

RESPIRAORY SYSTEM

The function of the respiratory system is to bring oxygen to the blood and to remove the carbon dioxide.



•The respiratory system is composed of two parts

- Conducting Portion
- Respiratory Portion

The Conducting Portion consists of a Series of cavities and conducting air to the lungs. The conducting Portion is composed of :



Nose

- Nasopharynx**

- Larynx**

- Trachea**

- Bronchi**

- Bronchioles (terminal and respiratory).**

Functions the conducting portion are to provide a route for the air to reach the lungs and also for conditioning the air. Air-conditioning during its passage through the conducting portion includes

- **filtration (by hairs)**
- **cleaning (by mucus and salivary action)**
- **moistening (by mucus) .**
- **Warming or cooling (by heat exchange via blood vessels)**

•The Respiratory Portion consists of.'

•Alveolar ducts

•Alveolar sacs

•Alveoli

The exchanges of gases (respiration) only occurs in the alveoli

The respiratory system, comprising the lungs and a sequence of airways leading to the external environment, functions in providing oxygen (O₂) to and eliminating carbon dioxide (CO₂) from the cells of the body.

The realization of this goal requires the fulfillment of the following four discrete events, collectively known as respiration:

- Movement of air in and out of the lungs (breathing or ventilation)**
- Exchange of O₂ in the inspired air for carbon dioxide in the blood (external respiration)**
- Conveyance of O₂ and CO₂ to and from the cells (transport of gases)**
- Exchange of CO₂ for O₂ in the vicinity of the cells (internal respiration)**

●Gross Structure of the Lungs

The left lung has two lobes; the right lung has three lobes.

Each lung has a medial indentation, the hilum, where the primary bronchi, bronchiolar arteries, and pulmonary arteries enter and the bronchiolar veins,

pulmonary veins, and lymph vessels leave the lung. This group of vessels and the airway that enter the hilum make up the root of the lung.

Each lobe is subdivided into several bronchopulmonary segments supplied by a tertiary intrapulmonary (segmental) bronchus. In turn, bronchopulmonary segments are subdivided into many lobules, each served by a bronchiole.



Lobules are separated from one another by connective tissue septa, in which lymph vessels and tributaries of pulmonary veins travel. Branches of bronchial and pulmonary arteries follow bronchioles in their passage through the center of the lobule



Lymphoid (Immune) System

The lymphoid system is responsible for the immunological defense of the body. Some of its component organs-lymph nodes, thymus, and spleen-are surrounded by connective tissue capsules, whereas its other components, members of the diffuse lymphoid system, are not encapsulated. The cells of the lymphoid system protect the body against foreign macromolecules, viruses, bacteria, and other invasive microorganisms, and they kill virally transformed cells



OVERVIEW OF THE IMMUNE SYSTEM

The immune system has two components: the innate immune system and the adaptive immune system

—The innate immune system (natural immune system) is nonspecific and is composed of

(1) a system of blood-borne macromolecules known as complement;

(2) groups of cells known as macrophages and neutrophils, which phagocytose invaders;

(3) another group of cells, natural killer (NK) cells, which kill tumor cells, virally infected cells, bacteria, and parasites



—The adaptive immune system (acquired immune system)

is responsible for eliminating threats from specific invaders. Whereas a macrophage can phagocytose most bacteria, the adaptive immune system not only reacts against one specific antigenic component of a pathogen, but also its ability to react against that particular component improves with subsequent confrontations with it



Cells of the Adaptive and Innate Immune

—Systems

The cells of the adaptive and innate immune system are

B lymphocytes,

T lymphocytes,

macrophages,

antigen-presenting cells,

and natural killer cells



■ B Lymphocytes

- B lymphocytes originate and become immunocompetent in the bone marrow. They are responsible for the humorally mediated immune system
- B lymphocytes, also known as B cells, are small lymphocytes that both originate and become immunocompetent in the bone marrow

■ T Lymphocytes

T lymphocytes originate in the bone marrow and migrate to the thymus to become immunocompetent.

They are responsible for the cellularly mediated immune response .

T lymphocytes (T cells) also are formed in the bone marrow, but they migrate to the thymic cortex, where they become immunocompetent by expressing specific molecules on their cell membranes that permit them to perform their functions.



Although histologically T cells appear to be identical to B cells, there are important differences between them

- T cells have TCRs rather than sIgs on their cell surface

T cells recognize only epitopes presented to them by other cells (APCs)

- T cells respond only to protein antigens

- T cells perform their functions only at short distances

There are three types of T cells, some with two or more

■subtypes

Naïve T cells

Memory T cells

Effector T cells

LYMPHOID ◼

The lymphoid organs are classified into two categories ♣

1-Primary (central) lymphoid organs are responsible for the development and maturation of lymphocytes into mature, immunocompetent cells.

2-Secondary (peripheral) lymphoid organs are responsible for the proper environment in which immunocompetent cells can react with each other, as well as with antigens and other cells, to mount an immunological challenge against invading antigens or pathogens



In humans, the fetal liver, prenatal and postnatal bone marrow, and thymus constitute the primary lymphoid organs. The lymph nodes, spleen, and mucosa-associated lymphoid tissues (as well as the postnatal bone marrow) constitute the secondary lymphoid organs