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Editorial

Imaging probes—Introduction

Advances in light microscopy and in vivo molecular imaging strongly rely on new developments in molecular probes properly designed to visualize, at the subcellular, cellular and organismal level, epitopes and enzyme activities of interest. Thus, the development of imaging probes has become a research area that has attracted numerous chemistry groups worldwide. The need of tailoring the probes for the specific tasks they have to fulfill has contributed to the growth of new collaborative projects in the field of biological and medical sciences. On one hand this has contributed to opening chemists' mind to the complexity of biological systems and on the other hand it has prompted biologists and physicians to acquire a molecular view of the underlying phenomena. Often chemists approached the field of molecular imaging probes from the side of a specific detection modality. Thus chemists with a background in NMR spectroscopy have specifically addressed contrast agents for MRI as well as radiochemists found a straightforward evolution of their research activities entering the field of nuclear probes. On the other hand many colleagues have acquired outstanding skills in designing probes for light microscopy either in terms of endowing them with excellent targeting capabilities and/or in terms of controlling their optical properties. Moreover, novel nanotechnological concepts in the development of in vitro and in vivo molecular imaging procedures are now more frequently introduced. In summary, chemistry has a key role for the advancement of the entire field of molecular imaging.

While interdisciplinary collaborations with biologists, physicians, physicists, and imaging engineers are clearly at the center of growth of the new science of molecular imaging, it appears necessary, in the forthcoming years, to pursue an enhanced integration of the chemical skills. There is an evident need to share achievements for efficient bioconjugation techniques as well as to join efforts to develop innovative, multi-modality probes, just to mention some of the areas in which improved scientific exchange will be instrumental to the development of the entire field. This issue has gathered articles from representative groups in the fields of advanced light microscopy as well as in vivo imaging. It is opened by an overview on photoactivatable probes used in cell biology. New imaging probes for optical, MRI and PET techniques are introduced with the aim to help tackle the above mentioned tasks. Optical probes include an improved H_2O_2 sensor as well as photoswitchable molecules and improved fluorescent in vivo labeling techniques. For MRI applications novel paramagnetic systems have been reported to show the great versatility of this class of agents to undertake new routes for an enhanced sensitivity and an improved characterization of the biological microenvironment.

We hope the reader will have as much fun with this collection of original articles as we had in compiling them for this issue.

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