**Introduction to immunology:**

***Immunology:*** the branch of biomedical science concerned with the response of the organism toantigenic challenge, the recognition of self from non-self, and all of the biological (*in vivo*), serological (*in vitro*), and physical-chemical aspects of immune phenomena.

Defense mechanismsinclude all physical, chemical and biological properties of the organism which reduce its susceptibility to foreign organisms, material, etc.

Functionally these may be divided into those which are static, or *innate*to the organism, and those which are responsive, or *adaptive*to a potential pathogen or foreign substance.

**Functional Division:-**

1. **innate system**

* evolutionary older system
* first line of defense
* non-specific
* resistance is static, ie. doesn't improve with repeated exposure, *no memory*
* often sufficient to prevent disease

**A.** physical defenses:

* + Skin & epithelial surfaces, cilia.
  + Commensal flora.
  + Acidic gastric contents.
  + Fever.

**B.** biochemical defenses

* soluble - lysozyme, acute phase reactants
  + complement, fibronectin, interferon
* cellular - natural killer cells, phagocytes

2. **adaptive system**

* second line of defense,
* activated once the innate system has been penetrated/overwhelmed.
* It is specificto the infective agent
* exhibits memorywith an enhanced response to subsequent challenge

i. soluble factors

ii. cellular factors

**THE INNATE SYSTEM:**

**Soluble Factors:**

***Lysozymes:*** distributed widely in secretions, act by cleaving bacterial cell wall proteoglycans.

***Fibronectin:*** family of closely related glycoproteins synthesized by endothelial cells & fibroblasts, involved with,

a. non-specific opsonization

b. facilitation of phagocytosis

c. wound healing and tissue repair

***Complement:*** series of > 15 plasma proteins, functions including, chemotaxis, mast-cell degranulation, opsonization, cytolysis, and viral neutralization.

***Interferons:*** produced by virally infected cells, transmit information to adjacent cells, making them resistant to viral replication, thereby impeding the spread of infection, also activate natural killer cellsand enhance cytotoxic action.

***Acute Phase Reactants:*** a group of plasma proteins which increase rapidly following infection eg. CRP, which is probably produced by the liver, recognizes and binds to a wide variety of bacteria & fungi, acts as an opsonin, enhancing phagocytosis, and activates complement.

**Cellular Factors:**

All are derived from the myeloid seriesin the bone marrow.

***Natural Killer Cells***: non-thymicderived lymphocytes with no antigenic surface markers of T/B-cells, bind to altered surface markers on virally infected or tumour cells. Do notrequire complement or Ab for recognition, but are activated by interferons, actively regulated by T-cells as well as interferon, therefore innateas well as adaptive.

***Phagocytes:*** these are cells of the reticuloendothelial system, ie. monocytes & macrophages. *macrophages*can engulf particles & destroy them, or represent the antigen in a more "active" form on their cell surface. *monocytes*are produced in the bone marrow, circulate for a short period then localize in various tissues becoming specific macrophages.

***Neutrophils***: capable of phagocytosis, able to penetrate endothelial surfaces under the influence of chemotactic factors.

***Eosinophils:*** also capable of phagocytosis, release granular contents adjacent to large foreign bodies which would otherwise be impossible to phagocytose, eg. worms (helminths).

***Basophils & Mast Cells:*** small numbers of basophils in the circulation more commonly associated with epithelial surfaces, then termed mast cells. may also have a role in immunity to parasitic infections and as enhances of the inflammatory response.

***Platelets:*** also myeloid derivatives & participate in the inflammatory response.

**THE ADAPTIVE SYSTEM**

**Soluble Factors:**

***Immunoglobulins***: these are glycoproteins produced by B cells direct neutralization of bacterial toxins and viral particles, opsonization, enhancing phagocytosis, complement activation, activation of cellular elements.

***Tumour Necrosis Factor TNF-a:*** cachectin is a macrophage polypeptide hormone, induces fever through direct effects on the hypothalamus, enhances PMN adhesion and phagocytosis, and is directly toxic to endothelial cells.

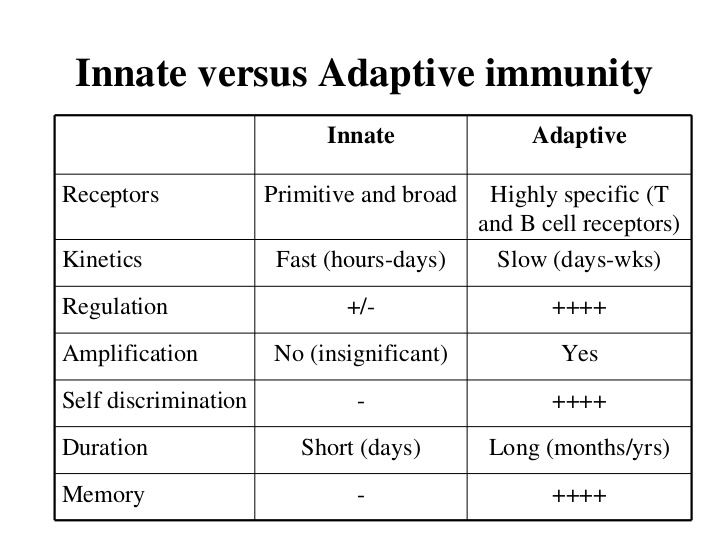
***Cytokines***: a generic term applied to,lymphokines, monokines, and other cell products influencing the behavior of other cells, react with specific cell surface receptors & are active at low concentrations.

**Cellular Factors:**

cell mediated immunity is any immune response in which antibodies play a subordinate role. CMI is far more persistent than humoral immunity, lasting ³ 10 years or for life.

***T Lymphocytes:*** thymus derivedlymphocytes, actually originate in the bone marrow but migrate to the thymus late in utero and early neonatal life, main effectors of CMI. separated into subtypes(T1-T10) with the use of monoclonal Ab'sto surface antigens, T4 helper inducers, T8 cytotoxic suppressers.

***B-Lymphocytes:*** derived from the bursa of Fabricius, or its equivalent, clonal expansion and differentiation to*plasma cells* - which produce specific antibody, and *memory cells* which readily produce plasma cells to repeat challenge.



**Thank you**