



AL-Mustaqbal University College

**Medical laboratory Techniques
Department**

Clinical Biochemistry

**Lecture (9)
(Pulmonary Function Tests)**



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The lungs are the primary organs of the respiratory system in humans. Entry of both lungs into the thoracic cavity. The function in the respiratory system is to extract oxygen from the atmosphere and transfer it into the bloodstream, and to release carbon dioxide from the bloodstream into the atmosphere, in a process of gas exchange.

Pulmonary function tests (PFT's) are breathing tests to find out how well you move air in and out of your lungs and how well oxygen enters your blood stream. The most common PFT's are spirometry , diffusion studies, and body plethysmography . Sometimes only one test is done, other times all tests will be scheduled on the same day.

Lung function tests can be used to:

1. Compare your lung function with known standards that show how well your lungs should be working.
2. Measure the effect of chronic diseases like asthma, chronic obstructive lung disease (COPD), or cystic fibrosis on lung function.
3. Identify early changes in lung function that might show a need for a change in treatment.
4. Detect narrowing in the airways.
5. Decide if a medicine (such as a bronchodilator) could be helpful to use.
6. Show whether exposure to substances in your home or workplace may have harmed your lungs.
7. Determine your ability to tolerate surgery and medical procedures.

Pulmonary Function Tests:

1. Spirometry Lung Volumes
2. Diffusion Capacity
3. Maximal Voluntary Ventilation (MVV)
4. Maximal Inspiratory Pressure (Pi max)
5. Maximal Expiratory Pressure (Pe max)
6. Arterial Blood Gas (ABG)
7. Walking Oxymetry
8. Bronchochallenge Tests

Spirometry: Measures the lung volume change during forced breathing maneuvers:

- Forced vital capacity (FVC)
- Forced expiratory volume in the first second (FEV-1)

Spirometry	Obstruction	Restriction
FEV-1	Decreased (--)	Decreased (-)
FVC	Decreased (-)	Decreased (-)
FEV-1/FVC	Decreased (definition)	Normal & Increased

Diffusion Capacity:

Estimates the transfer of oxygen in the alveolar air to the red blood cell.

Factors that influence the diffusion:

- 1) Area of the alveolar-capillary membrane (A)
- 2) Thickness of the membrane (T)

3) Driving pressure

4) Hemoglobin

Obstructive Lung Diseases:

- Emphysema & Chronic Bronchitis
- Cystic Fibrosis
- Asthma
- Bronchiectasis
- Some Interstitial Lung Disease: (combined)

Bronchochallenge Tests:

Goal: evaluate the airway hyperresponsiveness (asthma). Technique: Methacholine, Histamine, Cold, Exercise...etc. Criteria: 20% decrease in baseline FEV-1

Arterial Blood Gas:

- Oxygenation (PO₂ and FiO₂) & Ventilation (PCO₂ and PH)
- Acid – Base balance (PCO₂, HCO₂, and PH)

Types of PFT:

Evaluate Lung Mechanics:

- Volume
- Flow
- Resistance

Compliance

Airway Hyperractivity

Evaluate Respiratory Muscles:

Maximal Voluntary Ventilation (MVV)

Maximal Inspiratory Pressure (Pi max)

Maximal Expiratory Pressure (Pe max)

Seating & Supine Spirometry

Evaluate Gas Exchange:

PO₂ & alveolar-arterial oxygen pressure difference

Physiologic dead space ventilation

Diffusion capacity .