Respiratory system

The respiratory system is a group of organs and tissues that help you breathe. It's responsible for moving fresh air into your body, removing waste gases, and exchanging oxygen for carbon dioxide. The respiratory system also performs other important roles, such as:

- Temperature and moisture: Bringing air to the proper body temperature and moisturizing it
- Protection: Protecting your body from harmful substances
- Smell: Supporting your sense of smell

The main organs of the respiratory system include:

- Lungs: The main organ of the respiratory system, located in the chest and protected by the ribcage
- Nose: Warms and humidifies inhaled air
- Trachea: A hollow tube with cartilage rings to prevent it from collapsing
- Pharynx: The throat, where the nasal cavity and mouth meet
- Larynx: The voice box, which contains vocal cords that vibrate to make sounds
- Bronchi: The air tubes that connect to the lungs

Respiratory infections are common illnesses that can affect your upper or lower respiratory tract. Some examples include the common cold, epiglottitis, laryngitis, pharyngitis, and sinusitis.

The respiratory system begins at the nose and ends at the distal alveoli. It is comprised of the upper and lower airways. The upper airway includes the nose, sinuses, and pharynx. The nose provides olfaction and temperature regulation in hyperthermic patients. The nasal turbinates initially humidify and warm air, and filter particulate matter. The lower airways include the trachea, bronchi, bronchioles, and alveoli. The primary function of the respiratory system is to deliver oxygen to the lungs to be exchanged with carbon dioxide.

Gas exchange occurs in the alveoli, which are comprised of one-cell-layer-thick membranes in which oxygen moves into the capillary and where carbon dioxide moves into the alveoli from the blood in the capillary. Failure or major dysfunction

of gas transfer due to disease leads to respiratory distress or failure. Additional functions of the respiratory system include maintaining acid-base balance, acting as a blood reservoir, filtering and probably destroying emboli, metabolizing some bioactive substances (eg, serotonin, prostaglandins, corticosteroids, and leukotrienes), and activating some substances (eg, angiotensin).

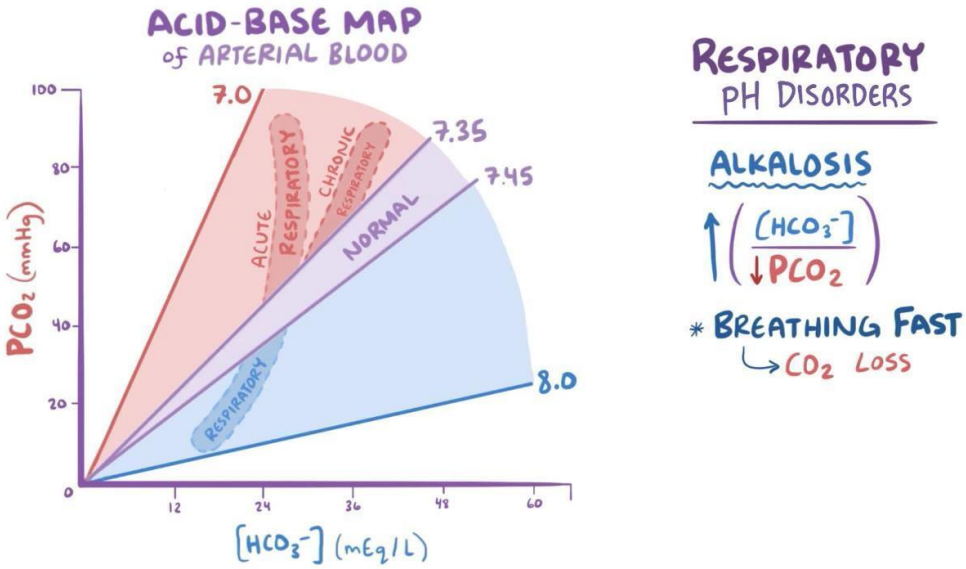
The anatomy of the respiratory tract differs markedly among species in the following features:

1. shape of the upper and lower airways
2. extent, shape, and pattern of turbinates
3. bronchiole pattern
4. anatomy of terminal bronchioles
5. lobation of the lungs
6. pleural thickness
7. mediastinal completeness
8. relationship of pulmonary arteries to bronchial arteries and bronchioles
9. presence of vascular shunts
10. mast cell distribution
11. pleural blood supply

Each variation in anatomic structure implies variation in function, which can influence the pathogenesis of respiratory disease in a particular species. The three main groups of species that have similar subgross anatomy of the lung are:

1. ruminants (cattle, sheep) and pigs
2. dogs, cats, monkeys, rats, rabbits, and guinea pigs
3. horses and humans

Marked physiologic variations also exist between different species. For example, cattle are prone to retrograde drainage from the pharynx, are predisposed to pulmonary hypertension and reduced ventilation in a cold environment, have relatively small lungs with low tidal volume and functional residual capacity, and are more sensitive to changes in environmental temperatures than are most other species. These anatomic and physiologic differences largely determine why some pathogens affect only some species (eg, Mannheimia haemolytica affects cattle but not pigs) and why pneumonia is very important in some species (cattle, pigs) but less so in others (dogs, cats).



Hypoxia is defined as insufficient oxygen to maintain normal metabolic functions; arterial oxygen is 60 mm Hg or less. An animal with hypoxia will show signs of respiratory distress. It can result from the following:

1. reduced oxygen-carrying capacity of the blood (anemic hypoxia, caused by a decreased number of red blood cells)
2. hypoperfusion (hypoperfusion hypoxia caused by decreased cardiac output)
3. hypoxic hypoxia (anatomic shunt, physiologic shunt, decreased inhaled oxygen, ventilation/perfusion mismatch, diffusion impairment, or hypoventilation)
4. inability of tissues to use available oxygen (eg, histotoxic hypoxia, as in cyanide poisoning)

There for four major centers of ventilatory control:

1. respiratory control center
2. central chemoreceptors
3. peripheral chemoreceptors
4. pulmonary mechanoreceptors/sensory nerves

If cerebral hypoxia develops, respiratory function may be reduced even further due to depression of neuronal activity. Erythropoiesis is also stimulated with chronic hypoxia, although the degree of polycythemia is species dependent. In addition, multiorgan dysfunction may result.