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Commentary

Structure and function of B cell and T cell receptors

Ran M Wal*

Department of Immunology, University of Milan, Milan, Italy.

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DESCRIPTION

Introduction to T cells and B cells: T cells and B cell lymphocytes work together to detect foreign substances called antigens. As the main agents responsible for the immune system, T cells and B cells are sometimes called “special ops” for the immune system. Structural features of B and T cell receptors are what provide antigen binding. Lymphocytes from the lymphoid progenitor cell are a process called hematopoiesis. In hematopoiesis, stem cells within the bone marrow divide into myeloid progenitors or lymphoid progenitors, which are then activated specifically for the twelve cell types that comprise blood cells, platelets, and macrophages which travel throughout blood and lymph systems. Lymphocytes can be further divided into B cells, T cells, and natural killer cells. While natural killer cells detect common symptoms of immune suppression such as inflammation, B and T cells detect foreign antigens mainly through hyper variable B cells and T cell receptors (BCRs and TCRs). B cells recognize free, untreated antigens. T cells detect antigens within a cell-rich protein complex called histocompatibility complex (MHC) which is superior to antigen-presenting cells (also called accessory cells). The proper functioning of B cells and T cells is essential to protect the body against foreign invaders. This ideal function depends on the structure of T and B cells, as they imply their function and downstream function. When these systems go out of control, the body becomes infected with cancer. An autoimmune disease is the result of the immune system accidentally attacking human body instead of protecting it. By studying the unique structure of various B cells and T cells in both high-level (large population) and low (individual) levels, we can gain insight into how diseases can be treated or prevented.

Structure and function of B cell: B cell receptors are composed of four peptides - two simple chains and two heavy chains - comprising two binding regions. Simple chains are classified as kappa or lambda, while heavy chains can be isotypes of IgG, IgA, IgM, IgD, or IgE. B cells can be activated in two ways: T-based activation or independent T cell activation. During T cell-dependent activity, B cells absorb the antigen and deliver antigen fragments to their surface through a large histocompatibility complex (MHC). Helper T cells can detect those antigens *via* MHC and activate B cells. Because of which, the T cells function independently but the B cells must interact with the antigen and receive a “danger signal,” which is a signal that an attack is taking place. Activated B cells can be active B cells or memory B cells. Effector B cells, also called plasma cells, produce antibodies. Antibodies act as tags or alarms to target invading agents to destroy other antibodies such as macrophages. B memory cells, such as T cells, help the immune system to respond more quickly to future attacks by the same agent.

Structure and function of T cell: T cell receptors composed of two polypeptide chains are grouped together to form a single antigen binding region. About 95% of TCRs are made up of alpha and beta chains, while the remaining 5% of TCRs are made up of gamma and delta chains. The T cell receptor structure is maintained by a disulfide bond that binds two chains together. Compatible determination regions (CDRs) are key structural elements within a flexible region and provide clarity in antigen binding. There are many types of T cells, and each has its own unique function. Cytotoxic T cells, also known as Killer T cells, usually target cancer, viruses, or damaged cells. Killer T cells respond to antigens by releasing cytotoxic granules that lead to apoptosis. Helper T cells help to locate B cells and other cells involved in the immune response by releasing cytokines. Memory T cells have a long shelf life and help identify the antigens present in them.

*Corresponding author. Ran M Wal, E-mail: ran.wal@msu.it.