INTRODUCTION TO IMMUNOLOGY

IMMUNITY

- The term immunity has its origin from the Latin word *immunitas*, which means protection from legal prosecution.
- In Life Sciences, *Immunity* refers to protection from disease and other pathogens.
- The organs, cells and molecules that are responsible for immunity are called *immune system* and their efforts in regards to any etiological agent are called *immune responses*.
- Normally the immune responses are elicited against the foreign substances but occasionally to the self molecules and are referred as *autoimmune responses*.

IMMUNOLOGY

- It is a branch of life science which deals with the cellular and molecular events that take place in our body after it encounters of micro-organisms and other foreign substances.
- Defence against microbes includes two types of responses
  - an early response action called innate immunity and
  - a later response called as adaptive immunity.

HISTORY OF IMMUNOLOGY

- The history of immunology is very old.
- In ancient China, people skin lesions of patients recovered from small pox were used to cure small pox in youngsters.
- The first successful vaccination was done by Edward Jenner against smallpox.
- He inoculated the cowpox pustules into the arm of a young boy who later did not show full progressive smallpox symptoms.
- Small pox was the first disease that was eradicated worldwide by vaccination.

RECENT DEVELOPMENTS IN IMMUNOLGY

- Recently the science of immunology is growing up at a substantial pace with the advent of new molecular biology tools.
- Now our understanding about the human and animal immune system and its functions has shown a remarkable improvement.
- Advances in recombinant DNA technology, immunohistochemistry, monoclonal antibody production and x-ray crystallography have added newer dimensions to immunology .
- Research in transgenic and knockout mice has also played a very important role towards understanding of many complex immunological pathways.

INNATE IMMUNITY

- It is also called natural or native immunity and provides first line of defence against any microbial infection in human body.
- It usually involves many cellular and biochemical events that react to microbes and their products in order to clear them from the body.

COMPONENTS OF INNATE IMMUNITY

- The main components of innate immune system are

1. **Barriers** – skin and outer epithelial surface.
2. **Scavenger cells** – neutrophils, macrophages, dendritic cell and natural killer cells.
3. **Complement system**
4. **Cytokines**
5. **Chemical mediators of inflammation**

PATHOGEN ASSOCIATED MOLECULAR PATTERNS (PAMPs)

- Microbial agents and pathogens contain certain molecules on their surface which are recognised as foreign by the body and are collectively called as pathogen associated molecular pattern (PAMP).
- PAMP's are recognized by specific proteins and biochemical molecules termed as pattern recognition receptors.
- They are produced by cells of innate immunity and recognise the pattern presented by PAMPs.

INNATE RESPONSE IS NON-SPECIFIC

- The innate immune responses are produced against the specific structures present over the microbes and are common to many of them.
- They cannot distinguish the minute differences among microbes.

ADAPTIVE IMMUNITY

- Adaptive immunity gets stimulated through constant exposure to infectious agents/ microbes.
- It develops specific memory against exposure of same pathogen.
- It can distinguish between fine differences among microbes and is therefore termed as ***specific immunity***.
- As specific immunity is develops due to repeated exposure to the microbes/foreign agents, it is also termed as ***acquired immunity***.

COMPONENTS OF ADAPTIVE IMMUNITY

The central components of adaptive immunity are

1. Lymphocytes and their secreted products e.g. ANTIBODIES
2. Foreign substances that trigger specific immune responses and are identified by lymphocytes or antibodies are called as ANTIGENS.

INNATE AND ADAPTIVE SYSTEM WORK TOGETHER

- All the higher organisms have well developed mechanisms for defending against the microorganisms.
- Innate and adaptive system work together as they are the components of host integrated system.
- There are many microbes that have developed and adapted to resist the innate immunity and hence more robust mechanisms are required for their expulsion.
- Innate and adaptive immune systems are interlinked; stimulation of anyone against the foreign substances instigates the other and hence functions cooperatively.

COMMON FEATURES OF INNATE AND ADAPTIVE IMMUNITY

S.No.	Features	Innate	Adaptive
1.	Specificity	Molecules present in group of related microbes	Microbes and non-microbial molecules
2.	Memory	No	Yes
	Diversity	Narrow	Wide
3.	Reactivity against self	No	No
	Part of Immune System		
1.	Barrier	Skin, epithelial surface	Lymphocyte and antibodies
2.	Proteins	complements	Antibodies
3.	Cells	Phagocytes	Lymphocytes

INNATE AND ADAPTIVE IMMUNITY