

Preface

Macrophages are a key component of the innate immune system and play an essential role in host defense and homeostasis. On the one hand, these cells contribute to host defense by triggering inflammation, displaying microbicidal and tumoricidal properties, regulating the activation of adaptive immunity, resolving inflammation, and promoting tissue repair. On the other hand, they perform essential trophic functions contributing to developmental processes in many organs or tissues like the brain, mammary gland, and bones. Thus, macrophages are extremely versatile cells that can efficiently respond to the tissue microenvironmental cues by polarizing to distinct functional phenotypes depending on the functions they need to perform. Indeed, functional plasticity and diversity are hallmarks of these cells.

Macrophages may also play a detrimental role. An overwhelming body of literature supports a crucial role for these cells in pathogenesis. The list is exhaustive, including cancer, metabolic syndrome, sepsis, allergy, immunodeficiency, autoimmune disease, etc.—impacting virtually every major disease that we know. These observations in turn suggest macrophages and their related molecules as potential targets for therapeutic applications.

In view of the above, macrophages have emerged as key players in homeostasis, host defense, and disease. However, in the last 10 years, a phenomenal amount of research has shed new light on our understanding of these cells including:

- New concepts on the origin of macrophages
- The trophic functions of macrophages and their contribution to homeostasis
- Emergence of new myelomonocytic subsets and their relationship to macrophages
- New tools to study monocytes and macrophages in vivo (such as fate mapping and novel transgenic models)
- The concept of macrophage polarization and definition of distinct polarization states
- Systems biology of macrophages: characterization of the transcriptional and post-transcriptional networks that regulate macrophage polarization and function

- Profiling of macrophages in vivo in various disease conditions (e.g., tumors, metabolic syndrome, resolution of inflammation, parasite infection, etc.) and a better understanding of their contribution in disease progression.

These developments called for a reevaluation and update of our understanding of macrophages. Thus, we hope that this book is both timely and topical in presenting a state-of-the-art understanding of these cells in health and disease.

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Singapore
Milan, Italy

Subhra K. Biswas, PhD
Alberto Mantovani, MD

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Biswas, S.K.; Mantovani, A. (Eds.)

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