

Lymphocyte b cell in the immune system biology essay



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B cell is a type of lymphocyte that is the basis for the body's humoral immune system; it is produced from the stem cell in the bone marrow (Darling, 2010). On its production a self-renewing hematopoietic stem cell produces lymphoid and myeloid progenitor.

Looking mainly at lymphoid progenitor, it gives rise to B cell progenitor, T cell progenitor and Natural Killer cells (Kuby et al. 2007, p. 25). Lymphoid progenitor produces progenitor B cells; it is the earliest identifiable cell that's committed to the development in the B cell lineage. The cells move and rearrange their Ig heavy chain genetic segments to make a functional IgH gene that are expressed as pre B cell receptors.

The B cell receptor is a membrane bound antibody molecule. From the pre B cell receptor, some of the cells stay in the bone marrow and some move into secondary lymphoid organs and there they reproduce, also in the secondary lymphoid organs the cells undergo antigen dependent maturation. On the topic of B cell progenitor, it produces B cell and these B cells further undergo two phases of maturation: an antigen independent phase and an antigen dependent phase (Kempert, 2010).

During the development, each B cell is genetically programmed or a process known as gene translocation, to express a unique B cell receptor. The molecules of that B cell receptor are placed on its surface where it can react with epitopes of an antigen (Kaiser, 2010)

Epitopes are antigenic determinants recognized and bound with B cell receptors and they are located on the surface of the antigen (Austin, 2010).

There are known to be two main classes of B cell epitopes, one is Linear or
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continuous, the surface that are interacted with the antibody are located next to each other sequentially on the protein. The second one is assembled or discontinuous; the components are located on disparate parts of the protein which are brought conformationally close to each other through side chain interactions (ProImmune, 2010).

Produced B cells contain two types of B lymphocytes, Plasma cells and memory cells which express CD19, CD20 and CD21 on these cells (Kempert, 2010). Plasma cells are a type of white blood cell that produces antibodies. Once produced, B cells mainly stay within the bone marrow and wait until an antigen invades the body. The antigens bind to the B cell and stimulate it to form plasma cells.

Plasma cells are known to have characteristic appearing nuclei; cytoplasm that contains dense rough endoplasmic reticulum and which is the site where antibodies are combined and also a distinctive perinuclear Golgi complexes where the antibody molecules are converted to their final forms and ready for secretion (Abbas et al. 2009, p. 22).

Memory cells are produced by antigen stimulation of naïve B cells, they have proteins that are expressed on their surface that distinguish them from B cells and Plasma cells and they can survive in a functionally state for many years after the antigen has been eliminated and also they are known as B cell sub types that are formed after an initial infection (Abbas et al. 2009, p. 22).

Function

The major function of B cell is the secretion of antibodies. When an antigen has invaded the body and has been encountered by the immune system, they bind to B cell and a number of certain B lymphocyte are then stimulated and undergo cell division to produce plasma cell and memory cells which is known as clonal expansion.

Clonal expansion is a process that when a naïve B cell encounter a pathogen's antigen. As the antigen floats through the blood system it gets attaches and binds to the naïve B cells. This trigger clonal expansion and the B cells multiples (Kuby et al. 2007, p. 17).

The B cell receptors are the ones responsible to bind to the antigens, the bounded antigen is then engulfed into the B cell by the receptor mediated endocytosis. The antigen are digested and broken down into small fragments and displayed on the cell surface that's sitting inside a class II Histocompatibility molecule.

With the help of Helper T cells that binds with B cells, the B cells then secretes lymphokines that stimulates the B cells to go through a cell cycle that develops and turn the B cells from being B cell receptors to being a plasma cell that secrete antibodies(Kimball, 2010).

The plasma cell each produces a particular antibody that's specifically attached to a specific antigen and these plasma cells are secreted into the blood system. As a specific antibody has attached to a specific antigen, the antibodies produce a humoral response and inactivate the pathogen, and make it easier to removal from the body (Anglin, 2010). Once this process <https://assignbuster.com/lymphocyte-b-cell-in-the-immune-system-biology-essay/>

has occurred meaning once the body defense has encountered and destroyed the pathogen's antigen, the body remember this pathogen's antigen and this remembering process is referred to as Memory cell.

Memory cells are produced by stimulated B cells, they are the form of basis for long term immunity and responsible for secondary response. As soon as an infection that was previously destroyed by the humoral immune system returns the memory cells that has remain dormant produce a quick response and the infection is removed as quickly and effectively leaving the patient immune (Martin, 2010).