

# Journal of Chemical, Biological and Physical Sciences



An International Peer Review E-3 Journal of Sciences

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**Section B: Biological Sciences**

CODEN (USA): JCBPAT

Review Article

## A Review on Lung Diseases in Special Reference to Asthma and its Impact

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**Received:** 1 December 2013; **Revised:** 14 December 2013; **Accepted:** 23 December 2013

**Abstract:** The lung is the essential respiration organ in many air-breathing animals, including most tetrapods, a few fish and a few snails. In mammals and the more complex life forms, the two lungs are located in the chest on either side of the heart. Their principal function is to transport oxygen from the atmosphere into the bloodstream, and to release carbon dioxide from the bloodstream into the atmosphere. In addition to their function in respiration, the lungs also alter the pH of blood by facilitating alterations in the partial pressure of carbon dioxide. Convert angiotensin I to angiotensin II by the action of angiotensin-converting enzyme. It may serve as a layer of soft, shock- absorbent protection for the heart, which the lungs flank and nearly enclose. Immunoglobulin-A is secreted in the bronchial secretion and protects against respiratory infections.

**Keywords:** diseases, lungs, Asthma.

## INTRODUCTION

Many environmental factors contribute to the development of respiratory diseases. The World Health Organization's 2002 report "Reducing Risks, Promoting Healthy Life" emphasized the importance of environmental factors in lung disease and stated that controlling air pollution and tobacco consumption would be among the most important interventions to promote good health (1). The report noted that the burden of lung disease is unevenly distributed and can be traced to regional environmental challenges, nutrition, and poverty, as well as to a person's underlying state of health. Because of the difficulty in assessing the prevalence and amount of exposure, the precise risk each environment poses is unknown. Risk assessment is further complicated by socioeconomic and genetic factors that may predispose a person to respiratory disease or alter the prognosis. However, by understanding the mechanisms of disease, defining high-risk populations, and intervening to mitigate or reduce environmental exposures, the burden of disease may be significantly lessened<sup>1</sup>.

The exchange of gases is accomplished in the mosaic of specialized cells that form millions of tiny, exceptionally thin-walled air sacs called alveoli. The environment of the lung is very moist, which makes it hospitable for bacteria. Many respiratory illnesses are the result of bacterial or viral infection of the lungs. Inflammation of the lungs is known as pneumonia; inflammation of the pleura surrounding the lungs is known as pleurisy<sup>2</sup>. Vital capacity is the maximum volume of air that a person can exhale after maximum inhalation; it can be measured with a spirometer. In combination with other physiological measurements, the vital capacity can help make a diagnosis underlying lung disease of<sup>3, 4</sup>. Maintain sterility by producing mucus containing antimicrobial compounds. Mucus contains glycoprotein, e.g. mucins, lactoferrin, lysozyme, lactoperoxidase<sup>5</sup>.

Typical resting adult respiratory rates are 10-20 breathes per minute with 1/3 of the breath time in inhalation, Human lungs are to a certain extent 'overbuilt' and have a tremendous reserve volume as compared to the oxygen exchange requirements when at rest. This is the reason that individuals can smoke for years without having a noticeable decrease in lung function while still or moving slowly; in situations like these only a small portion of the lungs are actually perfused with blood for gas exchange. As oxygen requirements increase due to exercise, a greater volume of the lungs is perfused allowing the body to reach its CO<sub>2</sub>/O<sub>2</sub> exchange requirements. An average human breathes around 11,000 liters of air (21% of which consists of oxygen) in one day<sup>6, 7</sup>.

Diseases of the human lung belong to respiratory diseases. Many of these are caused or worsened by smoking. These diseases involve Lung cancer, Emphysema, Asthma, Cystic fibrosis, Tuberculosis and Pneumonia etc<sup>8</sup>. Emphysema is an enlargement of the air spaces in the lung, making it hard to breathe. Asthma is an immunological disease which causes the bronchioles to narrow by inflammation and spasm of the lining of the airway wall. Cystic fibrosis is a hereditary disease which causes the lung to produce abnormally viscous mucus. Tuberculosis is a transmittable bacterial infection of the lung, the most common infectious disease today. Pneumonia is an infection of the lung, caused by bacteria, viruses or fungi. Pneumoconiosis is an occupational lung disease caused by the inhalation of dust. Bronchitis is inflammation of the bronchi<sup>9</sup>.

Asthma is a common chronic inflammatory disease<sup>3</sup> of the airways characterized by variable and recurring symptoms, reversible airflow obstruction, and bronchospasm. Symptoms include wheezing, coughing, chest tightness, and shortness of breath<sup>10</sup>. Treatment of acute symptoms is usually with an inhaled short-acting beta-2 agonist (such as salbutamol). Symptoms can be prevented by avoiding

triggers, such as allergen and irritants, and by inhaling corticosteroids. Leukotriene antagonists are less effective than corticosteroids and thus less preferred<sup>11</sup>. Each person with asthma has his or her own unique set of triggers. Most triggers cause attacks in some people with asthma and not in others, Common triggers of asthma attacks are the exposure to tobacco or wood smoke, Breathing polluted air, inhaling other respiratory irritants such as perfumes or cleaning products, breathing in allergy-causing substances (allergens) such as molds, dust, or animal dander, an upper respiratory infection, such as a cold, flu, sinusitis, or bronchitis, exposure to cold, dry weather, emotional excitement or stress, physical exertion or exercise, sulfites, and additive to some foods and wine, and menstruation -In some, not all, women, asthma symptoms are closely tied to the menstrual cycle<sup>12</sup>.

Full-blown attack of asthma attack is usually episodic and has symptoms like wheezing, recurrent breathlessness or shortness of breath, tightness of the chest pain, or pressure, coughing and difficulty speaking<sup>13</sup>. Symptoms of asthma vary from person to person. Some may have all the above symptoms and some may have few of them. Severity may vary in each attack,. Proper diagnosis is necessary for treatment<sup>14</sup>. Mild and moderate attacks usually involve the following symptoms, which may come on gradually chest tightness, coughing or spitting up mucus, restlessness or trouble sleeping, and wheezing. Severe attacks usually involve the symptoms like breathlessness, difficulty talking, tightness in neck muscles, slightly gray or bluish color in your lips and fingernail beds, skin appear “sucked in” around the rib cage, and “silent” chest (no wheezing on inhalation or exhalation)<sup>15</sup>.

## MATERIALS AND METHODOLOGY

**Spirometry:** The most reliable way to determine reversible airway obstruction is with spirometer, a test that measures the amount of air entering and leaving the lungs. Spirometry uses a measuring device called a spirometer that is connected by a flexible tube to a disposable cardboard mouthpiece. The patient exhales and inhales deeply, then seals his or her lips around the mouthpiece and blows as forcefully and for as long as possible until all the air is exhaled from the lungs<sup>16</sup>.

Ideally, the patient should exhale for at least 6 seconds. The amount of air exhaled in the first second, expressed as “FEV 1” is measured and compared to the total amount exhaled. If the amount exhaled in 1 second is disproportionately low to the total exhaled, the patient has an obstruction. To test for reversibility, the patient then inhales a bronchodilator (i.e., a drug that widens the airways in the lungs) and the Spirometry is repeated. If the values of the test performed after administration of the bronchodilator are significantly better than the prebronchodilator values, the obstructions are considered reversible<sup>17</sup>. The most common parameters measured in spirometry are vital capacity (VC), Forced vital capacity (FVC), Forced expiratory volume (FEV) at timed intervals of 0.5 , 1.0, (FEV1), 2.0, and 3.0 seconds, Forced expiratory flow 25-75% (FEF 25-75) and maximal voluntary ventilation (MVV), also known as Maximum breathing capacity<sup>18</sup>.

**Peak Expiratory Flow:** Because asthma symptoms vary, it is not unusual for a patient with chronic asthma to have normal Spirometry. In such cases, Peak expiratory flow (PEF) rate monitoring may be used to demonstrate reversible airway obstruction. A peak flow meter is a portable device that can be carried by the patient. It consists of a small tube with a gauge that measures the maximum force with which one can blow air through the tube<sup>19</sup>.

The patient performs the peak flow meter test twice a day for about 2 weeks and records the results for review in a follow up appointment. The first test should be performed after waking in the morning, before

taking bronchodilator medications. The patient should perform the peak expiratory flow maneuver 3 times and record the highest measurement. The second test should be done in the afternoon or early evening after taking a bronchodilator. Peak flows vary during the day and the early morning peak is lower than the evening peak. Variability greater than 20% indicates a reversible airway obstruction<sup>20</sup>.

**Bronchial Provocation:** Occasionally, a patient with a suspected asthma-related airway obstruction does not demonstrate obstruction in spirometry or peak flow monitoring. In this circumstance, the diagnosis of airway obstruction may be provided by Bronchial Provocation.. Bronchial provocation, also known as bronchoprovocation and bronchial challenge, identifies and characterizes hyper responsive airways having the patient inhale an aerosolized chemical, called a broncho-spastic agonist that triggers a hyper responsive reaction. The chemicals most often used are histamine and methacoline<sup>21</sup>.

The other common bronchoprovocation test is the exercise challenge test, which is used primarily with patients whose asthma is triggered by exercise. The patient performs spirometry and then exercises, usually on a treadmill or exercise cycle. The exercise test should resemble as closely as possible the conditions under which the symptoms are usually triggered. After the patient exercises, spirometry is repeated. This may be done several times, immediately after exercise and periodically, until there is a drop in the FEV1 greater than 20% or until 30 minutes have elapsed<sup>22</sup>.

**Other Asthma test:** Tests may be employed to exclude other diseases and to evaluate conditions that worsen the asthmatic condition. These include Chest x-rays are often obtained initially to rule out other health conditions, allergy testing, either by skin testing or by measuring antibodies, in the blood, sometimes is performed to determine if the asthma is allergy induced and if so, what specific allergens are involved. Oximetry: A painless probe, called a pulse oximeter, will be placed on your fingertip to measure the amount of oxygen in your bloodstream<sup>23</sup>.

## CONCLUSION AND DISCUSSIONS

Since asthma is a chronic disease, treatment goes on for a very long time. Some people have to stay on treatment for the rest of their lives. If you are in the emergency room, treatment will be started while the evaluation is still going on, you may be given oxygen through a face mask or a tube that goes in your nose, you may be given aerosolized beta-agonist medications through a face mask or a nebulizer, with or without an anticholinergic agent, another method of providing inhaled beta-agonists is by using a metered dose inhaler or MDI. An MDI delivers a standard dose of medication per puff<sup>24</sup>.

If your asthma has just been diagnosed, you may be started on a regimen of medications and monitoring. Controller medications are for long-term control of persistent asthma. They help to reduce the inflammation in the lungs that underlies asthma attacks. You take these every day regardless of whether you are having symptoms or not. Controller medicines help minimize the inflammation that cause an acute asthma attack<sup>25</sup>.

Long-acting beta-agonists class of drugs is chemically related to adrenaline, a hormone produced by the adrenal glands, inhaled long-acting beta-agonists work to keep breathing passages open for 12 hours or longer. Salmeterol (Serevent) and formoterol (Foradil) are long-acting beta-agonists. Inhaled corticosteroids are the main class of medications in this group. The inhaled steroids act locally by concentrating their effects directly within the breathing passages, with very few side effects outside of the lungs [26 Beclomethasone (Vancenase, Becloven) and triamcinolone (Masacort, Atolone) are examples of inhaled corticosteroids<sup>26</sup>. Leukotriene inhibitors are another group of controller medications.

Leukotriene are powerful chemical substances that promote the inflammatory response seen during an acute asthma attack. By blocking these chemicals, leukotriene inhibitors reduce inflammation. The leukotriene inhibitors are considered a second line of defense against asthma and usually are used for asthma that is not severe enough to require oral corticosteroids<sup>27</sup>. Methylxanthine are another group of controller medications useful in the treatment of asthma. This group of medications is chemically related to caffeine. Methylxanthine work as long-acting bronchodilators,. Theophylline and aminophylline are examples of methylxanthine medications.

Rescue medications are for short-term control of asthma attacks and you can take these only when you are having symptoms or are more likely to have an attack – for example, when you have an infection in your respiratory tract. Rescue medications are taken after an asthma attack has already begun. These do not take the place of controller drugs. Do not stop taking your controller drug (s) during an asthma attack<sup>28</sup>. The complications of asthma can be severe. That include decreased ability to exercise and take part in other activities, lack of sleep due to night time symptoms, permanent changes in the function for the lungs, persistent cough, trouble breathing that requires breathing assistance (ventilator), death<sup>29</sup>. If your asthma attacks are triggered by an allergic reaction, avoid your triggers as much as possible, Keep taking your asthma medications after you are discharged, this is extremely important. Although the symptoms of an acute asthma attack go away after appropriate treatment, asthma itself never goes away<sup>30</sup>.

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