Lec.1

**IMMUNOLOGY**

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**What Is Immunology?**

 Immunology is a relatively young science: the word immunology did not appear in the Index Medicine until 1910. Immunology has its roots in several other disciplines including microbiology, biochemistry, genetics, and pathology.

 Simply, immunology is the study of the immune system, or is branch of medical science which deals with the study of development and function of both cellular and humoral components of the immune system by which the body reacts to expel, destroy or neutralize foreign substances including pathogenic microorganisms.

 Immunity refers to protection against infection. The immune system is the collection of cells, tissues and molecules that functions to defend us against infectious microbes. The coordinated reaction of the immune system against infections (and other foreign substances) is known as the immune response. Abnormalities of the immune system that result in defective immune responses make individuals susceptible to infections by viruses, bacteria, fungi and parasites. This anti-microbial defense function of the immune system is essential for our ability to survive in an environment that is teeming with potentially deadly microbes. However, immune responses are also capable of causing damage.

The immune system is the body’s defense system against invasion by non-self-entities including infectious agents, and tumor cells. The normal functioning of the immune system gives rise to immunity.

 Immunis is a Latin word meaning free from burden or taxes. Persons free from or resistant to certain diseases are said to be immune to them.

 Immunity is the sum (total) of all defense mechanisms that protects humans from infectious disease and these mechanisms used by the body to resist environmental agents that are foreign to it and these agents may be microorganisms (bacteria, virus, parasite and fungi), or their products (toxin), foods, chemicals drugs, pollen, etc…and these mechanisms can recognize these foreign agents to neutralize, eliminate and destroy them.

 Pathogenic microorganisms are endowed with special properties that enable them to cause diseases. If microorganisms never encounter resistance from the host, we would constantly be ill and in most cases our body defenses prevent them of happening. In some instances, the body does not allow the organisms to enter. In others, even if they enter, are eliminated by different mechanisms. Our ability to ward off disease in general is called resistance (immunity).

 The ability or the capacity of a microbe to produce disease or tissue injury is called pathogenicity. An organism’s pathogenicity depends on its ability to invade a host, multiply in the hosts. *Mycobacterium tuberculosis* frequently causes disease upon entering the host whereas  *Staphylococcus epidermidis* cause disease, rarely, when it enters into a host with poor defense.

Microbial virulence factors are structural or physiological characteristics that help the microorganisms to cause infection and disease. Microbial virulence factors are as follows:

* **Adhesion** – Once the bacteria enter the body of the host, the critical point in the production of bacteria disease is the organism’s adherence, or attachment. If the organism did not adhere, they would be swept away by the mucus and other fluids that bathe the tissue surface.
* **Invasiveness**- Used to describe the entry of the bacteria into the host cells.
* **Toxigenicity**- Toxins produce by bacteria are generally classifies into two groups. Exotoxins which are secreted by pathogenic bacteria and diffuse readily into the surrounding medium, and, Endotoxins which are lipopolysaccharide form a part of the cell wall of gram-negative bacteria. Their toxicity depends upon lipid fraction.
* **Enzymes and other bacterial products** (Coagulase, Hemolysine).
* **Inhibition of phagocytosis** :-
* 1- Inhibition of chemotaxis ,
* 2- Inhibiteon of attachment of phagocyte,
* 3- Inhibition of lysosome fusion,
* 4- Resistance to killing in phagolysosomes,
* 5- Escape from phgolysosomes into cytoplasm.
* 6- Escape from host’s immune response by many factors.

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**Establishment of Infection**

(A) Extracellular pathogens (e.g., *Staphylococcus aureus*) that are not stopped by epithelial barriers will gain access to the underlying tissues and replicate to cause a local infection.

(B) After gaining entrance into the host, intracellular pathogens (e.g., *Mycobacterium tuberculosis*) must penetrate a host cell in order to establish an infection. Replication within the host cell leads to the death of that cell and spread of the pathogen to new host cells and/or to the bloodstream