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Commentary

A Short Note on T-Cell Immunology

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DESCRIPTION

T cells, also called T lymphocytes, are a type of white blood cell that is an important part of the immune system. T cells are one of the two major types of lymphocytes, and B cells are the second type that determines the specificity of an immune response to an antigen (foreign substance) in the body. T lymphocytes are derived from bone marrow hematopoietic stem cells. Some of these pluripotent cells become lymphocyte progenitor cells, leave the bone marrow and migrate through the blood to the thymus. When T lymphocytes reach the thymus, most of the developing T cells (called thymocytes) go through a selection process in which they do not survive. During this process, thymocytes with receptors for self-antigens receive a negative signal and are removed from the repertoire.

Each T lymphocyte has a T cell receptor (TCR) that is specific for a particular antigen. T lymphocytes that survive the selection of the thymus mature and exit the thymus. They then circulate in the peripheral lymphatic organs, encounter their cognate antigens, and are ready to be activated. As the thymus atrophies with age, the production of naive T lymphocytes decreases over time. Naive T lymphocytes are cells that have not yet encountered a particular antigen. In peripheral lymphoid organs, naive T lymphocytes may interact with antigen-presenting cells (APCs) that present antigens using MHC molecules. When T lymphocytes recognize specific antigens, they proliferate and differentiate into one of several subsets of effector T lymphocytes. Effector T lymphocytes interact with host cells (not pathogens) to perform immune function. T lymphocytes use co-receptors to bind to MHC molecules. The co-receptor is either CD4 or CD8. The CD protein helps distinguish the major groups of effector T lymphocytes. Naive $CD8^+$ Tlymphocytes become cytotoxic T lymphocytes. Alternatively, $CD4^+$ T lymphocytes become T helper lymphocytes, each dedicated to a particular task. Cytotoxic T lymphocytes kill target cells primarily by releasing cytotoxic granules to the target cells. These cells recognize certain antigens (such as viral fragments) only when presented to MHC class I molecules present on the surface of all nucleated cells. MHC class I molecules interact with CD8 on cytotoxic T cells. Cytotoxic T cells require the activation of multiple signals from other cells such as dendritic cells and T helper cells. Their main function is to kill cells infected with the virus, but they can also kill cells with intracellular bacteria and tumor cells. T-helper cells (Th) have different effector functions and can differentiate into different subtypes. B. Th1, Th2, Th17, TfH cells and regulatory T cells. They are activated when presented with peptide antigens on MHC class II molecules. These are represented on the surface of the APC. MHC class II molecules interact with CD4 on T helper cells and help identify this cell type. Functions of $CD4^+$ T cells include activation of other immune cells, release of cytokines, and helping B cells produce antibodies. They help shape, activate and regulate adaptive immune responses. After infection, antigen-specific, long-lived memory T lymphocytes are formed. Memory T lymphocytes are important because they rapidly proliferate into a large number of effector T lymphocytes upon re-exposure to the antigen and have a low activation threshold. They provide the immune system with memory for previously encountered antigens. Memory T lymphocytes are either $CD4^+$ or $CD8^+$. This all about the T-cell Immunology.

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