جامعة المستقبل
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lecture One
Introduction of immunity

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IMMUNE SYSTEM

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History of immunology

- **Edward Jenner was the first scientist to develop the immunization process.**

  Initially, **Antoni van Leeuwenhoek** 's development of the **microscope** and the subsequent realization that entities existed that were not visible to the human eye, allowed the concept of germs to be appreciated.

- That these organisms were the causative agent of disease was not recognized until **Louis Pasteur** developed his **germ theory of disease**. His original interests were in **fermentation** in wine and beer
- Pasteur was not the only proponent of the germ theory of disease. His chief competitor was **Robert Koch**. Then in 1882, Koch was able to demonstrate that the germ theory of disease applied to human ailments as well as animals, when he isolated the microbe that caused **tuberculosis**.

- Later, **Emil von Behring** and **Shibasaburo Kitasato** were able to demonstrate passive immunity when they took serum from animals infected with diphtheria and injected into healthy animals. These same animals were found to be resistant to the disease. Eventually these serum factors were recognized in 1930 as antibodies
- Ehrlich hypothesized that these antibodies were specialized molecular structures with specific receptor sites that fit each pathogen like a lock and key.
- The idea that specific cells could be directly involved with defending the body was first suggested in 1884 by **Élie Metchnikoff**.

Overview of the immune system

- **Immunity** defined as ability of the body to defense against infection,. The collection of cells, tissues, and molecules that mediate resistance to infections is called the **immune system**, and the coordinated reaction of these cells and molecules to infectious microbes is the **immune response**.

- **Immunocompromised**: having the IMMUNE RESPONSE attenuated by congenital defect, by administration of immunosuppressive drugs, by irradiation, by malnutrition, or by certain disease processes such as the viral infection that produces the acquired immunodeficiency syndrome

- **Immunocompetent**: having the potential for immunologic response; capable of developing immunity after exposure to antigen.

Overview of the immune system

- The main function of the immune system is self/non-self antigen. This ability to distinguish between self and non-self is necessary to protect the organism from invading pathogens and to eliminate modified or altered cells (e.g. malignant cells).
- Although the immune system, for the most part, has beneficial effects, there can be detrimental effects as well.

Host defense mechanisms consist of two subdivision

A.Innate immunity (also called natural or native immunity) refers to first line of defense which is always present in healthy individuals, prepared to block the entry of microbes and to rapidly eliminate microbes that do succeed in entering host tissues.

B.Adaptive immunity (also called specific or acquired immunity) is the type of host defense that is stimulated by microbes that invade tissues, which develops more slowly and mediates the later, even more effective, defense against infections.

Ccomponents of innate immunity

- - epithelial barriers (skin and mucosal membranes)
- - cells (phagocytes, NK cells...)
- - humoral components (complement, cytokines etc.)

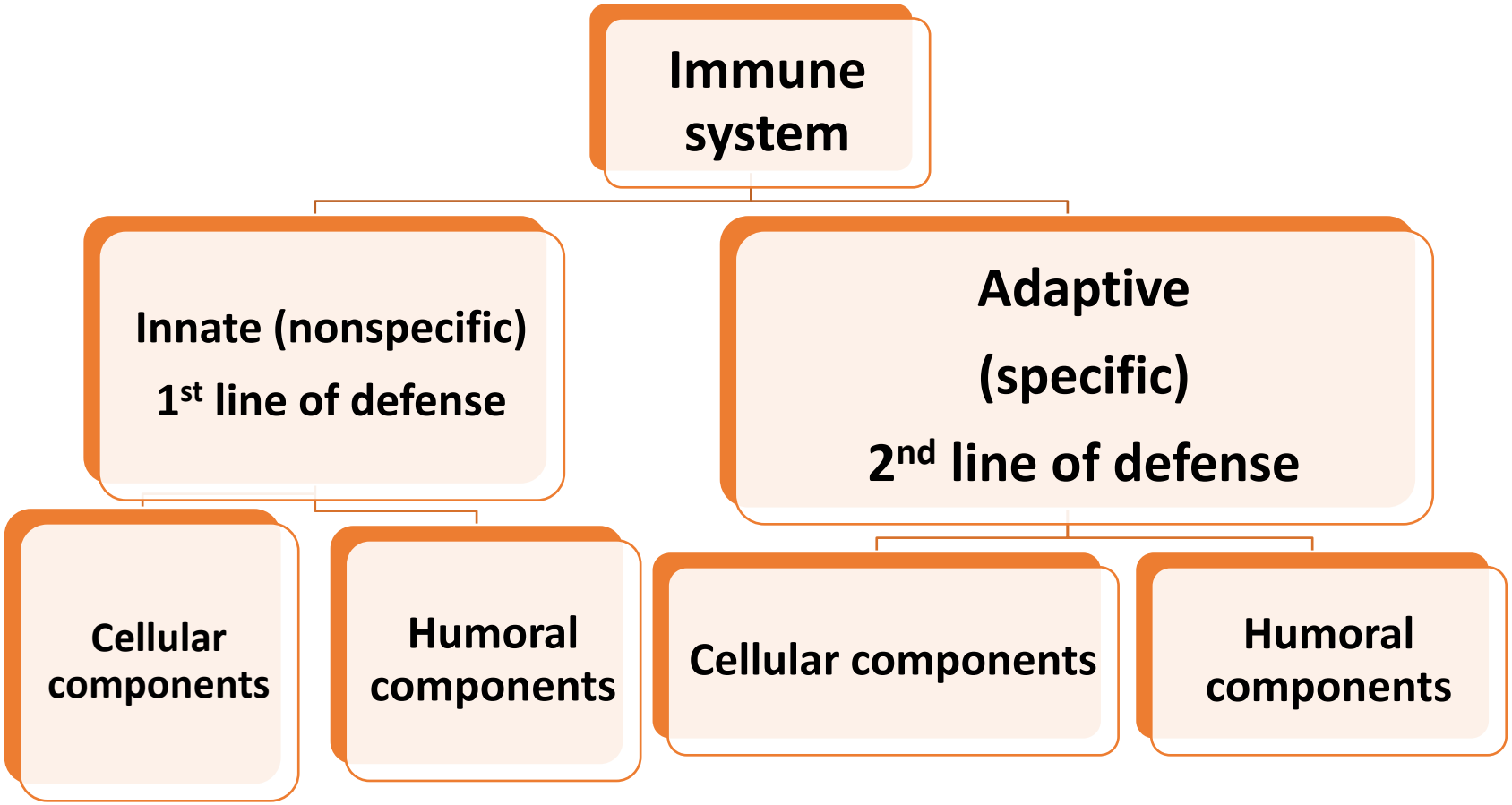
ADAPTIVE IMMUNITY

- The adaptive immune response can be antibody mediated (humoral), cell mediated (cellular), or both. Unlike innate immunity, adaptive immunity is highly specific, has immunologic memory, and can respond rapidly and vigorously to a second antigen exposure.

Comparison between innate and acquired immunity

Innate	Adaptive
Present at birth	Acquired response to antigens
Rapid 0-6 hours	Slow initiation (days), rapid thereafter
Leukocytes involved: Polymorphnucleus, monocytes, macrophages, eosinophils, NK cells.	Specific B cells, specific T cells
Mechanical barriers: Skin and mucous membranes and cells	Skin and mucosal immune systems
Soluble molecules: Complement(C)	Specific antibodies (Ab)
Cells involved: Phagocytes (macrophages, neutrophils) and natural killer (NK) cells	Both B and T lymphocytes
Mediators are: Macrophage-derived cytokines (e.g. interferon α- and β-) and tumor necrosis factor (TNF)	Lymphocte-derived cytokines (e.g. interferon γ)

Overview of the immune system



active immunity and passive immunity

active immunity refers to the process of exposing the individual to an antigen to generate an adaptive immune response, passive immunity refers to the transfer of antibodies from one individual to another. Passive immunity provides immediate but short-lived protection, lasting several weeks up to 3 or 4 months.

Active vs Passive Immunity

ACTIVE IMMUNITY

Exposure to a pathogen triggers antibody production.

Natural

Infection

Artificial

Vaccination

PASSIVE IMMUNITY

A person is given antibodies rather than producing them.

Natural

Maternal Antibodies

Artificial

Monoclonal Antibodies

THANK YOU