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Perspective

Evolution of Immunity and Immune System in Humans

Mujibul Anam*

Department of Immunology, Addis Ababa University, Addis Ababa, Ethiopia

DESCRIPTION

The immune system is a tightly regulated network that enables the development of defense mechanisms against foreign antigens and resistance to self-antigens. Regulatory T-cells contribute to immune homeostasis by maintaining unresponsiveness to self-antigens and suppressing exaggerated immune responses. The dysregulation of one of these processes can have serious consequences. Immunological self-tolerance is the unresponsiveness of the adaptive immune system to the auto antigens of the primary lymphatic organs and is a further control of peripheral auto reactive T and B cell activation, expansion, and survival. Acquiring immune tolerance is essential to avoid fighting with own cells and molecules. During T-cell thymic maturation, somatic recombination allows individual T-cells to express different T-cell receptors, allowing each T-cell to recognize a particular antigen. The entire T-cell specificity is called the repertoire. Binding of T-cell receptors to the thymic self-peptide loaded MHC molecule leads to positive selection, and the next step is to eliminate T-cells that bind with high affinity to self-pMHC by negative selection. Thymocytes can avoid this clonal deletion by rearranging the TCR gene and ultimately alter the affinity of the TCR for self pMHC. This central resistance is not absolute because not all self-antigens are expressed in the thymus and the efficiency of the selection process is incomplete. As a result, self-reactive T-cells are also depleted in the periphery, and many self-reactive T-cells can fall into a non-responsive state called "anergy" (peripheral tolerance).

The immune system protects the host against pathogen invasion and armed with an arsenal of deadly ammunition necessary to remove microorganisms or substances identified as pose a significant threat to the normal functioning of the host in order to protect the host from invading pathogens. This unique function has made it essential for the development of host immunity to include important mechanisms to prevent self-destruction. Therefore, maintaining immune tolerance is central to the normal functioning of the immune system, and disruption of immune tolerance has devastating consequences for the host. Increasing knowledge of the immune system helped to depict important mechanisms involved in maintaining immune tolerance. Currently, a central aspect of lymphocyte development is known to be the elimination of self-ligand-responsive lymphocytes by the process of negative selection. It seems appropriate for the immune system to evolve its fail-safe mechanism to address auto reactive lymphocytes that are not eliminated during the negative selection process. One such mechanism that has been proposed for decades is the ability of T lymphocyte subtypes to suppress the function of other lymphocytes. This subpopulation of T lymphocytes identified by the expression of CD4, CD25 and FOXP3 has been shown to play an important role in maintaining immune tolerance and homeostasis. It is well known that the coordinated interaction between cells of the innate immune system and cells of the adaptive immune system is important for the induction of an appropriate immune response. The recent finding that regulatory T cells regulate the function of innate immune cells such as macrophages, dendritic cells, and neutrophils is interesting and shows a significant overlap between the immune arms. The important role of regulatory T cells (defined by expression of CD4, CD25, and FOXP3) is maintaining immune tolerance. The new role of regulatory T-cells as regulators of innate immune cells. It emphasizes the poorly understood interaction between regulatory T cells and innate immune cells and the importance of this interaction in maintaining immune tolerance and in the pathogenesis of autoimmune diseases. The role of a special group of immune cells, properly named antigen-presenting cells, in providing the secondary signals required for lymphocyte activation is highly valued. Dendritic cells were first identified as Langerhans cells in the skin in 1868, but their major role in the immune response was not recognized until the 1970s. Although their major role in the immune response has been discovered recently, regulatory T lymphocytes (Tregs) regulate the immune response and help thyroid homeostasis prevent autoimmunity by regulating the immune system. Treg's active role in preventing autoimmunity can quickly be counteracted if it continues to suppress normal T cell function.

Correspondence to: Mujibul Anam, Department of Immunology, Addis Ababa University, Addis Ababa, Ethiopia, E-mail: mujian@sha.et

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