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Practical Immunology
Introduction to Immunology

The Immune System - includes all parts of the body that help in the recognition and destruction of foreign materials. White blood cells, phagocytes and lymphocytes, bone marrow, lymph nodes, tonsils, thymus, and your spleen are all part of the immune system

Innate immunity (non specific immunity)

Innate Immune System / First-Line Defenses

- The body's first line of defense against pathogens uses mostly physical and chemical barriers such as

- Skin – acts as a barrier to invasion
- Sweat – has chemicals which can kill different pathogens.
- Tears - have lysozyme which has powerful digestive abilities that render antigens harmless.
- Saliva – also has lysozyme.
- Mucus - can trap pathogens, which are then sneezed, coughed, washed away, or destroyed by chemicals.
- Stomach Acid – destroys pathogens

Second-Line Defenses

- If a pathogen is able to get past the body's first line of defense, and an infection starts, the body can rely on its second line of defense. This will result in what is called an **Inflammatory response** causes

- Redness - due to capillary dilation resulting in increased blood flow
- Heat - due to capillary dilation resulting in increased blood flow
- Swelling – due to passage of plasma from the blood stream into the damaged tissue

 Pain – due mainly to tissue destruction and, to a lesser extent, swelling

Adaptive (Acquired) immunity (Specific Mechanisms of Defense) Adaptive immunity refers to antigen-specific immune response. The adaptive immune response is more complex than the innate.

 Third-Line Defenses - Sometimes the second line of defense is still not enough and the pathogen is then heading for the body's last line of defense, the immune system.

 The immune system recognizes, attacks, destroys, and remembers each pathogen that enters the body. It does this by making specialized cells and antibodies that render the pathogens harmless.

Cells and Organs of the Immune System

The thymus and bone marrow are the primary (or central) lymphoid organs, where maturation of lymphocytes takes place

The lymph nodes, spleen, and various mucosal associated lymphoid tissues (MALT) such tissue (GALT) ,(NALT)or nasal and (BALT) or bronchial are the secondary (or peripheral) lymphoid organs, which trap antigen and provide sites for mature lymphocytes to interact with that antigen. gut-associated lymphoid

In addition, tertiary lymphoid tissues, which normally contain fewer lymphoid cells than secondary lymphoid organs, can import lymphoid cells during an inflammatory response

T CEIS
T cells arise in the thymus, and in many mammals-humans and mice for example-B cells originate in bone marrow

THYMUS

The thymus is the site of T-cell development and maturation. It is a flat, blobbed organ situated above the heart. Each lobe is surrounded by a capsule and is divided into lobules, which are separated from each other by strands of connective tissue called trabeculae The outer compartment, or cortex, is Each lobule is organized into two compartments: densely packed with immature T cells, called thymocytes. The inner compartment, or medulla, is sparsely populated with thymocytes.

The function of the thymus is to generate and select a repertoire of T cells that will protect the body from infection

Aging is accompanied by a decline in thymic function. This decline may play some role in the decline in immune function during aging in humans and mice

BONE MARROW

In humans and mice, bone marrow is the site of B-cell origin and development. Arising from lymphoid progenitors, immature B cells proliferate and differentiate within the bone marrow

2- Secondary lymphoid organs

1- Lymph nodes

Lymph nodes are the sites where immune responses are mounted to antigens in lymph. They are encapsulated beanshaped structures containing a reticular network packed with lymphocytes, macrophages, and dendritic cells.

SPLEEN

The spleen plays a major role in mounting immune responses to antigens in the blood stream. It is a large, ovoid secondary lymphoid organ situated high in the left abdominal cavity.

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