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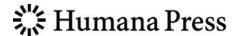
Live Cell Imaging

Methods and Protocols

Edited by

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Preface

Live cell imaging has now become a routine tool in biomedical and life science research. It is hard to imagine an active academic research department, pharmaceutical or biotechnology company without access to this technology and without using it on a regular basis. Over the last decade, major progress in this area has been achieved, making this core biochemical, cell and molecular biology techniques even more versatile, affordable, and mature. On the other hand, we continue witnessing numerous new, breakthrough developments which advance this technology even further, extending its capabilities and measurement standards. A variety of advanced-imaging methodologies, probe chemistries, experimental procedures, dedicated instruments, integrated systems, and a large number of new applications have come to the fore very recently. One can mention, for example, ultra-high resolution methods breaking the canonical diffraction limits, multi-photon excitation imaging and sample manipulation (e.g., (un)caging, permeabilization), new chemically and genetically engineered probes for key markers and parameters of cellular function, multi-color imaging, specialized detection formats, custom-built systems employing new optoelectronics and engineering solutions, user-friendly multi-mode microscopes, software, and data analysis algorithms. All this provide unprecedented opportunities for the real-time investigation of live objects, including individual cells, sub-cellular organelles, and even individual molecules, with high level of detail and information content. Being until recently a privilege of large institutions and centralized facilities, live cell imaging systems are now spreading into small labs, while sophisticated high content imaging stations are being deployed to screening labs.

At the same time, the wide and ever increasing range of imaging techniques and applications necessitates regular updates for existing users as well as an up-to-date introduction and some general guidance for newcomers to this area. This volume of the Methods in Molecular Biology series provides a comprehensive compendium of experimental approaches to live cell imaging in the form of several overview chapters followed by representative examples and case studies covering different aspects of the methodology. The 21 chapters of this volume are prepared by leaders in these fields, and the outstanding contribution of the authors is gratefully acknowledged. The book provides a range of state-of-the-art protocols extensively validated in complex biological studies. It highlights new experimental and instrumental opportunities and helps researchers to select appropriate imaging methods for their specific biological questions and measurement tasks. Each method also highlights the potential challenges and experimental artefacts which are likely to appear and which unfortunately are still not very uncommon. We believe that this volume will contribute to the further development and dissemination of this fundamentally important technology which spans across many disciplines including molecular and cell biology, chemistry, physics, optics, engineering, cell physiology, and medicine.

Dmitri B. Papkovsky

Contents

Prefa	ce	ν
Contr	ributors	ix
Part	I GENERAL PRINCIPLES AND OVERVIEW	1
1.	Instrumentation for Live-Cell Imaging and Main Formats	3
2.	Labels and Probes for Live Cell Imaging: Overview and Selection Guide	17
3.	Live Cell Imaging: An Industrial Perspective	47
Part	II IMAGING TECHNIQUES, PROBES, AND APPLICATIONS	67
4.	Design of Fluorescent Fusion Protein Probes	69
5.	Synthetic Fluorescent Probes for Imaging of Peroxynitrite and Hypochlorous Acid in Living Cells	93
6.	Photo-Activatable Probes for the Analysis of Receptor Function in Living Cells	105
7.	The Application of Fluorescent Probes for the Analysis of Lipid Dynamics During Phagocytosis	121
8.	Imaging of Mitotic Cell Division and Apoptotic Intra-Nuclear Processes in Multicolor	135
9.	Manipulation of Neutrophil-Like HL-60 Cells for the Study of Directed Cell Migration	147
10.	A Method for Analyzing Protein–Protein Interactions in the Plasma Membrane of Live B Cells by Fluorescence Resonance Energy Transfer Imaging as Acquired by Total Internal Reflection Fluorescence Microscopy Hae Won Sohn, Pavel Tolar, Joseph Brzostowski, and Susan K. Pierce	159
11.	Sample Preparation for STED Microscopy	185

:::	Can	tanta
VIII	COH	tents

12.	Two-Photon Permeabilization and Calcium Measurements in Cellular Organelles	201
13.	Imaging and Analysis of Three-Dimensional Cell Culture Models	211
14.	Long-Term Imaging in Microfluidic Devices	229
15.	Monitoring of Cellular Responses to Hypoxia	243
16.	Imaging of Cellular Oxygen and Analysis of Metabolic Responses of Mammalian Cells	257
17.	Analysis of Mitochondrial pH and Ion Concentrations	275
18.	Live Cell Imaging Analysis of Receptor Function	311
19.	Subcellular Dynamic Imaging of Protein–Protein Interactions in Live Cells by Bioluminescence Resonance Energy Transfer	325
20.	Quantitative Analysis of Membrane Potentials	335
21.	Image Correlation Spectroscopy to Define Membrane Dynamics	353
Subje	cct Index	365

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