

Preface

Recent advances in noninvasive imaging techniques and fluorescent labeling methods have revolutionized our knowledge of cellular processes, signaling and metabolic pathways, underlying mechanisms for health problems, and the identification of new therapeutic targets for drug discoveries. Endogenous biomolecules such as amino acid tryptophan, coenzymes (e.g., NADH, FAD), and structural proteins (e.g., collagen, elastin) are intrinsically fluorescent and therefore have potential as natural biomarkers for cellular processes as well as clinical diagnosis. In contrast with fluorescent dyes, these native biomarkers minimize toxicity, interference with biomolecular machinery, and nonspecific binding in living cells.

This book is divided into four sections and is designed to capture the current state of knowledge and challenges associated with using cellular/tissue autofluorescence in quantifying metabolic activities under physiological and pathological conditions toward clinical diagnosis. Section I highlights the fundamentals of cellular energy metabolism as well as natural biomarkers within the context of their biological functions. Section II outlines the theoretical and technical background of quantitative, noninvasive, autofluorescence microscopy and spectroscopy methods, which include experimental design, data acquisition, calibration, pitfalls, and remedies. Finally, Sections III and IV highlight selected applications in biochemistry, cell biology, and medicine. The book is also suitable for advanced undergraduate and graduate students, biophysics instructors, as well as researchers at the postdoctoral level.

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