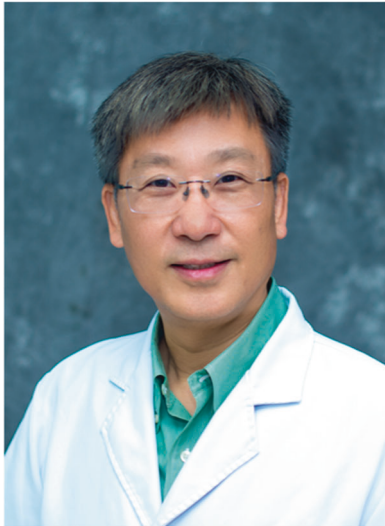


EDITORIAL


Immunological modulation in health and disease

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Cellular & Molecular Immunology (2023) 20:981–982; <https://doi.org/10.1038/s41423-023-01066-1>



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The immune system is a complex network of cells, tissues, and organs that protect the body from pathogens and diseases. It consists of two interconnected branches: the innate immune response and the adaptive immune response. The innate immune response is the body's first line of defense against pathogens and acts promptly upon encountering them. It consists of physical barriers such as skin and mucous membranes and innate immune cells such as neutrophils, macrophages, and natural killer cells.

These cells recognize pathogen-associated molecular patterns shared by pathogens and initiate an immune response to eliminate them [1].

On the other hand, the adaptive immune response is a defense mechanism that develops over time and is more specific and tailored. It involves lymphocytes, including T and B cells, which are specialized immune cells. The adaptive immune response depends on lymphocytes' ability to recognize and establish memory against specific antigens [2]. In summary, the immune system depends on the intimate connection between innate and adaptive immune responses, with the lymphatic system functioning as an essential link between these two branches. Lymphatic vessels facilitate immune cell activation, antigen presentation, and coordination of immune responses by transporting immune cells and antigens [3]. Together, this integrated network enables the host to mount effective immune defenses against pathogens and maintain tissue homeostasis and provides immune protection over the long term. In this special issue of *Cellular and Molecular Immunology (CMI)*, we compile a collection of current review articles on major innate immune cell types, such as macrophages and neutrophils, and adaptive immune cell types, such as T lymphocytes and B lymphocytes, as well as the lymphatic system.

By focusing on how macrophages may prime the premetastatic niche to enable growth of metastasis and how subsequent metastasis-associated macrophages can support secondary tumor growth, the review article by Bied and colleagues provides a comprehensive view of the function of macrophages in health and tumorigenesis [4]. Neutrophils are the most abundant leukocytes in the human circulatory system. Long believed to comprise a short-lived, homogeneous leukocyte population, these cells have received much attention recently as their heterogeneity has been recognized. In this collection, Qu et al. discuss the heterogeneity of neutrophils and implications of their functional diversity in transplantation [5].

Regarding the adaptive immune response, we present two articles covering regulation of CD4 T helper cell and CD8 T-cell effector cell function. Wang et al. provides an overview of the significance of the balance between the regulation of regulator T cells (Tregs) and T helper 17 cells, with a focus on how the transforming growth factor (TGF) cytokine superfamily modulates generation and coordinates Treg and Th17 cell function [6]. On the other hand, Chen et al. provide an overview of the function of mTOR signaling pathways in generation and maintenance of CD8 T memory cells. The authors also discuss the therapeutic potential of modulating mTOR signaling pathways to restore exhausted CD8 T-cell functionality [7]. In addition to T lymphocytes, B lymphocytes are vital to the adaptive immune response, as they are the cell type responsible for antibody production. Germinal centers are essential for producing highly specific antibodies, generating diversity, promoting affinity maturation, and establishing long-term immune memory. In this collection, Playoust et al. discuss B-cell responses in the tumor context and how the tumor microenvironment can influence the B-cell repertoire as well as the BCR specificity, affinity, and function [8]. In particular, the

Received: 16 July 2023 Accepted: 18 July 2023
Published online: 25 August 2023

authors propose that in-depth analysis of tumor-infiltrating B cells may contribute to cancer diagnosis and treatment.

Lymphatic vessels “link” both the adaptive and innate immune systems. The lymphatic system functions as a conduit for immune cells to migrate between tissues and lymphoid organs, and it also plays an essential role in removing excess fluid and waste from tissues, thereby contributing to tissue homeostasis and immune surveillance. The article by Angeli and Lim examines the mechanisms that lymphatic vessels use to detect and translate mechanical cues into biological signals and their function [9].

In summary, this special collection aims not to cover all aspects of each cell type but to promote new biological aspects of each cell type. We also hope that this special collection will inspire new ideas and discussion regarding these cell types.

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AUTHOR CONTRIBUTIONS

BS and LGN wrote the editorial together.

COMPETING INTERESTS

The authors declare no competing interests.

ADDITIONAL INFORMATION

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