QuickActin™

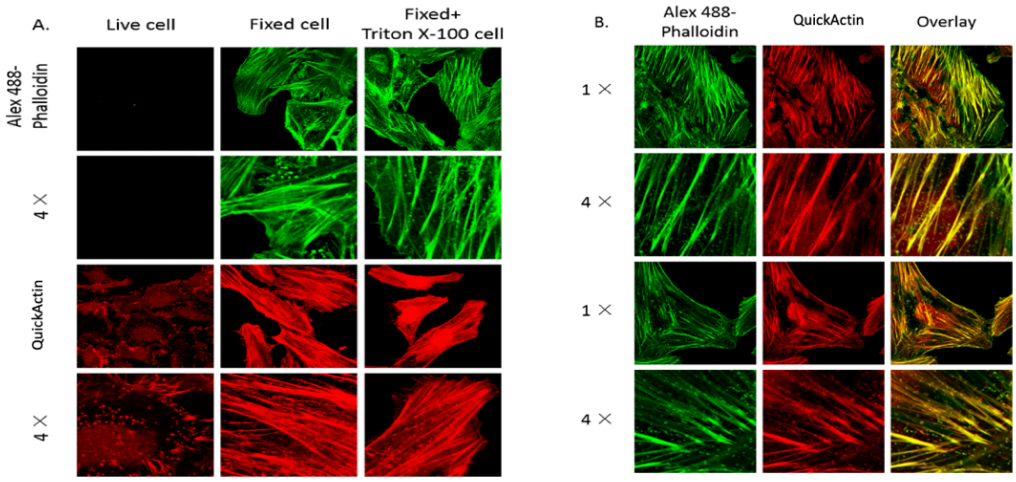
Actin is the most abundant protein in most eukaryotic cells. As an important part of the cytoskeleton, actin is essential for cell stability and morphogenesis. It is involved in many crucial processes, such as cell division, endocytosis, and cell migration. Much effort, both experimental and theoretical, has been directed toward understanding the dynamics of actin filaments at the molecular level. F-actin participates in the formation of cytoskeletal structures, cell cortex, and stress fibers in mammal cells. The cell cortex is a thin meshwork of actin filaments beneath the plasma membrane and can regulate the shape and mobility of cells.

F-actin visualization using fluorescent markers is an important tool for getting a deeper understanding of the structural cytoskeletal dynamics. For the observation of F-actin-related processes, non-invasive live cell imaging has become the state-of-the-art technique. Depending on the application and the investigated model organism and cell type, there are different F-actin staining techniques available—each of them with its own advantages and disadvantages.

The ideal probe for cytoskeleton imaging is highly fluorogenic and nontoxic, has far-red emission and excitation wavelengths, and labels with high specificity in living cells. Up to now, small molecules that fulfill this wish list have not been described. Probes for the two major components of the cytoskeleton, tubulin and actin, have been introduced by linking fluorophores to taxanes and phalloidin that bind to microtubules and F-actin filaments, respectively. However, current paclitaxel (Taxol) derivatives do not show increased fluorescence upon target binding (i.e., they are not fluorogenic), and phalloidin derivatives are not cell permeable, thereby resulting in limited applicability in both cases.

Different Methods of Actin Visualization.

	Phalloidin	Actin-Coupled Fluorescent Proteins	QuickActin™
Suitability for fixed samples	+++	n.d.	+++
Suitability for live cell imaging	-	++	+++
Maintenance of actin functionality	-	+	+++
Biocompatibility	-	++	+++
Quality of signal-to-noise ratio	+++	++	+++
Actin binding specificity	+++	+++	+++



A. QuickActin™ specifically stains F-actin in Tumor cell (dead/live cell) and B. co-localizes with phalloidin.

Selected References for actin staining

(1) Melak, M.; Plessner, M.; Grosse, R. Actin visualization at a glance. J Cell Sci 2017, 130 (3), 525-530.

(2) Oda, T.; Iwasa, M.; Aihara, T.; Maeda, Y.; Narita, A. The nature of the globular- to fibrous-actin transition. Nature 2009, 461 (7263), 550-550.

(3) Lukinavicius, G.; Reymond, L.; D'Este, E.; Masharina, A.; Gottfert, F.; Ta, H.; Guther, A.; Fournier, M.; Rizzo, S.; Waldmann, H.; Blaukopf, C.; Sommer, C.; Gerlich, D. W.; Arndt, H. D.; Hell, S. W.; Johnsson, K. Fluorogenic probes for live-cell imaging of the cytoskeleton. Nat Methods 2014, 11 (7), 731-3.

(4) Wehland, J.; Osborn, M.; Weber, K. Phalloidin-induced actin polymerization in the cytoplasm of cultured cells interferes with cell locomotion and growth. Proc Natl Acad Sci U S A 1977, 74 (12), 5613-7.

(5) Wulf, E.; Deboben, A.; Bautz, F. A.; Faulstich, H.; Wieland, T. Fluorescent phallotoxin, a tool for the visualization of cellular actin. Proc Natl Acad Sci U S A 1979, 76 (9), 4498-502.

Onestep Laboratories Inc.

www.1steplab.com

info@1steplab.com