Major Histocompatibility Complex (MHC)

Presented by
Dr. Mrs. Supriya S. Wankar
HOD, Department of Microbiology
Janata Mahavidyalaya, Chandrapur

- **Major Histocompatibility complex** refers to a **cluster of genes responsible for immune response, transplantation antigen and proteins of the complement system.**
- In **1930, Gorer** discovered the term **MHC**
- MHC produces a set of proteins called **histocompatible molecules.**
- These molecules are located on the cell membranes of nucleated cells of the body as well as blood serum.
- These molecules are responsible for allograft rejection, immune recognition, complement levels etc.

- Transplantation means the implantation of a tissue from one individual to another.
- The implantated tissue is called **graft.**
- Individual which donates the graft called **donor** and which receives the tissue is called **recipient**.
- Tissues or organs grafted from an individual to another member of same species is called **allograft.**
- This **allograft** are recognized as foreign and rejected and that led to discover the term MHC

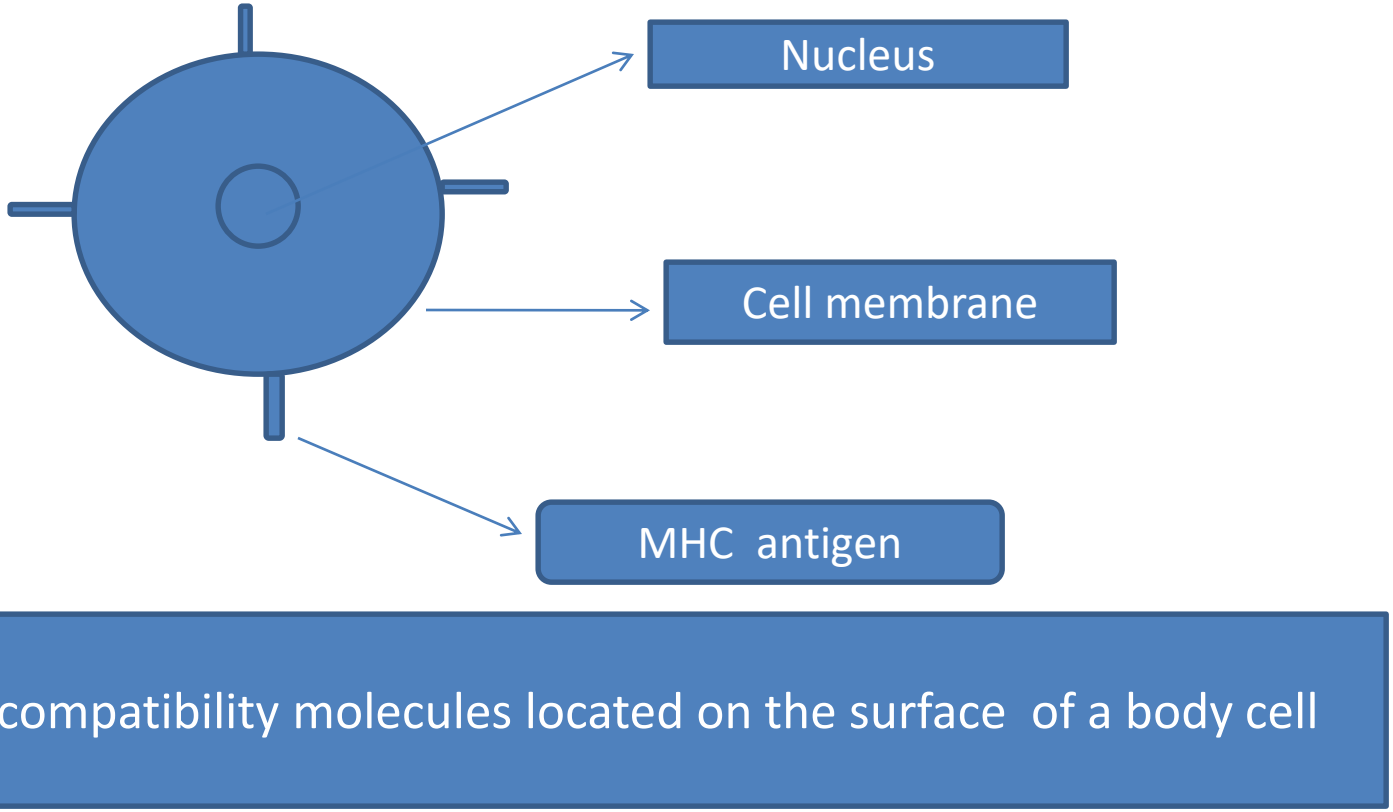
- **Autograft:** Organs or tissue grafted on himself.

- **Isograft:** Graft taken from one individual and placed on another individual of same genetic constitution is called **isograft.**

- **Allograft:** Graft between two genetically non-identical members of the same species.

- **Xenograft (Heterograft):** Grafts between members of different species are called **Xenograft** or **hererograft.**

- The graft is accepted when **genotype** and **phenotypes** (antigenic patterns) of donar and recepient are indentical.
- When they are dissimilar (Non identical) , the graft dies and it is said to be **graft rejection.**
- The rejection of graft is due to immunological reaction. The graft tissue releases antigen into the recipient.
- The immune system of recipient recognises the antigen as **non-self** and elicits immune response which rejects the graft.
- The antigen which is responsible for graft rejection is called **transplantation antigen or histocompatibility antigens.**



- The MHC is present in all mammals. The MHC of mouse and man has been extensively studied. The MHC of mouse is called **H-2** and that of man is called **HLA** (**Human Leukocyte Antigen**)

Histocompatible Molecules (MHC Antigen)

- The molecules produced by major histocompatibility genes are called **histocompatible molecules.**
- **Located on cell membrane of nucleated cell of the body or in the blood serum.**
- **Four major types of histocompatible molecules are:-**

1. **Class 1 molecule**
2. **Class 2 molecules**
3. **Class 3 molecules**
4. **Class 4 molecules**

- **Class 1 Molecules:** 1)found on nucleated cells e.g. lymphocytes, platelets 2) In human these antigens are called **human leucocyte antigen(HLA)**responsible for graft rejection and hence called **transplantation antigen.**
- **Class 2 Molecules:** 1) Present on the surface of **B-cells, macrophages, monocytes, antigen presenting cells and activated T-cells.**

2) These antigens are associated with the regulation of immune response. So, these antigens are called **immune associated antigens(Ia)**

- **Class 3 Molecules:** These molecules include complements like **C2 and C4** and **factor B(Bf)**
- **Class 4 Molecules: Present on the T cells of leukemia(Tla)** and **immature thymocytes.**

• H-2 Complex of Mouse(MHC of mouse)

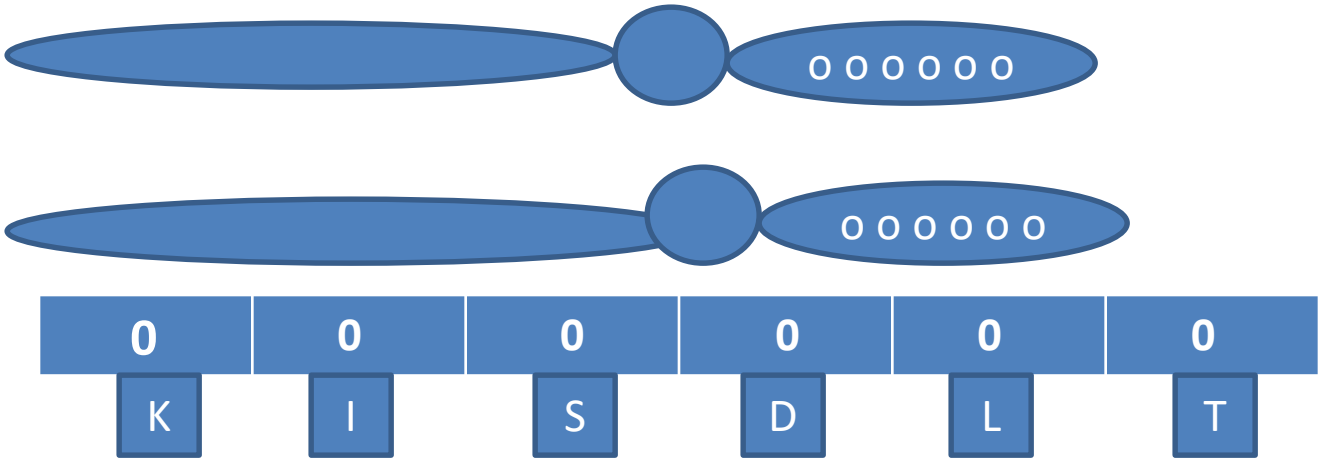


Fig.:- Chromosome number seventeen (on short arm of chromosome)of mouse with 6 loci showing H-2 complex.

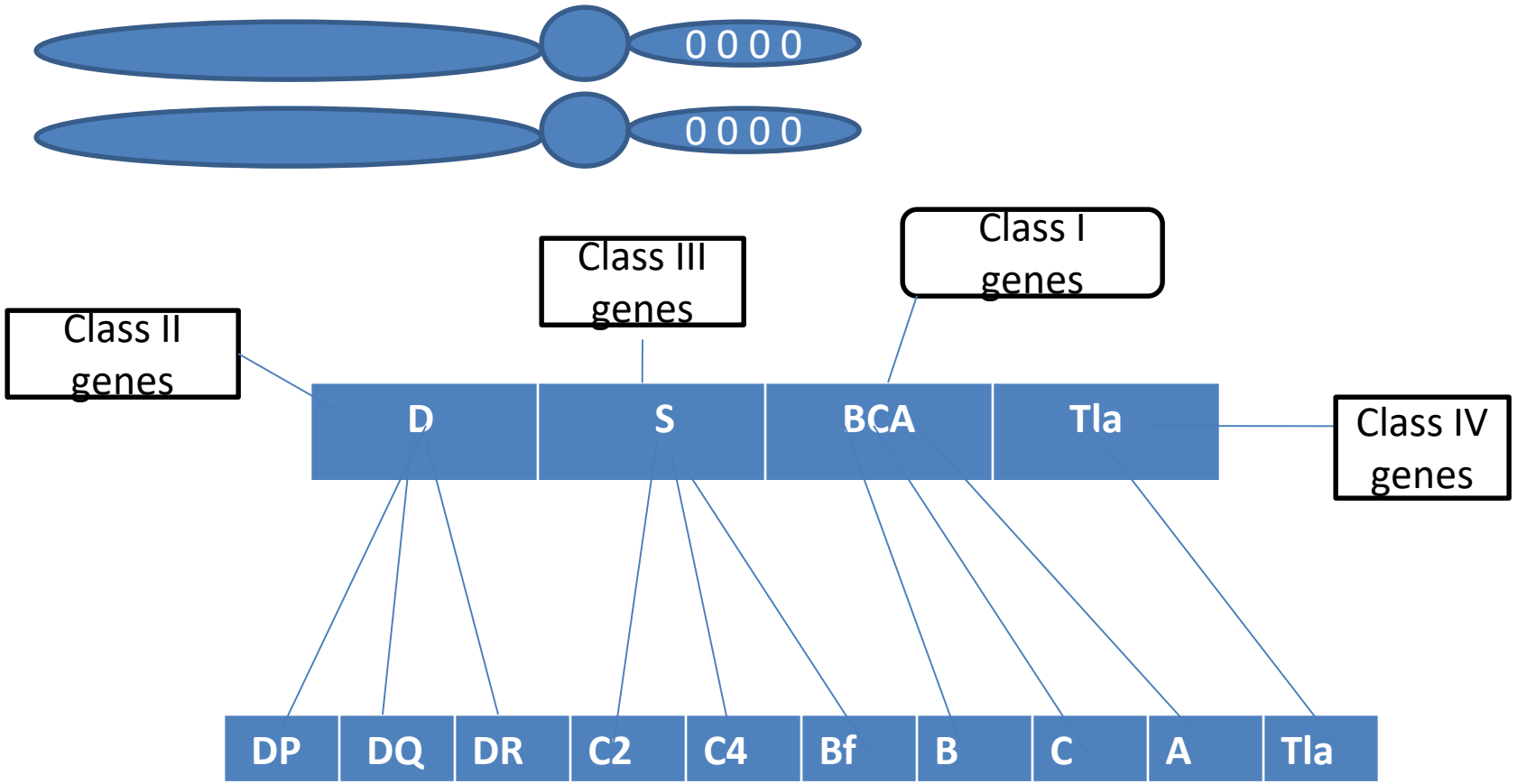
K,I,S,D,L and **T** are grouped into four groups of genes, namely **class 1 genes, class 2 genes, class 3 genes and class 4 genes**

- **Class I:** include loci **K,D** and **L** and are called **transplantation antigen** responsible for graft rejection.
- **Class II:** genes include locus **I** and are associated with the **regulation of immune response.**
- **Class III:** genes include locus **S** and they control the components of **complement system**
- **Class IV:** genes include locus **T.** They control primitive antigens present on T cell of leukeamia(Tla) as well as **immature thymocytes**

HLA(Human Leucocyte Antigen)

- MHC of human is called HLA.
- It is the a cluster of structural genes responsible for the production of antigens located on the nucleated cells and components of complements.
- HLA is located in the short arm of chromosome number 6. It has six loci and they are named as- A,B,C,D,S and Tla

- Fig.:- Chromosome number 6 showing HLA



Class I genes: are transplantation antigens

Class II genes: are immune associated antigen(Ia)(regulation of immune response)

Class III genes are responsible for levels of complement components.

Class IV gene is associated with Ag present on Tla and immature thymocyte

- **Functions of MHC :**

1. Production of HLA(Graft rejection Ag or transplantation Ag).
2. Production of immune associated antigens on B-cell, monocytes, macrophages, antigen presenting cell and activated T-cells.
3. Control of the levels of complement components like C4,C2 and Bf (factor B).
4. HLA complex help in T-cell Recognition: T-cells recognizes foreign Ag only in the presence of MHC class I and class II molecules (Cytotoxic T-cells need class I molecule and T- Helper and suppressor cells need class II molecules.

Thank You!