MOLECULAR IMAGING IN PHARMACOLOGY

Guest Editors: A. Maggi, M. Salvatore

Molecular imaging

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Over the past twenty to thirty years, exponential growth of biomedical research has gone forward with technological advances in molecular biology and genetics. The molecular tools coming out of research provide the long sought key to understanding cellular events in human disease: cell proliferation, growth, differentiation, reactivity to hormones and neurotransmiters. With the adoption of the reductionist approach even by the more traditional fields of physiology and pharmacology, novel cell-based approaches have begun to replace animal experiments investigating molecular basis of organ function and in drug development. The abandonment of animal experimentation has been widely greeted by public opinion concerned about the needless suffering of laboratory animals.

Yet despite the variety of new methodologies and knowledge being applied to drug discovery, the number of new chemical entities reaching the market is decreasing: fewer and fewer new drug targets are identified, medicines have been withdrawn from the market; drug development costs are soaring. Perhaps the time has come for safer and more effective drug discovery programs to re-enlist some of the discarded methodologies and, in particular, to revise the use of experimentation on whole organisms. In preclinical research this is now facilitated by applying noninvasive imaging technologies to animals engineered specifically to report on drug action, while in clinical research novel imaging technologies will prove valu-

able for the study of drug effects and for more accurate patient selection. The prospects for imaging and molecular imaging in drug discovery and treatment of human disease are promising.

The Quarterly Journal of Nuclear Medicine and Molecular Imaging has devoted an entire issue to drug discovery, with a series of invited articles on this novel field of application for imaging techniques. The articles by Lecchi *et al.* and Stell *et al.* present currently available tools for animal imaging and their application to preclinical drug discovery programs. But the application of these innovative technologies needs to be validated, as Adrian Nunn argues in his discussion on the difficulty of introducing novel, surrogate endpoints for preclinical and clinical research. Rottey describes the use of radiolabelled compounds in the study of drug absorption and metabolism; Del Vecchio *et al.* and Rottey *et al.* report on the applicability of imaging technologies to cancer therapy; Rueger *et al.* point to the tremendous advantage imaging may afford in the diagnosis and therapy of neural disorders and neurodegenerative diseases, in particular. Many of these authors are members of two Centers of Excellence, EMIL and DIMI, both founded by the European Union with a view to broaden the application of noninvasive methodologies in animal and clinical studies.

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