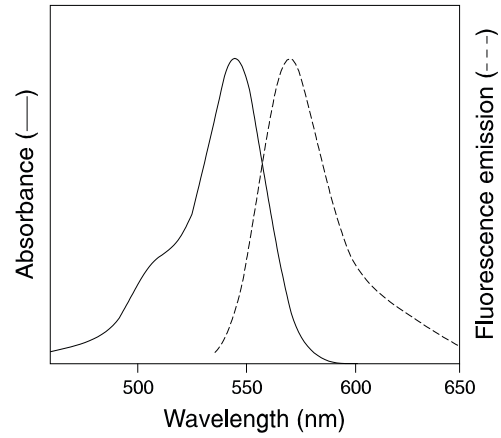
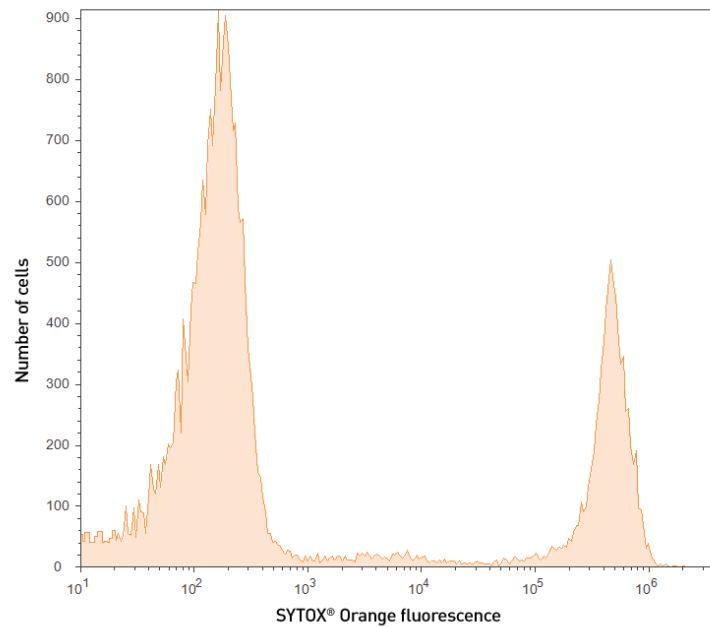


Figure 2 A mixture of heat-killed and live Jurkat cells were stained with 250 nM SYTOX® Orange dead cell stain and incubated at room temperature for 20 minutes. Cells were analyzed on the Attune® Acoustic Focusing Cytometer equipped with a 488 nm laser. Fluorescence emission was collected using a 575/24 bandpass filter. Live cells are easily distinguished from the brighter dead cell population.



Before Starting

Materials Required but Not Provided

- Cells and culture medium
- Appropriate suspension buffer
- 12 × 75-mm tubes, or other flow cytometry tubes

Caution

No data are available addressing the mutagenicity or toxicity of SYTOX® Orange dead cell stain. Because SYTOX® Orange dead cell stain binds to nucleic acids, treat the stain as a potential mutagen and use with care. Handle the DMSO dye solution with caution, because DMSO is known to facilitate the entry of organic molecules into tissues. Always wear protective clothing, gloves, and eye/face protection when handling this reagent. Dispose of the reagents in compliance with all pertaining local regulations.

Storage and Handling

The SYTOX® Orange dye is supplied as a 250 µM solution in dimethylsulfoxide (DMSO) in a unit size of 1,000 µL. Upon receipt, store the vials of dye frozen at ≤−20°C, upright, and protected from light. Before opening, allow the vials to warm to room temperature and then briefly centrifuge in a microcentrifuge to bring the DMSO solution to the bottom of the vial. Before refreezing, seal all vials tightly. When stored properly, the stock solution is stable for at least one year.

Experimental Protocols

The following procedure was developed using the Jurkat T-cell leukemia cell line using 488 nm excitation on the Attune™ Acoustic Focusing Cytometer. If 532 nm excitation is used, dilute the dye 1/62.5 in DMSO to a final concentration of 4 µM. The SYTOX® Orange dead cell stain can be adapted for any cell type; growth medium, cell density, cell type variations, and other factors may influence staining. In initial experiments, test a range of stain concentrations to determine optimal stain concentration for the given cell type, buffer, and experimental conditions. For using the SYTOX® Orange dead cell stain in combination with other dyes for multicolor applications, see **Multicolor Staining** below.

- 1.1 Remove the vial containing the SYTOX® Orange dead cell stain from the freezer, and allow the contents to equilibrate to room temperature.

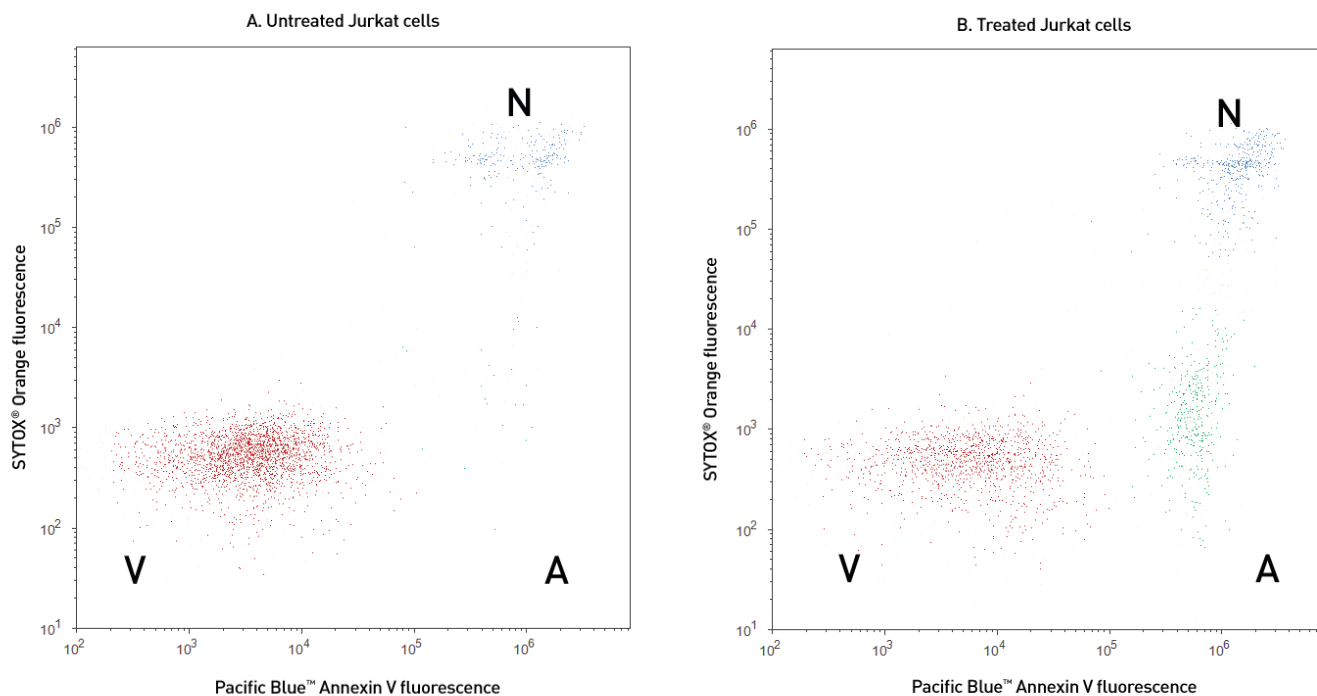
The SYTOX® Orange dead cell stain solution in DMSO may be subjected to many freeze-thaw cycles without reagent degradation and is stable for 1 year when stored at ≤−20°C.

- 1.2 Harvest the cell sample(s). Using an appropriate buffer, adjust the cell concentration of the sample(s) to be from 1×10^5 to 5×10^7 cells/mL.
- 1.3 Prepare flow cytometry tubes each containing 1 mL of cell suspension.
- 1.4 Add 1 µL of SYTOX® Orange dead cell stain solution in DMSO to each flow cytometry tube and mix well. The final labeling concentration of stain is 250 nM.
- 1.5 Incubate flow cytometry tubes for a minimum of 20 minutes at room temperature or 2–6°C, protected from light.
- 1.6 Analyze samples without washing or fixing, using 488 nm (or 532 nm) excitation and emission collected in a 575/24 bandpass filter or equivalent.

Multicolor Staining

SYTOX[®] Orange dead cell stain has little spectral overlap with fluorophores excited by other laser lines, and it can be combined with other dyes excitable by the 488 nm or 532 nm lasers. SYTOX[®] Orange dead cell stain may be combined with many Annexin-V conjugates to distinguish live, apoptotic, and dead cells (Figure 3). If SYTOX[®] Orange dead cell stain is used in combination with other dyes for multicolor applications, apply the other dyes to the sample first following manufacture's instructions, including washes. Apply the SYTOX[®] Orange stain as the last stain to the sample following the protocol above, and do not wash or fix samples prior to flow cytometric analysis.

Figure 3 Jurkat cells (T-cell leukemia, human) treated with 10 μ M camptothecin for four hours (panel B) or untreated control (panel A). Cells were stained with an anti-human Annexin V-Pacific Blue™ conjugate (Cat. no. A35112) and 250 nM of SYTOX[®] Orange dead cell stain and then analyzed using the Attune[®] Acoustic Focusing Cytometer equipped with 488 nm and 405 nm lasers for the excitation of SYTOX[®] Orange and Pacific Blue™ dyes, respectively. Samples were run at a collection rate of Sensitive 100 μ L/minute and fluorescence emission was detected using a 575/24 bandpass filter for SYTOX[®] Orange and 450/40 bandpass filter for Pacific Blue™ conjugate. Note that the camptothecin-treated cells (panel B) have a higher percentage of apoptotic cells than the basal level of apoptosis seen in the control cells (panel A). A = apoptotic cells, V = viable cells, N = necrotic cells.



Tips and Tricks for the Attune[®] Acoustic Focusing Cytometer

- SYTOX[®] Orange dead cell stain may be analyzed at any collection rate using the Attune[®] Acoustic Focusing Cytometer with fluorescence emission collected in the BL2 (575/24) channel.
- Samples which are dilute (1×10^4 – 1×10^5 cells/mL) can be run at any collection rate without dilution.
- To analyze concentrated samples ($\geq 1 \times 10^6$ cells/mL) at Standard 200, Standard 500, and Standard 1,000 transit times, dilute the samples in buffer containing SYTOX[®] Orange at a final concentration of 250 nM immediately prior to analysis. Failure to include SYTOX[®] Orange in the diluent may lead to inaccurate results.

References

1. J Leukoc Biol 83, 456 (2008);
2. J Microbiol Methods 63, 276 (2005);
3. Anal Chem 77, 3554 (2005);
4. Autoimmunity 37, 85 (2004);
5. Cytometry A 60, 125 (2004);
6. Anal Biochem 286, 138 (2000).

Product List

Current prices may be obtained from our website or from our Customer Service Department.

Cat. no.	Product Name	Unit Size
S34861	SYTOX® Orange dead cell stain *for flow cytometry* *250 µM* *1,000 tests*	1 mL
Related Products		
S10274	SYTOX® AADvanced™ dead cell stain *for 488 excitation* *for flow cytometry* *500 tests*	1 kit
S10349	SYTOX® AADvanced™ dead cell stain *for 488 excitation* *for flow cytometry* *100 tests*	1 kit
S34857	SYTOX® Blue dead cell stain *for flow cytometry* *1,000 assays* *1 mM solution in DMSO*	1 mL
S34859	SYTOX® Red dead cell stain *for 633 or 635 nm excitation* *5 µM solution in DMSO*	1 mL
S34860	SYTOX® Green dead cell stain *for flow cytometry* *30 µM* *1,000 tests*	1 mL
S34862	SYTOX® dead cell stain sampler kit *for flow cytometry*	1 kit

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