

METHODS IN MOLECULAR BIOLOGY™

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Molecular Imaging

Methods and Protocols

Edited by

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ISSN 1064-3745

ISBN 978-1-60761-900-0

DOI 10.1007/978-1-60761-901-7

Springer New York Dordrecht Heidelberg London

e-ISSN 1940-6029

e-ISBN 978-1-60761-901-7

Library of Congress Control Number: 2010935924

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Printed on acid-free paper

Humana Press is part of Springer Science+Business Media (www.springer.com)

Preface

From the first development of radioactive tracers in the early 1930s, it would take almost seven more decades for molecular imaging to evolve into a mature field of research. Since then, however, molecular imaging techniques have advanced and become invaluable tools for molecular biology research and – to a more modest extent – clinical medicine. Molecular imaging abandons the canonical imaging paradigm of detecting morphological contrasts and aims to explore the dynamics of molecules indicative of physiology and disease in a qualitative and quantitative manner. It allows longitudinal, noninvasive visualization of biological processes at the sub-cellular level, typically but not necessarily through the use of reporters with strong binding affinity to the molecular targets of interest. It follows from this rather unrestrictive definition that molecular imaging is not limited to specific image-capture methods but includes optical (near-infrared and visible spectrum fluorescence, bioluminescence), radio-scintigraphic modalities (PET, SPECT), magnetic resonance imaging (MRI), and magnetic resonance spectroscopy (MRS). All these imaging techniques progressively employ tagged probes with high affinity for molecules of interest, binding-activatable ‘smart’ probes and genetically engineered stably expressed reporters thus allowing optimized target visualization. Consequently, the list of biological processes that can be investigated is long and continues to expand.

The amount of possibilities offered by different molecular imaging techniques can be puzzling to biologists new to the field. Bearing this in mind, this book sets out to describe a rich variety of practical procedures and methods for diverging imaging technologies. Different sections are devoted to imaging of basic molecular and biochemical events, imaging in pre-clinical and finally in clinical settings and include sufficient practical details for students, established practitioners, and research fellows from different fields to become familiar with molecular imaging and incorporate imaging into their work.

Khalid Shah

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