

# Pulmonary Function Test (Lung Function Test)

## Test Overview

Pulmonary Function Tests evaluate how much air your lungs can hold, how quickly you can move air in and out of your lungs and how well your lungs add oxygen to the blood and remove carbon dioxide from the blood. The tests can help diagnose lung diseases and measure the severity of lung problems that prevent you from breathing normally.

The lung function test that is done first is a Spirometry. This test measures how quickly your lungs can move air in and out and how much air they can move in and out. You breathe into a mouthpiece attached to a recording device for this test.

Lung function results are measured directly in some tests and are calculated in others. No single test can determine all of the lung size and function values, so more than one type of test may be done during a session. Some of the tests may be repeated after you inhale medication that enlarges your airways (bronchodilator).

The more common lung function values that may be measured include:

- **Tidal volume ( $V_T$ )**. This uses a spirometer to measure the amount of air you inhale during a normal breath.
- **Vital capacity (VC)**. This uses a spirometer to measure the maximum amount of air you can exhale after you inhale as deeply as possible.
- **Forced expiratory volume (FEV)**. This uses a spirometer to measure the amount of air you can exhale forcefully in a sustained breath. The amount of air you exhale may be measured at 1 second ( $FEV_1$ ), 2 seconds ( $FEV_2$ ), or 3 seconds ( $FEV_3$ ). The total amount of air you exhale during this test is called the forced vital capacity (FVC).
- **Peak expiratory flow (PEF)**. This uses a spirometer to measure how quickly you can exhale. It is usually measured at the same time as your forced vital capacity (FVC).
- **Maximum voluntary ventilation (MVV)**. This uses a spirometer to measure of the greatest amount of air you can breathe in and out during one minute.
- **Residual volume (RV)**. This uses gas dilution tests or body plethysmography to measure the amount of air that remains in your lungs after you have completely exhaled.
- **Total lung capacity (TLC)**. This uses gas dilution tests or body plethysmography to measure the maximum amount of air your lungs can hold when fully inflated.
- **Diffusing capacity for carbon monoxide ( $DL_{CO}$ )**. This is an estimate of your lungs' ability to transfer a gas (a very small amount of carbon monoxide) through the lining of the lung into the blood.

## Why It Is Done

Lung function tests are done to:

- Diagnose certain lung diseases.
- Help determine the cause of breathing problems.
- Measure the amount of lung function in a person who has a lung disease and to monitor the effectiveness of treatment.
- Identify people at high risk of developing lung disease (especially people who smoke).
- Evaluate a person's ability to breathe before surgery.
- Monitor the lung function of a person who is regularly exposed to substances that can damage the lungs.

## How To Prepare

Tell your doctor if you have had recent chest pains or a heart attack, or if you are allergic to any medications. Also, tell your doctor if you take medication for a lung disease. You may need to stop taking some medications before testing.

Do not eat a heavy meal just before this test because a full stomach may prevent your lungs from fully expanding. You should not smoke or exercise strenuously for 6 hours before the test. On the day of the test, wear loose clothing that does not restrict your breathing in any way.

If you have dentures, wear them during the test to help you form a tight seal around the mouthpiece of the spirometer.

## How It Is Done

For most of the lung function tests, you will wear a nose clip to make sure that no air passes in or out of your nose during the test. You will then be asked to breathe into a mouthpiece connected to a recording device. You may be asked to breathe normally or rapidly, or to inhale and exhale deeply and forcibly.

The exact procedure is different for each type of test. For example, you may be asked to inhale as deeply as possible and then to exhale as fast and as hard as possible. You also may be asked to breathe in and out as deeply and rapidly as possible for 15 seconds. Some tests may be repeated after you have inhaled a spray containing medication that expands the airways in your lungs (bronchodilator). You may be asked to breathe a special mixture of gases, such as 100% oxygen, a mixture of helium and air, or a mixture of carbon monoxide and air. Sometimes a sample of blood may be taken from an artery in your wrist to measure blood gases. For more information, see the medical test Arterial Blood Gases.

If you have body plethysmography, you will be asked to sit inside a small enclosure similar to a telephone booth, with windows that allow you to see out. The booth measures small changes in pressure that occur as you breathe.

The accuracy of the tests depends on your ability to follow all of the instructions. The examiner may strongly encourage you to breathe deeply during some of the tests to get the best results.

The testing may take from 5 to 30 minutes, depending upon how many tests are done.

## Results

The normal value ranges for lung function tests will be adjusted for a person's age, height, sex, and sometimes weight and race. Results are often expressed in terms of a percentage of the expected value for that person.

For more information or to make an appointment, call 607.729.8845.