**Cellular and Molecular Immunology Module1: Introduction**

**Lecture 1: Introduction** The term immunity comes from the Latin word immunitas, means protection from legal prosecution. Immunity refers to protection from disease and other pathogens. The cells and molecules 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** is a branch of life-science which deals with the cellular and molecular events occurring in the body after encounters of micro-organisms and other foreign substances. The history of immunology is quite old. In ancient China, people often used skin lesions of patients recovered from small pox to cure small pox in young children. The first successful record of vaccination came from the work of Edward Jenner’s efficacious vaccination against smallpox. Jenner observed that milkmaid who had recovered from cowpox never showed any symptom of smallpox. Following this observation 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. Recently the science of immunology has grown up by the advent of new molecular biology tools. Our current understanding of the human and animal immune system and its functions has remarkably improved. Advances such as recombinant DNA technology, immunohistochemistry, monoclonal antibody production and x-ray crystallography have changed the immunology to a broader area. The development of techniques to produce transgenic and knockout mice has also played a great role to understand many complex immunological pathways.

***1.1 Innate and adaptive immunity***

Defense against microbes includes an early response action called **innate immunity** and a later response called as **adaptive immunity.** Innate immunity is also called **natural or native** immunity and provides first line of defense 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. 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

Microbial agents and pathogens contain some molecules over their surface that act as foreign substance for the body and are collectively called as **pathogen associated molecular pattern** (PAMP). PAMP’s are recognized by specific proteins and biochemical molecules produced by cells of innate immunity and these recognition molecules are called as **pattern recognition receptors**. The innate immune responses are produced against the specific structures present over the microbes and are common to many of them. Thus, they cannot distinguish the minute differences among microbes. In contrast, adaptive immunity is stimulated by constant exposure of infectious agents. The most characteristic feature of adaptive immunity is **memory** against the repetitive exposure of same pathogen. Furthermore, it has a capacity to distinguish between fine differences among microbes and hence also called as **specific immunity**. As specific immunity is gathered by constant exposure to the foreign agent, it is better termed as **acquired 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**.

**immunity:** Almost 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. However 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.