

P. G Sem III CC 10

Unit - I Sub - unit - 1.3.

Humoral Immunity:  $\beta$  Cell activities and Differentiation. Primary and Secondary Humoral Response. Part II

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Introduction: - If foreign particles are in large numbers, they are not tackled by macrophages and escape into lymphatic system through blood and are tackled by lymphocytes. Lymphocytes are mainly classified into two categories.

a - T-lymphocytes (Thymus produced lymphocytes which is involved in cell-mediated immunity and (ii)  $\beta$ -lymphocytes (Bursa produced Lymphocytes in birds). Bursa is mammal is absent but as its corresponding functions can be undertaken by lymphoid tissue in thymus, intestine and appendix. This is involved in humoral antigen-antibody reaction.

The two types of lymphocytes -  $\beta$ -lymphocytes and T-lymphocytes - can be differentiated on the basis of presence

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of certain glycoproteins on their cell surface.  $\beta$ -lymphocytes is found in bone-marrow of mammals and mature there before they become antibody secreting cells, called Plasma Cells. During maturation, surface antibodies such as IgM, IgD, IgG, IgA etc. appear on its surface. These are called SIg (Surface Immunoglobulins.) bound to Cell-membrane. T-lymphocytes are formed in bone-marrow and mature in thymus and present in lymph nodes, spleen etc. Since, Thymus gland involutes after adolescence, the no. of T-lymphocytes gradually decline and so the cell-mediated antigen-antibody reactions also decline fast with age.  $\beta$ -lymphocytes in co-operation with T-lymphocyte is associated with blood antigen-antibody reactions. The following are the substances which are involved in humoral immunity.

Antibody mediated: The principal humoral component of Immunity (adaptive) is antibody produced by  $\beta$ -lymphocytes. It is produced in response to specific antigens. Thus, antibodies are family of specialized proteins which are synthesized by  $\beta$ -lymphocytes in response to exposure to an antigen.

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The antibodies produced will bind specifically to antigenic determinants. After exposure to an antigen,  $\beta$  lymphocytes take a lag of around 10 days for detectable levels of antibody to appear in blood, after which there is substantial formation of antibodies. This is called primary response. After, the primary response has subsided in a month, a second injection of the same antigen evokes antibody formation quickly. This is called secondary response which remains present for longer duration. This is because of memory cells that differentiate during primary response. There are diverse types of  $\beta$ -lymphocytes circulate in the body and antigen selects the fitting type and multiplication and differentiation of that  $\beta$ -lymphocyte occurs for formation of specific antibody. Thus, one cell, one antibody specificity is the rule of Humoral Immunity.

$\beta$  lymphokines and other secretions - The humoral components of non-specific immunity are various antibacterial and antifungal chemicals together with an enzymatic system known as Complement.

which can interact with antibody to  
puncture the surface membrane of foreign  
cells; also important among this  
group are Interferons, and other types of  
lymphokines; lymphotoxins etc which  
are secreted by B and T-lymphocytes  
and macrophages.

B-cell Activation - whenever a foreign  
antigen enters into  
any organism, it encounters antigen  
presenting cell (APC), a macrophage of  
blood and tissue. APC has self antigens  
on its surface. Foreign antigen and  
self antigen of APC is coupled and  
presented to the T-lymphocytes and  
B-lymphocytes for its activation for  
antibody formation. After activation,  
majority of the lymphocyte population  
specially divide and form antibody.  
However, a small fraction of the  
progeny of Antigen reactive lymphocyte  
become non-dividing memory cells.  
Not all progeny of an activated B  
lymphocyte are plasma cells. The other  
important product is memory B cells.  
These are cells that retain for the life  
of the animal, a record of antigens.