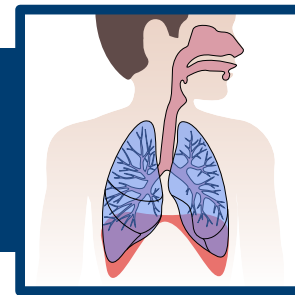


## Student Background

### PULMO PARK

#### LESSON 3: RESPIRATORY EXPLORATORY – DIVING DEEPER

##### Activity 3A: *Dust & Us – Particulates in the Air*



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### Dust & Us: Particulates in the Air

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The health of our lungs is impacted by particulates suspended in the air. These particulates include pollutants, pollen, dirt/dust, and pathogens such as bacteria and viruses. Our respiratory system has developed protective mechanisms against particulates, such as fine hair within the nasal passage. These hairs trap particulates which cause an increase in mucus production. Particulates and pathogens cling to the mucus and are expelled through sneezes. Particulates and pathogens which make it past the nasal passage are generally trapped by mucus.

In the upper portion of the throat there are specialized lymph node cells, commonly called adenoids and tonsils. These specialized cells are part of the immune system and absorb particulates and pathogens which are then destroyed by specialized immune cells. Despite the body's defenses, particulates and pathogens can make their way deeper into the throat. When we swallow, the epiglottis closes and the mucus carrying the particulates and pathogens is swallowed and transported to the stomach. The stomach produces hydrochloric acid (HCl). The HCl acid has a pH between 1.5 and 3, which makes it a strong acid. Particulates and pathogens are destroyed by HCl and any remnants pass through the body. However, sometimes particulates and pathogens make their way into the lungs.

The lungs have additional defense mechanisms. The bronchi and smaller branches of the bronchioles are lined with cilia. Cilia are finger-like projections of tissue coated in mucus. The mucus traps particulates and pathogens. To rid the body of these intruders, we cough. A "productive cough" is the body's mechanism to eliminate particulates and pathogens from the lung. Particulates and pathogens can irritate the tissue which line the bronchi and bronchioles. This further activates the body's immune system. Fluid containing specialized immune cells [*lymphocytes* (B and T), *macrophages*, *neutrophils*, *eosinophils*, *basophilic*, and *mast cells*], each with a specialized function and response. These cells are released into the *interstitial fluid* and blood stream to surround particulates and to neutralize pathogens. When the immune system is overwhelmed by particulates or pathogens, the lungs ability to take in sufficient oxygen is decreased resulting in a build-up of carbon dioxide throughout the body. With high levels of carbon dioxide and low levels of oxygen, body cells build up toxic levels of CO<sub>2</sub>. Metabolic processes stop and the cells begin to die.