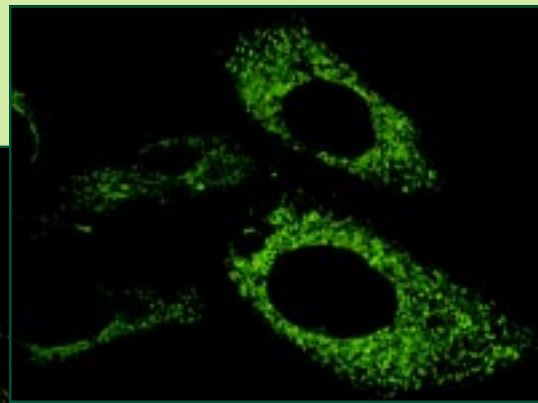
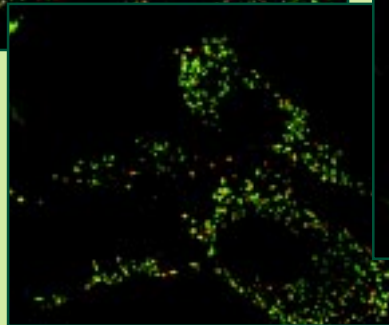
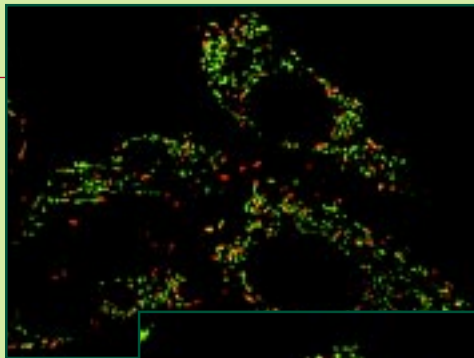
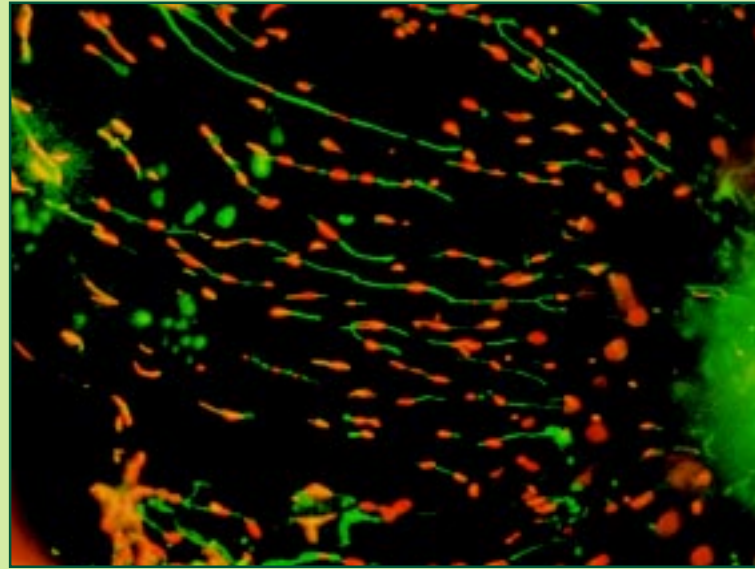


JC-1

Mitochondrial Membrane Potential Sensor

Vital Insights into Cell Physiology



- DEFINITIVE** Two-color vital staining clearly identifies depolarized mitochondria in apoptotic cells
- VERSATILE** Ideal for flow cytometry, wide-field microscopy or confocal laser scanning microscopy analysis
- SPECIFIC** Mitochondrion-selective staining; no plasma membrane potential-sensitivity complications
- PROVEN** Well-established utility in neurons, myocytes and other cell types, as well as in isolated mitochondria
- RAPID** Stain cells for 10 minutes, wash and analyze

Technical Information

JC-1 is a cationic dye that indicates mitochondrial polarization by shifting its fluorescence emission from green (~525 nm) to red (~590 nm). This potential-sensitive color shift is due to concentration-dependent formation of red fluorescent J-aggregates.^{1,2,3} JC-1 is more specific for mitochondrial versus plasma membrane potential, and more consistent in its response to depolarization, than other cationic dyes such as DiOC₆(3) and rhodamine 123.⁴ Detection of mitochondrial polarization using JC-1 is readily accomplished by wide-field microscopy, confocal microscopy or flow cytometry. For imaging, optical filters designed for fluorescein and tetramethylrhodamine can be used to separately visualize the green and red emission components. In flow cytometry, the green and red fluorescence signals are resolved by detection in the conventional FL1 and FL2 channels respectively (Figure 1).

JC-1 Applications

- Apoptotic cell death detection
- Investigating relationships between mitochondrial potential and intracellular calcium levels
- Detecting changes in membrane potential associated with the mitochondrial permeability transition
- Monitoring mitochondrial depolarization in response to excitotoxic glutamate stimulation of neurons
- Evaluating mitochondrial function following oxidative stress
- Detecting defective mitochondrial function in myopathic cells

References

1. *Fluorescent and Luminescent Probes for Biological Activity*, W.T. Mason, ed., Academic Press (1993) pp.124–132;
2. *Biochemistry* 30, 4480 (1991);
3. *J Physiol* 486, 1 (1995);
4. *FEBS Lett* 411, 77 (1997).

Product Summary

T-3168 JC-1; CBIC₂(3) (5,5',6,6'-tetrachloro-1,1',3,3'-tetraethylbenzimidazolyl-carbocyanine iodide) 5 mg

For further information contact

MOLECULAR PROBES, INC.
Eugene, Oregon USA
Customer Service: (541) 465-8338
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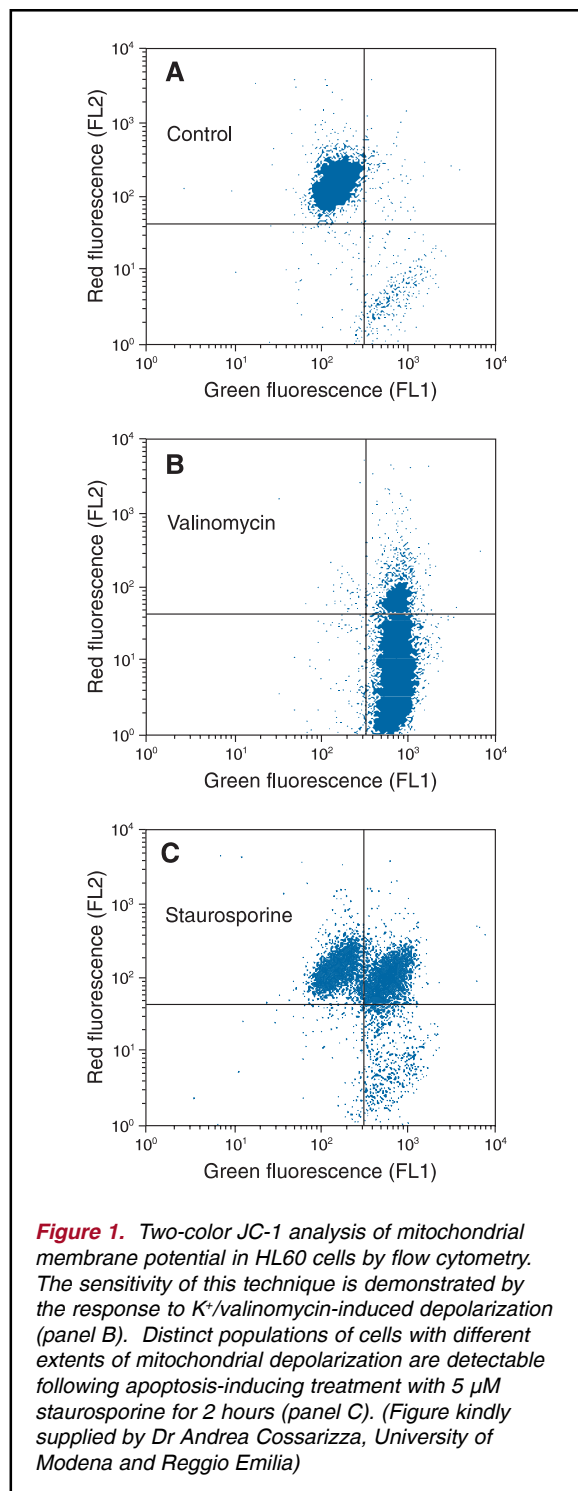


Figure 1. Two-color JC-1 analysis of mitochondrial membrane potential in HL60 cells by flow cytometry. The sensitivity of this technique is demonstrated by the response to K⁺/valinomycin-induced depolarization (panel B). Distinct populations of cells with different extents of mitochondrial depolarization are detectable following apoptosis-inducing treatment with 5 μM staurosporine for 2 hours (panel C). (Figure kindly supplied by Dr Andrea Cossarizza, University of Modena and Reggio Emilia)

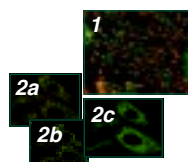


Photo 1. Potential-dependent JC-1 staining of mitochondria in CCL64 fibroblasts visualized by epifluorescence microscopy using a 520 nm longpass optical filter. Regions of high mitochondrial polarization are indicated by red fluorescence due to J-aggregate formation by the concentrated dye. Depolarized regions are indicated by the green fluorescence of JC-1 monomers. Photo contributed by Lan Bo Chen, Dana Farber Cancer Institute and Harvard Medical School.

Photo series 2. NIH-3T3 fibroblasts stained with JC-1 showing the progressive loss of red J-aggregate fluorescence and cytoplasmic diffusion of green monomer fluorescence following exposure to hydrogen peroxide. Images show the same field of cells viewed (a) before, (b) 5 minutes after and (c) 20 minutes after H₂O₂ treatment. Photos contributed by Ildo Nicoletti, Perugia University Medical School.