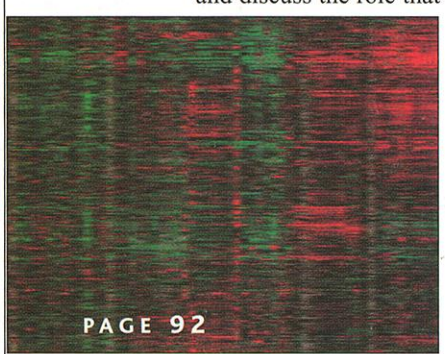
Immune Cell Networks

To fight its ancient war on pathogens, the immune system has evolved a rich and diverse army of specialized cells. They pull together through extraordinary means to prevent viruses, bacteria, and malignant cells from achieving their devastating ends. As a consequence, immunology has developed as a subject embracing the scrutiny not only of subcellular events but also of the intriguing and unexpected workings of a complex cellular system.

This special issue surveys recent developments in four areas of cellular immunology. In the first Review, Ravetch and Lanier (p. 84) discuss the abundant inhibitory receptors used by immune cells. By their sheer number, these receptors testify to the importance of diminishing the activity of lymphocytes once they have completed their task. Indeed, they provide a crucial safeguard against inappropriate immune responses and autoimmunity. In their Viewpoint, Fagarasan and Honjo (p. 89) focus on an unusual subclass of B cells, termed B1 cells, which reside in the peritoneal cavity and may provide a crucial link in the early phase of humoral immune responses. A striking feature of these cells is their ability to produce antibodies independently of T cell help. This property, along with distinct modes of migration and activation, could be key to the unusual niche that these lymphocytes occupy.

The dendritic cell (DC) is a strategic intermediary between pathogen and lymphocyte and as such continues to enjoy much attention from immunologists. In their Review, Lanzavecchia and Sallusto (p. 92) outline the remarkable dynamics of the relationship between the DC and the T cell and discuss the role that DCs play in guiding effector and memory T cell responses.



Pathogens are most frequently encountered at surfaces, such as the skin and the mucosal linings of the lung and gut. Because of the DCs they contain, these tissues also act as interfaces between the outside world of the pathogen and the cells of the systemic immune system. In a Viewpoint, Hayday and Viney (p. 97) develop this "information relay" paradigm. They suggest that many immune cells at mucosal surfaces play a dual role, offering local protection against pathogens while impeding overt reactivity to common harmless antigens.

A critical issue in all areas of cellular immunology is deciphering how the signals initiated by the cell-to-cell contacts that regulate immune responses are conveyed into a cell's interior. An excellent example of how this can be achieved is reported by Seddon *et al.* (p. 127), who examine the role of the signaling protein $P56^{lck}$ in the survival and expansion of T cells.

Finally, two News stories by Michael Hagmann focus on technical advances that are promoting our understanding of cellular and other aspects of immunology. The first (p. 80) describes how computer modeling is helping to identify the antigen fragments that stimulate strong immune response and might thus be suitable candidates for vaccine development. A second story (p. 82) focuses on the use of microarray technology to identify the gene changes involved in normal immune cell activities and in diseases, including blood cell cancers.

Although steady progress is being made in characterizing the key molecular players of the immune system, the extraordinary cellular network that these components make up remains mysterious, and there is much left to explore.

–STEPHEN SIMPSON, STELLA M. HURTLEY, AND JEAN MARX

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