

Unit 7 – Lymphocytes

Introduction

A lymphocyte is a type of white blood cell that present in the vertebrate immune system. There are two main types of lymphocytes are present in fish they are B-cells and T-cells. In teleost fish, the head kidney is an important source of B cells, B cells can also be found in spleen of the adult fish. The T cells can be found in thymus which is a primary lymphoid organ in fish. The primary function of fish lymphocytes is to executive the specific immune response against the antigen, lymphocytes may even act as phagocytic cells.

B-cells

B cells are primarily responsible for specific humoral immunity (relating to antibodies). These B cell in the presence of antigen are activated and differentiated into plasma cells in spleen, after differentiation Plasma cells migrate to the head kidney. These B cells are characterized by the expression of B cell receptor, a surface immunoglobulin receptor (sIg). B cells of teleost fish are highly phagocytic and display microbicidal properties. In case of intestine there is an increase in number of IgM+ cells from the anterior and middle to the posterior part of the intestine because the higher absorption of antigens is present in posterior part of gut. In skin of fish, B cells are present only in the epithelium layer and the numbers of IgM-secreting cell present in the skin can increase up to 20-fold if the fish is immunized with antigen. B cells are also present in the stratified epithelium of the gill arch and filaments.

T-cells

T-cells take part in cell mediated immune response. T cells are part of white blood cells known as lymphocytes, and take part in cell mediated immune response. They are different from other lymphocytes, such as B cells and natural killer cells (NK cells), by the presence of a T cell receptor (TCR) on the cell surface. They are called T cells because they mature in the thymus.

The life history of T lymphocytes

There are several subsets of T cells, each with a distinct function they are :-

- Cytotoxic T cells (CD8)
- T helper cells (CD4).
- Regulatory T Cells (Treg cells)

T helper cells (CD4):

T helper cells are also known as CD4+ T cells because they express the CD4 protein on their surface. Helper T cells are activated by the antigen presenting cells (APCs). Activated T cell secretes small proteins called cytokines that assist in the active immune response include maturation of B cells into plasma cells and memory B cells, and activation of cytotoxic T cells and macrophages.

Cytotoxic T cells:

Cytotoxic T cells are called "killer cells" because they produce chemical substances known as lymphokines. These cells are also known as CD8+ T cells because they express the CD8 on

their surface. These cells destroy virally infected cells and also tumor cells. These cells recognize their targets by binding to antigen associated with MHC class I, which is present on the surface of nearly every cell of the body.

Regulatory T Cells (Treg cells):

Treg cells formerly known as suppressor T cells can regulate the mechanisms to prevent sustained inflammatory responses that may attacks on healthy tissue. Regulatory T cells are involved in preventing autoimmunity, moderating inflammation, and minimizing tissue damage. The function of regulatory T cells is to suppress the function of antigen-presenting cells and effector T cells (Teff cells). If Treg cell activity is reduced it may cause autoimmune diseases.

Treg cells are divided into 3 subsets.

- Naturally occurring CD4+CD25+
- Tr1 cells and
- Th3 cells

Naturally occurring CD4+CD25+

Naturally occurring CD4+CD25+ Treg cells develops in the thymus and performs the function like Induction of cytolysis, Disruption of metabolic activities, Inhibition of dendritic cell maturation and Secretion of IL-10, IL-35, TGF-b1, Galectin-1. This cells plays a major role in immune control.

Tr1 cells

Develop in the periphery during a normal immune response. Perform the function like cell-cell contact, secretion of IL-10, TGF-b1 and IFN-g

Th3 cells

Develop in the periphery during a normal immune response and secret TGF-b1.