

New Outlook for Old Cells

2nd Edition

editor

Dmitry I. Gabrilovich

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2nd Edition

DEDICATION

For the people who made this book possible: Yulia, Sonia, Lev, and Jacob

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Preface

Five years ago in the preface to the first edition of this book, I wrote about a revived interest in the neutrophil in recent decades. The last five years have witnessed even more remarkable upswing in interest in this cell. Neutrophil has become a test ground for new hypotheses in signal transduction, reactive oxygen production, and mechanisms of cell motility and adhesion. The results of these studies have broad implications for our understanding of the many biological processes. An emerging understanding of the close link between innate and adaptive immunity puts neutrophil into a prominent position in the initiation and regulation of immune responses. It has become increasingly clear that therapeutic manipulation of neutrophils might provide a very important method of treatment of different diseases.

In preparing this monograph, the authors tried to pursue two major aims. First, to provide readers with a detailed overview of the recent developments in neutrophil research, as well as to present some topics that are rarely discussed in monographs on neutrophils. Second, to draw the attention of a broad spectrum of researchers from other fields and clinical scientists to this remarkable cell, and to demonstrate how much neutrophil can give in return for exploration by inquisitive minds. This monograph consists of two sections. The first describes basic neutrophil

biology, and the second shows how our knowledge of neutrophil biology can be applied in practical medicine.

In the first chapter of this monograph, Dr. English introduces a variety of signal transduction pathways that make these cells so important for our understanding of cell biology. He describes why neutrophils may serve as a unique model for investigation of the basic mechanisms of cell activation, since neutrophil as a terminally differentiated cell does not require these pathways for cell division. Dr. English introduces several major players in neutrophil function that are discussed in greater details in other chapters. In the second chapter, Dr. Quinn presents a detailed review of neutrophil respiratory burst oxidase. He provides up-to-date information regarding key structural and functional features of the neutrophil NADPH oxidase and its protein components. In the next chapter, Drs. Chen and Wei describe several novel neutrophil receptors important for its function. They also discuss signal transduction pathways associated with those receptors. Migration to the site of infection or injury is a critical function of neutrophils. In this monograph our readers will find a chapter written by two experts in this field: Drs. Burns and Rumbaut, who discuss recent data pertaining to the mechanisms of neutrophil migration. They provide detailed description of several key receptors involved in cell migration. Special emphasis is on the mechanisms of transendothelial migration of these cells. The fate of neutrophils is discussed by Dr. Rossi and his colleagues in the next chapter. They review recent data on neutrophil apoptosis and its biological significance. Dr. Ferrante and colleagues discuss new data on the effect of fatty acids on neutrophil function. During the last 5 years, this area of investigation has generated a wealth of new interesting and important information with direct clinical implications. The first section concludes with a chapter written by Dr. Collet-Martin and colleagues. They discuss the very interesting and highly important issue of cytokine production by neutrophils. This area was thriving during the last 5 years and new data dramatically expand our understanding of the role of cytokine production by neutrophils in the pathogenesis of many diseases.

In the second block of this book we focused on the direct role of neutrophils in different diseases and as a potential tool for therapy. Dr. Roberts has updated his chapter on the role of neutrophils in the antiviral response. He includes new information regarding neutrophils involvement in HIV and influenza virus infections. A new chapter in the second edition of the book is focused on the controversial role of neutrophils in cancer. These cells have recently emerged as a major player determining the speed of tumor progression and even the success of certain types of antitumor therapy. The last two chapters discuss the issue of therapeutic utility of neutrophils. Dr. Nelson and colleagues provide new, updated information regarding the use of colony-stimulating factors in the treatment of neutropenia and infectious diseases. Dr. Strauss discusses new data on the benefits and possible pitfalls of neutrophil transfusion therapy.

This book is the result of the collective effort of a group of scientists. I am extremely grateful to all contributors to this book, who have kindly found time in the midst of their active research and clinical duties to share with us their knowledge and thoughts.

Dmitry Gabrilovich, MD, PhD

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