Session Learning Outcomes

This session aims to:

- Understand the use of various diagnostic tests and procedures for the disorders of respiratory system
- Comprehend how and why the clinical features of respiratory disorders appear
- Discuss the causes and management of respiratory failure.
RESPIRATORY SYSTEM

Section through an alveolus showing its cellular components

Details of respiratory membrane

**FUNCTIONS OF RESPIRATORY SYSTEM**

<table>
<thead>
<tr>
<th>Function</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gaseous exchange – intake of Oxygen, elimination of Carbon dioxide</td>
<td></td>
</tr>
<tr>
<td>Helps regulate the blood pH – by maintaining the CO2 levels</td>
<td></td>
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<tr>
<td>Contains receptors for the sense of smell</td>
<td></td>
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<tr>
<td>Filters, warms and moistens the inspired air to make it suitable to enter the lungs.</td>
<td></td>
</tr>
<tr>
<td>Produces and modifies the speech and vocal sounds as the air passes over the nose and vocal folds in larynx</td>
<td></td>
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<tr>
<td>Elimination of waste: Excretes small amounts of ketone bodies, volatile molecules, heat and water</td>
<td></td>
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</tbody>
</table>
FUNCTIONS OF RESPIRATORY SYSTEM

(a) Inhalation

During normal quiet inhalation, the diaphragm and external intercostals contract. During labored inhalation, sternocleidomastoid, scalenes, and pectoralis minor also contract.

Thoracic cavity increases in size and volume of lungs expands

Alveolar pressure decreases to 758 mmHg

(b) Exhalation

During normal quiet exhalation, diaphragm and external intercostals relax. During forceful exhalation, abdominal and internal intercostal muscles contract.

Alveolar pressure increases to 762 mmHg

Atmospheric pressure is about 760 mmHg at sea level


Figure 23-16 Principles of Anatomy and Physiology, 11/e © 2006 John Wiley & Sons
FUNCTIONS OF RESPIRATORY SYSTEM

PULMONARY VOLUMES

# CLINICAL EXAMINATION

- Respiratory rate and rhythm effort
- Hands – clubbing, cyanosis
- Pulses – rate & rhythm
- BP
- Face, mouth eyes – anaemia, cyanosis
- Thorax – deformity, movements, breath sounds
- Leg - oedema
INVESTIGATION OF RESPIRATORY DISEASE

**Imaging**

- Plain chest X ray
- CT/MRI
- Ultrasound
- Ventilation-perfusion imaging
- PET
- Pulmonary angiography
INVESTIGATION OF RESPIRATORY DISEASE

- **Endoscopic examination**
  - Laryngoscopy
  - Bronchoscopy
  - Mediastinoscopy
  - Pleural aspiration and biopsy using thoracoscopy

- **Skin tests**
  - Tuberculin test
  - Skin hypersensitivity test
CHEST X RAY

Normal Lung X-ray


© Endeavour College of Natural Health
endeavour.edu.au
Ventilation-perfusion imaging
Normal airway

Narrowed airway

Inflamed airway

Foreign Body

Dilated airway

Bronchogenic carcinoma

http://www.diegori.it/InternetMedico/Bronchoscopy%20Atlas_file/cover_art.jpg
Pulmonary Angiography under CT Scan


Courtesy of Department of Diagnostic and Interventional Radiology, Goethe University Frankfurt, Germany
Pulmonary Angiography
CT Scan
TUBERCULIN TEST

www.stanford.edu/group/parasites/ParaSites200...

## INVESTIGATION OF RESPIRATORY DISEASE

- **Immunological and serological test**
  - Presence of antigens
  - Antibody titres

- **Microbiological investigations**
  - Sputum, pleural fluid, throat swab

- **Histological and cytological examination**
  - Biopsy material
  - Cytology of sputum, pleural fluid or bronchial washing
Needle Biopsy

- A needle lung biopsy is performed when there is an abnormal condition that is near the surface of the lung, in the tissues surrounding the lungs, or on the chest wall.

- The test can be performed to obtain a sample for culture when infection of the lung is suspected, and sputum or bronchoalveolar lavage cultures have not identified the cause of the infection.

INVESTIGATION OF RESPIRATORY DISEASE

- Respiratory function testing
  - Peak flow metre
  - Spirometer
- Arterial blood gases and oximetry
- Exercise tests
Peak Flow Meters

http://www.promed.ie/shop/assets/catalog/categories/15361peakflow.jpg


http://www.healthproductsforyou.com/prodimages/ProductImage/27820072211801.gif

http://www.endeavour.edu.au
Spirometers
## CLINICAL PRESENTATIONS IN RESPIRATORY DISEASE

<table>
<thead>
<tr>
<th>Cough</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Most frequent symptom</td>
</tr>
<tr>
<td>• Characteristics of cough differ in different disorders</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Viral lower respiratory tract infection (common), post-nasal drip, inflammation of the airways (usually upper)</td>
</tr>
</tbody>
</table>
CLINICAL PRESENTATIONS IN RESPIRATORY DISEASE

Dyspnoea

- Feeling of an uncomfortable need to breathe (difficulty in breathing)

Causes

- Causes
  - Respiratory causes
  - Cardiac causes
  - Others (muscular, psychological, GIT and traumatic)
- Chronic exertional dyspnoea in COPD
- Acute severe dyspnoea
## CLINICAL PRESENTATIONS IN RESPIRATORY DISEASE

### Chest pain

Frequent manifestation of cardiac and respiratory diseases

### Causes

- **Cardiac causes** (refer session 19)
- **Respiratory causes** – peripheral chest pain exacerbated by deep breathing or coughing
  - Pulmonary infarct, pneumonia, pneumothorax, malignancy, TB
- **Other causes**
  - Musculoskeletal
  - Neurological
### CLINICAL PRESENTATIONS IN RESPIRATORY DISEASE

#### Haemoptysis

- Coughing up blood

#### Causes

- Common causes
  - Carcinoma
  - Bronchiectasis
  - Acute bronchitis
  - Tuberculosis
  - Pulmonary infarction
Bronchogenic Carcinoma

http://images.radiopaedia.org/images/382214/a280a19796be7dc5ae90deec5887b7.jpg
Tuberculosis

Ghon Lesion

http://upload.wikimedia.org/wikipedia/commons/9/9c/Tuberculosis-x-ray-1.jpg
PRIMARY TUBERCULOSIS

Secondary Tuberculosis

http://ivanlt.files.wordpress.com/2009/04/ind180.jpg
Miliary Tuberculosis

# RESPIRATORY DISEASES

## Common causes

- Bronchial carcinoma
- Single metastasis
- Localised pneumonia
- Lung abscess
- Tuberculoma
- Pulmonary infarct
Lung Metastases
Bronchopneumonia (left)

Lobar pneumonia (right)

## CLINICAL PRESENTATIONS IN RESPIRATORY DISEASE

### Pleural effusion

- Accumulation of serous fluid within the pleural space

### Causes

- Tuberculosis (infective)
- Malignant disease
- Cardiac failure (bilateral)
CLINICAL PRESENTATIONS IN RESPIRATORY DISEASE

Sleep-disordered breathing

- Many respiratory disorders manifest during sleep
  - Nocturnal cough and wheeze in asthma
  - Exacerbation of respiratory failure in patients with restrictive lung disease

Causes

- Sleep apnoea/hypopnoea syndrome
  - Due to recurrent occlusion of pharynx during sleep
  - Apnoea followed by series of deep breath, sleep, snoring and apnoeic once more
  - Predisposing factors – male, obesity, nasal obstruction, recessed mandible
CLINICAL PRESENTATIONS IN RESPIRATORY DISEASE

Respiratory failure

- Pulmonary gas exchange fails to maintain normal arterial oxygen and carbon dioxide levels
- **Classification**
  - Type I - Hypoxia with normal or low PaCO\(_2\)
  - Type II - Hypoxia with hypercapnia (raised PaCO\(_2\))
## RESPIRATORY FAILURE

### Causes (many respiratory disorders)

- Asthma
- Chronic Obstructive Pulmonary Disease (COPD)
- Pneumonia
- Pneumothorax
- Pulmonary emboli
- Airway obstruction
- Lung fibrosis
- Narcotic drugs
- Brain stem lesion
# RESPIRATORY FAILURE

## Management

- Prompt diagnosis and treatment of underlying cause
- Maintenance of airway
- Oxygen therapy
- Bronchodilators
- Antibiotics
- Mechanically assisted ventilation
- Lung transplantation
RESPIRATION SOUNDS

It’s not often that you will be able to listen to abnormal respiratory sounds during the course of your studies. Here is a great link to not only listen to normal air intake sounds, but also a bunch of abnormal sounds associated with various lung pathologies. Have a listen, then see how you go with the Quiz on the same site. I think this is a great link to keep, for later reference.

http://www.easyauscultation.com/lung-sounds
Readings and Resources

Resources:

- **Set Textbooks:**

- **Additional textbooks:**
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