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Issue: *B-1 Cell Development and Function*

B-1 Cell Development and Function

B-1 cells constitute a unique subpopulation of normal B lymphocytes and were historically the first such subdivision recognized. As the highly productive inaugural decade of their study drew to a close in 1991, an international meeting was organized to bring together the diverse group of investigators studying B-1 cells. In fact, it was at this meeting that the new nomenclature of "B-1" cells[a] (more specifically, "B-1a" cells) replaced "CD5 B" cells, recognizing that B-1 cells emerge in ontogeny before conventional (B-2) B cells. This highly successful meeting ("CD5 B Cells in Development and Disease"), sponsored by the New York Academy of Sciences and held in Palm Beach Gardens, Florida June 3–6, 1991, was cochaired by Leonore A. Herzenberg, Geoffrey Haughton, and Klaus Rajewsky, who also coedited the conference proceedings volume of *Annals of the New York Academy of Sciences* published in 1992. Many new findings were reviewed and discussed, and in Lee Herzenberg's words "a common understanding of what is known and what has yet to be clarified" was developed.

The world of immunology, especially B-1 cell immunology, has not stood still since that time. In the decades following 1991, B-1 cells have been shown to engage in functional activities beyond the generation of germline-like natural antibody, which is both antimicrobial/defensive and autoreactive/homeostatic. These functions include phagocytosis that parallels macrophage function, antigen presentation that rivals dendritic cell activity, and immunosuppression that recalls the role of regulatory T cells. And yet, over the 23-year period since 1991 no meeting devoted to B-1 cells was organized.

In 2014 this deficiency was addressed when 156 investigators met in Tarrytown, New York for an international meeting entitled "B-1 Cell Development and Function," organized by Nichol E. Holodick and Eliver Ghosn, and cochaired by Thomas L. Rothstein and Leonore A. Herzenberg. Klaus Rajewsky gave the keynote memorial address in honor of Leonard Herzenberg. The participation of Drs. Herzenberg and Rajewsky provided wonderful continuity with the first B-1 cell meeting and set the stage for exciting interchanges that occurred through formal talks, discussion periods, and poster sessions. We are deeply grateful for the extensive support provided by the Merinoff Family Foundation, the Feinstein Institute for Medical Research, and several industry sponsors that enabled this meeting to move from idea to reality.

In this volume of *Annals of the New York Academy of Sciences*, we are able to bring the exciting results and intriguing discussions that took place in Tarrytown to a wider audience. The 26 contributions that follow contain the most up-to-date information regarding the origin, fate, and function of B-1 cells. These articles discuss the nature of B-1 cells in rodents, humans, and nonhuman primates, and include results on early B-1 cell development from non-HSC hemogenic sources, and on regulation of B-1 cell numbers and expansion by transcription factor, miRNA, cyclin-dependent kinase, and specific receptor elements. The unique antimicrobial and homeostatic roles of B-1 cell–generated IgM, IgA, and IgG antibodies are highlighted, along with the potential fate-determining role of surface immunglobulin specificity. Further discussion revolves around novel phenotypic subdivisions of B-1 cells and unique B-1 cell functional

[a]A new nomenclature for B cells. 1991. *Immunology Today* **12:** 388.

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characteristics of phagocytosis, antigen presentation, and immunosuppression. The susceptibility of B-1 cells to malignant transformation is also addressed.

The articles in this volume give voice to our current understanding of B-1 cells and present new results, ideas, paradigms, and questions that will guide future efforts to unravel the role of this unique innate-like B cell in health and disease. Although tremendous progress has been made in elucidating the development and function of B-1 cells, much of it summarized here, this new understanding raises new questions yet to be answered.

Thus, although the nomenclature for B-1a, B-1b, and B-2 cells was fixed during the first B-1 cell meeting, findings discussed at the more recent meeting raise questions about the development, function, and potential heterogeneity of murine B-1b cells and suggest a closer kinship with B-2 cells, one that a revised name might better capture. In addition, although B-1a cells have been thought to lack memory responses, results discussed at the meeting raise questions about the universality of this conclusion and the function of B-1a cells during active infection. Finally, while B-1a–like cells have been identified in human peripheral blood, a host of questions remain regarding the origin, location, activity, and role of such B-1a–like cells and whether/how the phenotypic profile that describes them can be further refined.

These are some of the important and exciting issues that we expect will animate investigations of B-1 cells, leading us to look forward to the next B-1 meeting and the vibrant exchange of information and ideas we expect will occur. We extend deep appreciation to our scientific advisory committee (Nicole Baumgarth, Michael P. Cancro, Kenneth Dorshkind, Richard R. Hardy, John F. Kearney, Timothy L. Manser, Herbert C. Morse III, Laurence Morel, and Gregg J. Silverman) who helped make the 2014 Merinoff/Tarrytown meeting a success; we hope to enlist them in our future efforts. In addition, we trust that new investigators will join this body to provide insight and advice to make the next B-1 cell meeting as exciting and beneficial as the last.

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