

جامعة الانبار
كلية العلوم
قسم التقنيات الأحيائية

اسم المادة: المناعة

Major histocompatibility complex: عنوان المحاضرة

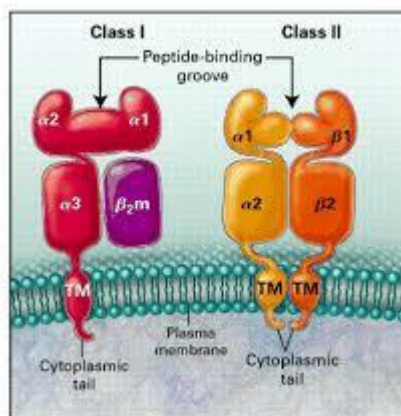
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Major histocompatibility complex

Major histocompatibility complex (MHC), group of genes that code for proteins found on the surfaces of cells that help the immune system recognize foreign substances. MHC proteins are found in all higher vertebrates. In human beings the complex is also called the human leukocyte antigen (HLA) system.

There are two major types of MHC protein molecules.

MHC class I and MHC class II

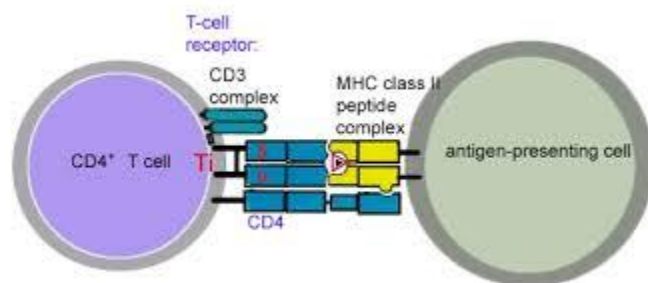


Class I MHC molecules span the membrane of almost every cell in an organism, while **class II MHC** molecules are restricted to cells of the immune system called macrophages and lymphocytes.

In humans these molecules are encoded by several genes all clustered in the same region on chromosome 6. Each gene has an unusually large number of alleles (alternate forms of a gene that produce alternate forms of the protein). As a result, it is very rare for two individuals to have the same set of MHC molecules, which are collectively called a tissue type.

The MHC also contains a variety of genes that code for other proteins—such as complement proteins, cytokines (chemical messengers), and enzymes—that are called **class III MHC** molecules.

MHC molecules are important components of the immune system because they allow T lymphocytes to detect cells, such as macrophages, that have ingested infectious microorganisms. When a macrophage engulfs a microorganism, it partially digests it and displays peptide fragments of the microbe on its surface, bound to MHC molecules. The T lymphocyte recognizes the foreign fragment attached to the MHC molecule and binds to it, stimulating an immune response. In uninfected healthy cells, the MHC molecule presents peptides from its own cell (self peptides), to which T cells do not normally react.



MHC molecules were initially defined as antigens that stimulate an organism's immunologic response to transplanted organs and tissues. In the 1950s skin graft experiments carried out in mice showed that graft rejection was an immune reaction mounted by the host organism against foreign tissue. The host recognized the MHC molecules on cells of the graft tissue as foreign antigens and attacked them. Thus, the main challenge in a successful transplantation is to find a host and a donor with tissue types as similar as possible. The term *histocompatibility*, derived from the Greek word *histo* (meaning "tissue")

and the English word *compatibility*, was applied to the MHC molecules to describe their function in transplantation reactions and does not reveal their true physiological function.

Cytokines

Cytokines are small secreted proteins released by cells have a specific effect on the interactions and communications between cells. Cytokine is a general name; other names include

Lymphokine (cytokines made by **lymphocytes**)

Monokine (cytokines made by **monocytes**)

Chemokine (cytokines with **chemotactic activities**)

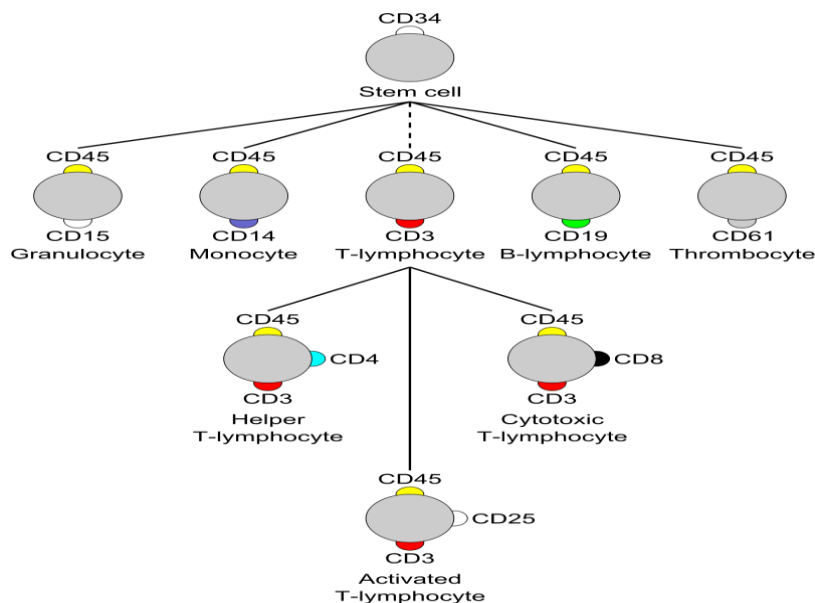
Interleukin (cytokines made by one **leukocyte** and acting on other leukocytes).

Cytokines may act on the cells that secrete them (**autocrine action**), on nearby cells (**paracrine action**), or in some instances on distant cells (**endocrine action**). Cytokines include **chemokines, interferons, interleukins, lymphokines, tumour necrosis factor** but generally not hormones or growth factors (despite some terminologic overlap). Cytokines are produced by a broad range of cells, including immune cells like **macrophages, B lymphocytes, T lymphocytes and mast cells, as well as endothelial cells, fibroblasts, and various stromal cells**; a given cytokine may be produced by more than one type of cell

Cluster of Differentiation

Cluster of differentiation (Cluster of Designation or Classification Determinant) (often abbreviated as **CD**) is a protocol used for the identification and investigation of cell surface molecules providing targets for immunophenotyping of cells. **CD** molecules can act in numerous ways, often acting as **receptors** or **ligands** (the molecule that activates a receptor) important to the cell.

Two commonly used **CD** molecules are **CD4** and **CD8**, which are, in general, used as markers for helper and cytotoxic T cells, respectively. **CD** for humans is numbered up to **364** (as of November 2014)



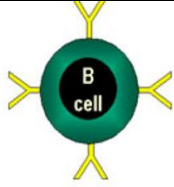
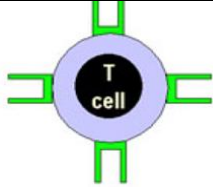
Lymphocyte

Lymphocyte are mononuclear, nongranular leukocytes of lymphoid tissue, participating in immunity.

They are found in blood, lymph and lymphoid tissues such as spleen, lymph nodes, tonsils, peyer`s patches, appendix etc.... the lymphocytes are two types. They are

1. B lymphocytes
2. T lymphocytes

Comparison of B lymphocyte and T lymphocyte

property	B cells	T cells
		
Origin	Bone marrow	Bone marrow
Maturation	Lymphoid tissue or bone marrow. Bursa of fabricius in birds	Thymus
Longevity	Short few days to week	Long months to years
Complement	Present	Absent
Receptors surface immunoglobulins	Present	Absent
Proliferation	Proliferate upon antigenic stimulation, differentiate into plasma cells and memory cells	Proliferate upon antigenic stimulation
Type of immunity	Humoral immunity	Cell mediate and humoral immunity
Secretary product	Antibodies	Lymphokines
Distribution	High in spleen, lymph nodes, bone marrow and other lymphoid tissue , low in blood	High in blood, lymph and lymphoid tissue

Types and functions

1-Memory cell long lived cells responsible for anamnestic response

2-Plasma cells – a cell arising from a B cell that manufactures specific antibodies

1-T cytotoxic cell Tc – lysis cell recognized as non self and parasite infected cells

2-T helper cell Th – it is necessary for B cells activation by T- dependant antigens and T effectors cell

3-T regulator cell – it develops into Th or T suppressor cell and control balance between enhancement and suppression of response to antigens

4-T suppressor cell Ts- it blocks induction and or / activation of Th and B cells. It helps maintain tolerance

5-T dependant Th cell TD TH cell – it provides protection against infectious agents, mediates inflammation and activates macrophages in delayed type hypersensitivity

Null cell – lymphocytes that lacks surface cell markers

References:-

- 1- Richard Coioco and Geoffery Sunshine (2014). Immunology. Seventh edition. Wiley Blackwell.