

## Respiratory Physiology Activities

**Purpose:** Explore the various volumes of air that go in and out of the lungs.

**Materials:** round balloons, string, and measuring tape or ruler

**Activities:** NOTE: Please do not do this activity if you have respiratory difficulties or asthma.

A) Sit quietly, concentrating on how much air moves in (inspiration) and out (expiration) during your normal breath. At the end of a normal inspiration, blow into the balloon the same (approximate) amount of air you normally breathe out. Practice this once or twice. Rest for a minute between trials so you don't feel lightheaded. On the third time, measure the circumference of the balloon at its widest point, using the string and the ruler. Write your answer here.	
B) Repeat A) but this time, take a deep inspiration before you start. Try to exhale only to the extent that you normally would. This is like a big 'sigh' you might do occasionally. Again, after you practice this, measure the balloon. Write your answer.	
C) Repeat A) but this time, from a normal inspiration, breathe into the balloon as much as you can in one breath. Practice first, then do it and measure the balloon. Write your answer here.	
D) Repeat the process in C) again. This time take a deep inspiration before you start and then breathe into the balloon as much as you can. As before, practice first then do it again and measure the balloon. Write your answer here.	
E) Stand up and repeat D) again. Write your answer here.	

**Outcome:** The size of the balloon should increase progressively from A) to E).

**Background and Significance:** This activity illustrates the various 'volumes' of the lung and how they change. The activities above demonstrate, respectively, A) normal tidal volume; B) respiratory reserve volume, C) expiratory reserve volume, and D) total lung volume, as measured while sitting. The volume in E) reflects the effects of standing on facilitating filling and emptying the lungs with air.

### Questions for Group Discussion:

- ▶ What are the respective volumes measured?
- ▶ How do lung volumes compare with others in your group?
- ▶ Which increases lung volume more – deep inspiration or deep expiration?
- ▶ How and why does exercise cause breathing to increase?
- ▶ If you got 'light-headed' during this activity, how can it be explained?

\* Activity presented by Steven S. Segal, Ph.D., Yale University School of Medicine, at the Experimental Biology '99 workshop for teachers and students, Washington, DC.