

Lung Volumes and Capacities

Measurement of lung volumes provides a tool for understanding normal function of the lungs as well as disease states. The breathing cycle is initiated by expansion of the chest. Contraction of the diaphragm causes it to flatten downward. If chest muscles are used, the ribs expand outward. The resulting increase in chest volume creates a negative pressure that draws air in through the nose and mouth. Normal exhalation is passive, resulting from "recoil" of the chest wall, diaphragm, and lung tissue.

In normal breathing at rest, approximately one-tenth of the total lung capacity is used. Greater amounts are used as needed (i.e., with exercise). The following terms are used to describe lung volumes (see Figure 1):

<i>Tidal Volume (TV):</i>	The volume of air breathed in and out without conscious effort
<i>Inspiratory Reserve Volume (IRV):</i>	The additional volume of air that can be inhaled with maximum effort after a normal inspiration
<i>Expiratory Reserve Volume (ERV):</i>	The additional volume of air that can be forcibly exhaled after normal exhalation
<i>Vital Capacity (VC):</i>	The total volume of air that can be exhaled after a maximum inhalation: $VC = TV + IRV + ERV$
<i>Residual Volume (RV):</i>	The volume of air remaining in the lungs after maximum exhalation (the lungs can never be completely emptied)
<i>Total Lung Capacity (TLC):</i>	$= VC + RV$
<i>Minute Ventilation:</i>	The volume of air breathed in 1 minute: (TV)(breaths/minute)

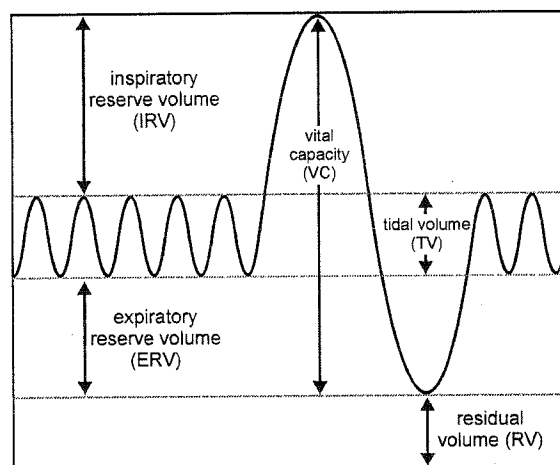


Figure 1

In this experiment, you will measure lung volumes during normal breathing and with maximum effort. You will correlate lung volumes with a variety of clinical scenarios.