Antigen

Characters of antigenic substance
Immunogen, antigen, epitope, hapten

- **Immunogen**: a stimulus that produces a humoral or cell-mediated immune response
- **Antigen**: any substance that binds specifically to an antibody or a T-cell receptor
Immunogen, antigen, epitope, hapten

- All immunogens are antigens but not all antigens are immunogens

- Some very small molecules called haptens can bind to Ab’s or TCR’s but they cannot initiate an immune response...
Immunogen, antigen, epitope, hapten

• Immunogen: a stimulus that produces a humoral or cell-mediated immune response

• Antigen: any substance that binds specifically to an antibody or a T-cell receptor

• Epitope: the portion of an antigen that is recognized and bound by an Ab or TCR/MHC complex (aka antigenic determinant)

• Hapten: a low molecular weight molecule that can be made immunogenic by conjugation to a suitable carrier
Immunogen, antigen, epitope, hapten

• Paratope...

• Paratope: “The site in the variable (V) domain of an antibody or T-cell receptor that binds to an epitope on an antigen...
The key event...
The basis of immunogenicity...

• Foreignness
• Molecular size
• Chemical composition and heterogeneity
• Degradability
The basis of immunogenicity...

1- Foreignness: the antigen should be foreign to stimulate the immune system.

2- Molecular size: the immune system react with the antigens of high molecular weight.
• 3- Chemical composition and heterogeneity: The immune system usually react with the complex structure.

• 4- Degradability: The immune system react with the degradable antigen which engulfed by macrophage to make presentation of the antigens to other immune system cells.
There are two general classes of antigens:

**Exogenous (external)**

**Endogenous (internal)**
There are two general classes of antigens

Exogenous: presented by Antigen Presenting Cells (APC’s). These are macrophages, B-cells, and some dendritic cells

Endogenous: typically peptides derived from any protein; an infected cell displays “not-self” proteins and is, thus, an “altered self cell”
There are two general classes of antigens

**Exogenous:** these antigens are presented in MHC-II; they are seen by T-cells with a TCR and an associated protein called CD4

**Endogenous:** these antigens are presented by MHC-I; they are seen by T-cells with a TCR and an associated protein called CD8
There are two classes of T-cells

$T_H$ have $\textbf{CD4}$ which interacts with MHC-II; thus, $\text{CD4}^+$ T-cells are “MHC-II restricted.”

$T_H$ cells are “helper cells” that send signals (via cytokines and surface proteins) to other cells of the immune system. The $T_H$ cells function as the “brain” of the immune system.
There are two classes of T-cells

$T_C$ have **CD8** which interacts with MHC-I; thus, CD8$^+$ T-cells are “MHC-I restricted.”

$T_C$ cells become *cytotoxic T lymphocytes* (CTL’s) which attack “altered self-cells (*e.g.*, infected cells.) “Altered self-cells” are also called “target cells.” They are the targets for the CTL’s cytotoxicity.
Experimental systems… *viz.* “haptens”

Hapten: a low molecular-weight molecule that can be made immunogenic by conjugation to a suitable carrier…