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## Preface

It is becoming increasingly clear that natural killer (NK) cells are critical sentinels of the innate immune response. NK cells play important roles in protecting the body from numerous pathogens and cancer in addition to contributing to normal pregnancy and impacting the outcomes of transplantation. They have the unique capacity to detect and immediately respond to abnormal cells in the body without prior exposure. NK cell responses include the classical tumor cytolytic activity for which they were named and for the production of a number of cytokines that directly contribute to or potentiate the immune response. Although efficient tolerance mechanisms appear to prevent NK cells from causing autoimmune diseases, a great deal of genetic evidence suggests that match or mismatch of certain NK cell regulatory receptors [namely killer cell Ig-like receptors (KIR)] and their MHC class I ligands can influence a wide variety of human pathological conditions, including altering outcomes of viral infections, transplantations, pregnancies, and tumor therapies.

The second edition of *Natural Killer Cell Protocols* provides a broad collection of some of the most important methods currently being used to study NK cells both in vitro and in vivo. The authors are international leaders in the field, who are directly using these methods to advance our understanding of this fascinating subset of lymphocytes. While the first edition provided a valuable collection of classical cellular and in vivo techniques to study NK cell functions, the chapters in the second edition focus on more recently developed methods, more refined techniques, and protocols designed to study NK cells within specialized tissue sites. These include protocols to analyze the various stages of NK cell development/maturation, to assess NK cell interactions with target cells and dendritic cells, to evaluate signal transduction by NK cell receptors, and to define KIR expression profiles by genotyping or flow cytometry. Additional chapters describe methods for the study of unique subsets of NK cells within the uterus during pregnancy and at intestinal mucosal surfaces, as well as techniques to evaluate NK cell responses to viral infections and malaria. The collection also includes specialized techniques to identify ligands for NK cell receptors, to define promoters regulating human KIR expression, to map receptors encoded within the murine NK cell gene locus that are responsible for resistance to pathogens, and to introduce cDNAs and shRNAs into NK cells using recombinant retrovirus or lentivirus. Finally, the book's appendix provides a rich resource summarizing available reagents to study NK cells, cross-referencing KIR nomenclature, and detailing the many HLA ligands for various KIR family members.

NK cells in rodents and humans are regulated by very different repertoires of receptors. Therefore, protocols from both perspectives are provided in this volume, with the species noted in the title or abstract. Furthermore, we have emphasized the "Notes" sections, which provide important details within each protocol, thereby extending the long-standing tradition of the *Methods in Molecular Biology* series.

NK cells play unique roles in the immune response, but despite several decades of study, there is still much to learn about their functions, maturation, and regulation. The goal of *Natural Killer Cell Protocols* is to provide open access to important techniques

written by key researchers in the field. I am indebted to the authors who have contributed their time and energies to provide high quality protocols. Their commitment to providing detailed descriptions of the methods was essential in making this project a success. I hope that this collection of methods will make significant contributions to your research and thereby further advance our collective understanding of these fascinating cells for many years to come.

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<http://www.springer.com/978-1-60761-361-9>

Natural Killer Cell Protocols  
Cellular and Molecular Methods  
Campbell, K.S. (Ed.)  
2010, XIV, 550 p., Hardcover  
ISBN: 978-1-60761-361-9  
A product of Humana Press