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## Foreword

Progress in technology and development of new analytical methods provide the driving force for discovery in various branches of biology and medicine. During the past three decades we have witnessed a spectacular development of instrumentation and expansion of methods that utilize flow and laser-scanning cytometry. Application of these methods was particularly rewarding in clinical settings, where they are currently used as routine diagnosis and prognosis assays in numerous diseases, often providing invaluable information to the clinician and being life-saving to the patient.

*Cellular Diagnostics*, edited by Ulrich Sack, Attila Tárnok and Gregor Rothe, presents a very comprehensive review of the most useful cytometric methods that found clinical applications. The monograph consists of 37 chapters, many written by the renowned authors who contributed towards the development and application of the described method in clinical medicine. The first several chapters are introductory, describing the history of flow cytometry, principles of instrumentation, different fluorescence techniques, fluorescence measurements, cell sorting, data analysis, standards and controls. These chapters provide useful information, particularly for newcomers to the field, to develop knowledge on the background and capabilities of the technology, which is essential for its practical application.

The most frequent clinical uses of cytometry are for immunophenotyping, and this topic is extensively covered in numerous chapters of the monograph. In fact, this book contains an all-inclusive collection of chapters describing clinical applications of immunophenotyping in a variety of diseases. Thus, many chapters present the uses of cytometry in hematological disorders, HIV infection, organ or stem cell transplantation and sepsis. Applications of cytometry in oncology, particularly in leukemias and lymphomas, are covered in-depth as well. A large section of chapters of clinical relevance is devoted to cell function analysis. These chapters cover a variety of topics, including measurements of intracellular cytokines, metabolic parameters, oxidative stress, cell proliferation, apoptosis, differentiation markers, multi-drug resistance, platelets function, etc.

The *Cellular Diagnostics* monograph, thus, provides a collection of valuable chapters that describe up-to-date developments in the most important areas of clinical cytometry. Certainly, the book will find wide readership among researchers who use cytometry in clinical settings as a routine tool for disease diagnosis and assessment of treatment efficiency and prognosis. It will also be useful for the laboratory per-

sonnel using the protocols for cell analysis and operating cytometry instrumentation. The researchers with a main interest in basic sciences, who however want to extend the relevance of their findings to the clinic, may also find this monograph worth close scrutiny. The text of this useful monograph, which was originally published in German, is now presented English, which extends its readership to a worldwide audience.

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## Preface

In the past 20 years, flow cytometry has developed from a 'science in itself' to an indispensable tool for both research and the diagnostic characterization of cells in health and disease. While several immunophenotyping techniques already are routine procedures in the laboratory, new methods for the functional characterization of cells, the analysis of rare cells, and the diagnosis of complex materials have only begun to gain wide recognition. Multiparameter approaches will further improve analysis.

The intention of this book is to provide a comprehensive and detailed compilation of all aspects of flow cytometry in clinical translational research and clinical practice. This is addressed in four sections. In the first section of the book, the background and common methodological principles of flow cytometry are introduced. The second section addresses the biology and immunophenotypic characterization of the various cell types of the immune and hematopoietic systems as well as of the cells involved in angiogenesis or tissue repair. This section also provides in depth information for advanced users of flow cytometry. The third section then addresses specific methods which allow the characterization of the functional state of cells, their immunological competence and their turnover within a given phenotype. Specific protocols are intended to support the adaptation of methods to various cell systems. Finally, the fourth section of the book addresses already firmly established diagnostic applications of flow cytometry and is intended to serve as a reference and to assist in the interpretation of results. Each chapter provides background information in conjunction analytical protocols for the various applications of flow cytometry.

The book is the updated English version of the 2006 handbook *Zelluläre Diagnostik* which was created by a working group of scientists active in the disciplines of laboratory medicine, immunology, hematology and transfusion medicine in Germany. The common goal of this group was to promote the use of flow cytometry by providing background information together with technical protocols for a broad range of research and clinical applications to colleagues and students as well as laboratory technicians. We are grateful to the Wallace H. Coulter Foundation who identified the potential of this concept of a combined textbook and manual not only to help new coworkers in our laboratories to become familiar with new applications, but also to promote cellular diagnostics in geographic regions where flow cytometry currently still finds only a limited use. The international orientation of the new edi-

tion of the book is reflected by additional information as well as new chapters on the history of flow cytometry and monitoring of HIV disease as well as by a selection of manuscripts focused on techniques or applications with a high potential to address current or emerging medical needs.

We are thankful to all contributing authors for the time they devoted to share their knowledge and experience. We are also thankful to the International Federation of Clinical Chemistry and Laboratory Medicine (IFCC) for adopting this project as part of its international educational efforts.

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