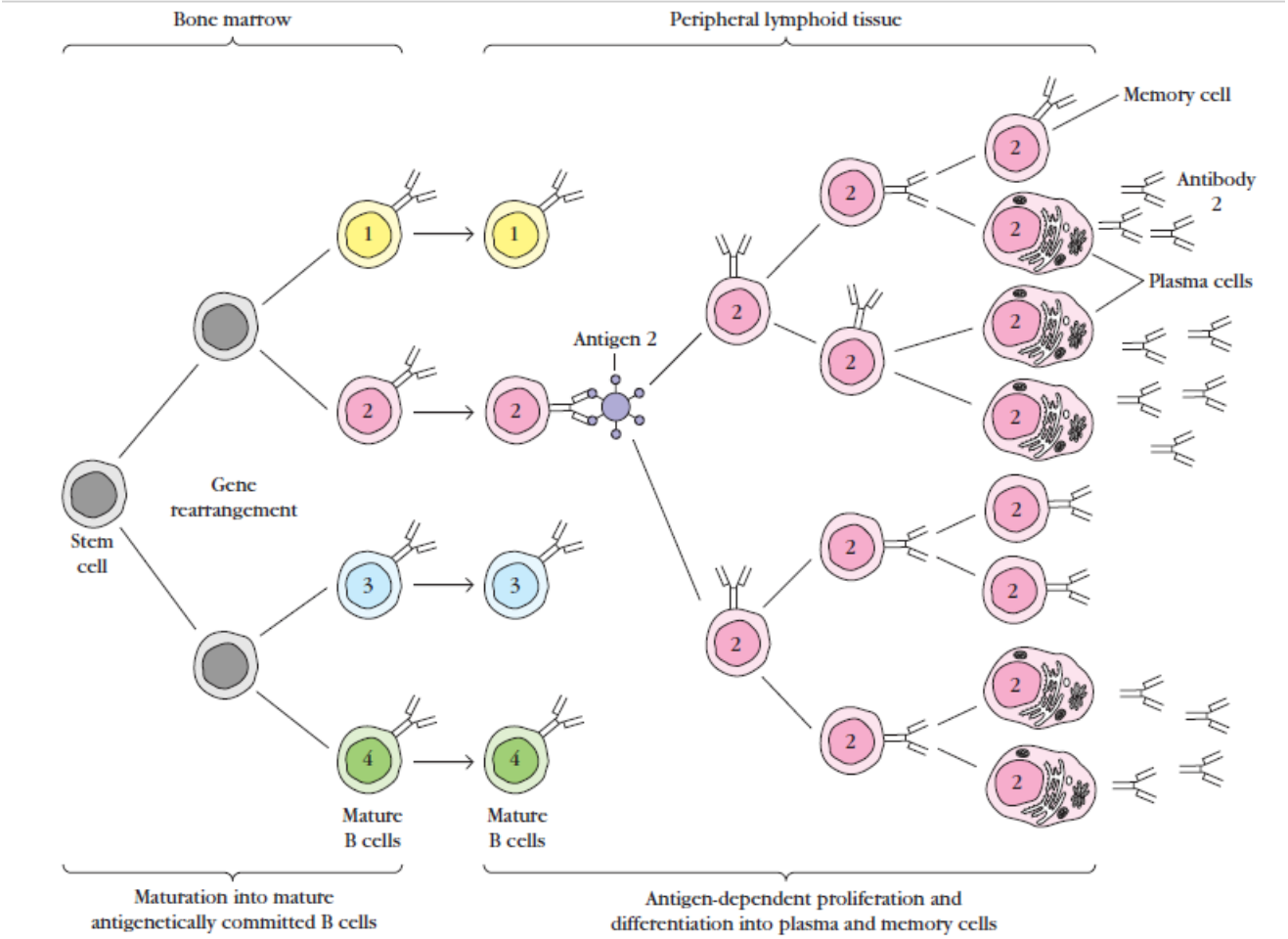
Clonal Selection Theory

Clonal selection theory is a scientific theory in immunology that explains the functions of cells of the immune system (lymphocytes) in response to specific antigens invading the body.

The concept was introduced by **Frank Macfarlane Burnet in 1957**, in an attempt to explain the great diversity of antibodies formed during initiation of the immune response.

The theory states that in a pre-existing group of lymphocytes (specifically B cells), a specific antigen activates only its counter-specific cell, which then induces that particular cell to multiply, producing identical clones for antibody production. This activation occurs in secondary lymphoid organs such as the spleen and the lymph nodes

CLONAL SELECTION



Clonal selection theory is used to clarify the basic response of the adaptive immune system to antigenic stimuli.

Clonal selection involves two main concepts i.e., are **cloning and affinity maturation**. More precisely, it establishes the idea that only those cells capable of recognizing an antigen will proliferate, while other cells are selected against. Clonal selection calls both B and T cells.

When B cell antibodies bind with an antigen, cells become activated and differentiated either to be plasma cells or memory cells. The closer the matching between an antibody and a specific antigen is, the stronger is the bond. This property is called affinity. Plasma cells make large amounts of a specific antibody that work against a specific antigen to destroy it.

Memory cells remain with the host and promote a rapid secondary response. However, before this process, clones of B cells are produced and undergo somatic hypermutation.

the specificity of each T and B lymphocyte is determined before its contact with antigen by random gene rearrangements during maturation in the thymus or bone marrow.

The role of antigen becomes critical when it interacts with and activates mature, antigenically committed T and B lymphocytes, bringing about expansion of the population of cells with a given antigenic specificity.

In this process of **clonal selection, an antigen binds to a particular T or B cell** and stimulates it to divide repeatedly into a clone of cells with the same antigenic specificity as the original parent cell

Specificity is shown because only lymphocytes whose receptors are specific for a given epitope on an antigen will be clonally expanded and thus mobilized for an immune response. Self/nonself discrimination is accomplished by the elimination, during development, of lymphocytes bearing self-reactive receptors or by the functional suppression of these cells in adults.

Immunologic memory also is a consequence of clonal selection

During clonal selection, the number of lymphocytes specific for a given antigen is greatly amplified. Moreover, many of these lymphocytes, referred to as memory cells, appear to have a longer life span than the naive lymphocytes from which they arise.

The initial encounter of a naive immunocompetent lymphocyte with an antigen induces a **primary response; a later contact of the host with antigen** will induce a more rapid and heightened **secondary response.**

The amplified population of memory cells accounts for the rapidity and intensity that distinguishes a secondary response from the primary response.