MHC- MAJOR HISTOCOMPATIBITY COMPLEX

By
Swarnakshi Upadhyay
Assistant Professor
School of Pharmaceutical Sciences
CSJM University

INTRODUCTION

- Major Histocompactibility complex (MHC) is set of surface proteins located on the cell membrane of nucleated cells.
- It plays more important work to indentify the antigen between self and non self body, intracellular recognization and responsible for antigen presentation.
- Histo refers to tissues. Compatibility refers to living together harmoniously.
- MHC molecules always recognize only T lymphocytes. The two types of MHC are worked in immunity. T helper (Th) cell recognized by MHC molecules II, and T cytotoxic (Tc) cells are recognized by MHC I molecules.

DEFINITION

- *"Major Histocompactibility complex is membrane attached protein which work on recognization of antigen between self and non self body and antigen presentation".*

HISTORY

- **Peter Gorer (1930) found that four group of MHC molecules he used the blood sample of mice to identified the blood group antigen which designated by I to IV group of MHC.**

- **Georg Snell, Jean Dausset** and **Bariy** received noble prize in 1980 for their contribution to the discovery of MHC molecule.

CLASSES OF MHC MOLECULES

- The MHC molecules are classified in to four classes namely ;-

1. Class I MHC molecules
2. Class II MHC molecules
3. Class III MHC molecules
4. Class IV MHC molecules

CLASS I MHC MOLECULES

- Class I MHC(45 KD) molecule are a group of major histocompactibility antigen.
- They are present on the surface of all nucleated cells except nervous tissue and platelets.
- It present antigen to **Tc** cells.
- It bind with **CD-8** adhesion molecules of **Tc** cells.
- It brings about **cell mediated immune response**.

STRUCTURE OF CLASS I MHC MOLECULE

- It consists two polypeptide chains namely **α chain and β2 – micro globulin.**
- α chain which is non covalently attached with β2 microglobuline . α chain contain a transmembrane glycoprotein which is encoded by A,B and C gene of grouped HLA.
- α chain is organized by three domains such as α 1, α 2 and α 3 each domain containing 90 amino acids sequences .
- β2 microglobuline is similar in size of α 3 and it dose not contain trans membrane proteins .
- When the antigen is internalized and processed inside by proteosome (Ubiquitin, cytosolic degradation), the peptides are produced .
- Peptide is further loaded on the groove of MHC I molecules from endoplasmic reticulum.

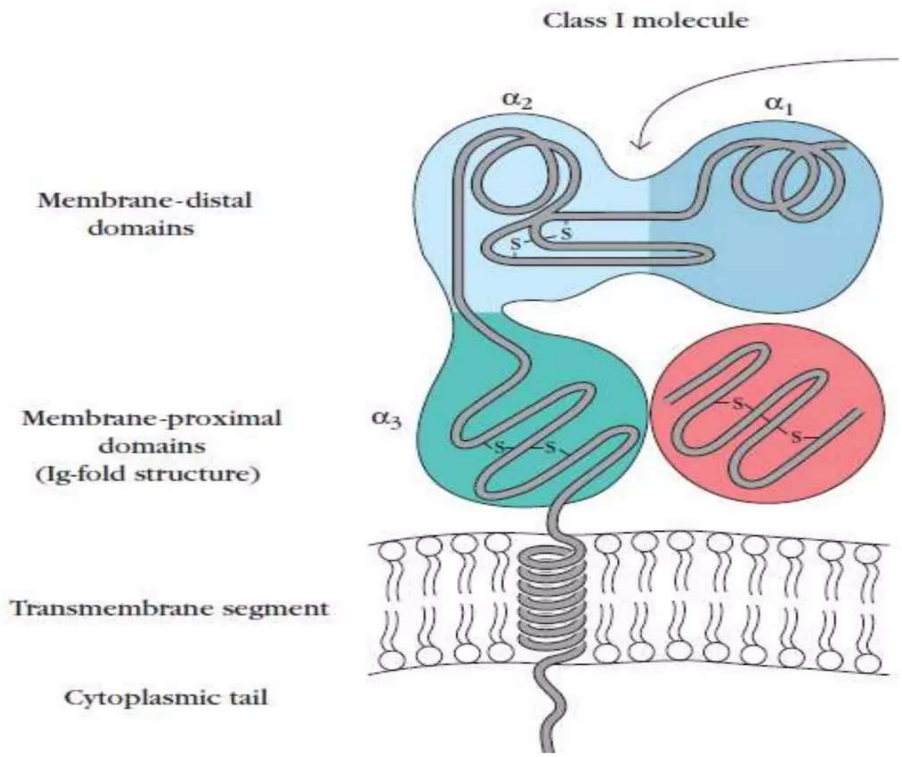

Fig:- Class I MHC antigen

CLASS II MHC MOLECULE

- Class II MHC molecule are present on the surface of antigen presenting cell and cell which engulfed the foreign antigen.
- It binds with the exogenous(endocytic degradation) antigens.
- It binds with CD4 adhesion molecules T_H cells.
- It also consist of two polypeptide chains namely α chain and β chain.
- Antigen is processed inside the **endosome** and peptide is further loaded on groove of MHC II molecules.

STRUCTURE OF MHC II MOLECULE

- The class II MHC Molecule consists of two polypeptide chain namely α chain (33 kDa) and β (28kDa) chain.
- The both chain are attached noncovelantly.
- Each chain contains two units. The two units of α chain are called α1 and α2. The two domains of β chains are called β1 and β2.
- β2 and α2 are **transmembrane** domains anchoring the MHC to plasma membrane.
- The α1 and β1 domains jointly bear a **peptide binding groove.**

Peptide binding groove

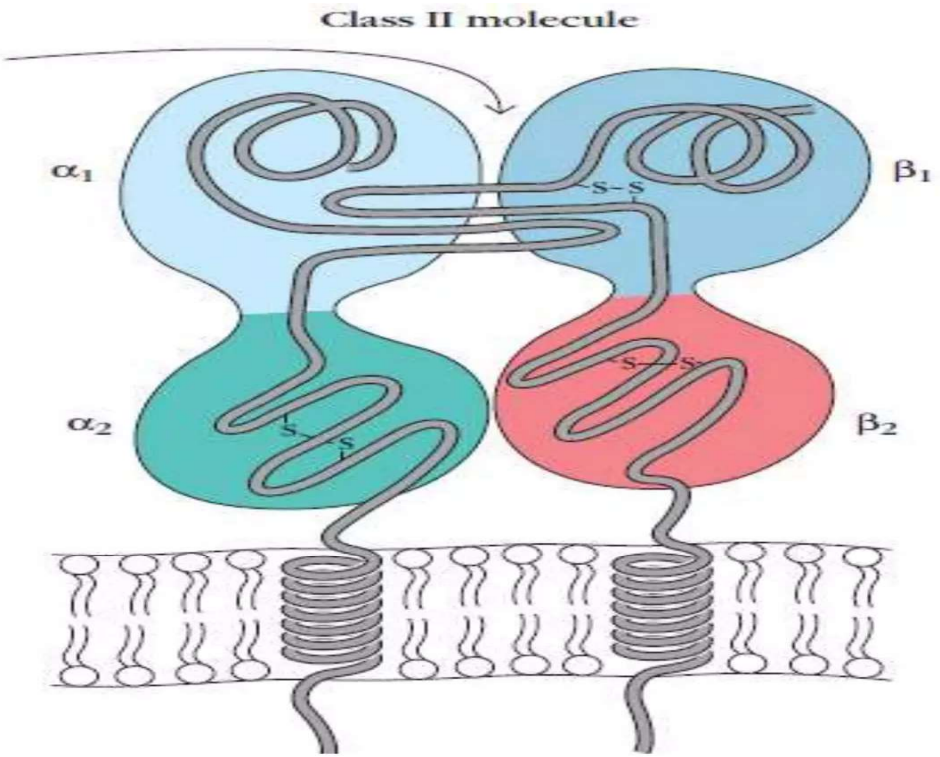

Fig:- Class II MHC molecule

Class III MHC molecule

- The molecules include complements like C2 and C4 and Bf (factor B).

Class IV MHC molecule

- These molecule is present on T cells of leukemia(Tla) as well as on immature thymocytes .

HLA-HUMAN LEUKOCYTE ANTIGEN

- **HLA** is the **human leukocyte antigen**.
- HLA is the MHC molecules present in human beings.
- HLA is a set of surface protein present on the surface of all nucleated cells. They are responsible for **graft rejection, adaptive immunity, defense against infection, some time it is expressed on cancer cell destruction, certain autoimmune diseases** and certain complements.
- MHC is the general term referring to the cell surface antigen of vertebrates.

H-2 COMPLEX OF MOUSE

- **The major histocompactibility complex (MHC)** of mouse is called ***H-2* complex**.
- *H-2* complex is a **cluster of genes** responsible for the production of **antigens located of nucleated cells** and complement components.
- This complex is located in the **short arm** of the chromosome number 17.
- It consists of a **set of structural genes** .
- The genes, that make up a given histocompactibility complex, are called **halotypes.**

FUNCTION OF MHC MOLECULES

- MHC molecules are loaded with a bit of sample peptide fragment derived from the **degradation of proteins** present inside the cell. This peptide is the **mirror image** of proteins present inside the cell.
- MHC molecules contain **self** as well as **nonself (foreign)** antigen.
- They bring about **defense against infections and diseases**.
- They mediate certain **autoimmune diseases**.
- They are responsible for **individual smell** of people.