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## Lung Health: Reducing the Incidence of Occupational Lung Diseases

Occupational lung diseases occur as a result of repeated and long-term exposure to air particulates and irritants. Some occupations are more at risk for development of these diseases because of the nature and environment of the workplace or jobsite. Many lung diseases are preventable as long as they are recognized early. However, chronic lung problems can develop if the signs and symptoms are not diagnosed and treated early. According to the Canadian Lung Association, the economic burden of respiratory disease in Canada is approximately 3 billion dollars. While certain conditions such as pneumoconiosis have declined in the last 30 years, others such as occupational asthma have increased.

### Early detection and diagnosis:

Symptoms of occupational lung disease include:

- Coughing
- Shortness of breath
- Chest pain or tightness
- An abnormal breathing pattern

Many of these symptoms resemble other medical conditions which is why accurate diagnosis is important. Dysfunction can be initially identified through pulmonary function tests, such as spirometry, to measure the lungs ability to exchange gases such as oxygen. Once dysfunction is identified a client should seek the care of a physician for more accurate diagnosis. The physician often will send the client to have a chest x-ray to determine how much damage has occurred to the lungs.

### How respiratory diseases occur:

Respiratory diseases occur through the inhalation of small particles of dust, pollens, moulds, smoke and other gases from sources such as factories, smokestacks, exhaust, fires, construction and mining sites.

Finer particles travel deeper into the lungs potentially creating more damage to the lung tissue. These particles cause scarring of the lung tissue and leave that area of the lung incapable of exchanging oxygen to the blood.

Lung diseases can be divided into those that come from inorganic (those that do not contain carbon) and organic (those that do contain carbon) dusts. Examples of inorganic dust diseases include asbestosis, coal worker's pneumoconiosis and silicosis. Occupational asthma is an example of an organic dust disease from inhaling irritants such as gases, fumes and vapours.

### Prevention:

Certain lung conditions such as occupational asthma are reversible if detected early. However, most lung diseases are irreversible. Therefore, prevention of these diseases plays a significant role both from a health perspective for the employee and a cost perspective from the employer. There are many steps a company can take to reduce the incidence of lung diseases including the following:

- **Education:** Lung health begins by educating employers and employees about the occupational risks, symptom detection and benefits of early detection.
- **Smoking:** Smoking increases the risk of lung diseases including lung cancer and emphysema. What is your company doing to promote smoking cessation programs?
- **Proper mask protection:** While most employees use facial masks, it is vital that masks are properly fit for each employee.
- **Spirometry:** Early lung changes can be detected with a simple pulmonary function test.

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## Pulmonary Function Test Tracking Program

SureHire is implementing an automated pulmonary function test tracking program. This program can be accessed through SureWire, our web-based results system. The database keeps track of each employee's spirometry tests. The automated system will notify your company when an employee should have a follow-up spirometry exam. The time period between spirometry tests can be customized for your company based on an employee's position and exposure to airborne particulates. Additionally, results of baseline through to the latest spirometry test can be easily displayed and compared in one report allowing easier analysis for detrimental changes in lung function.

## Quantitative vs. Qualitative Mask Fit Testing

SureHire is now offering **quantitative** mask fit testing. It is a more accurate and precise method of mask fitting when compared to traditional **qualitative** mask fitting procedures.

Qualitative mask fitting is a pass/fail method of testing requiring the client to detect a bitter or sweet odour such as Bitrex (denatonium benzoate), banana oil or a saccharin solution. This odour is injected into a test booth or hood while the client is wearing their mask. If the client cannot detect the odour, the test is considered a pass. This type of testing can only be performed on disposable and half-face masks.

Quantitative mask fitting delivers a numerical measurement of the "fit factor" of a particular respirator. A particle counting device (such as a TSI Portacount Plus) measures the concentration of microscopic particles that exist in ambient air to measure the "fit factor" directly. The measurement is made while the person performs dynamic movements and/or breathing exercises resembling those experienced in the workplace in order to stress the respirator seal. This type of testing can be performed on all types of masks.

Quantitative mask fitting offers several distinct advantages:

- It eliminates the reliance of the tester on the subject's ability, honesty, cooperation and sensitivity when detecting agents. Quantitative testing makes a direct measurement of mask fit factors.

- Results are available immediately as a "pass" or "fail". Results can be maintained electronically or customized in a printed report.
- The particle counting device uses a programmed sequence of steps so that critical steps cannot be skipped or performed incorrectly which may invalidate the fit test.
- It can be used to fit test almost all respirators including elastomeric half and full-face masks, PAPRs, SCBA and even disposable respirators.
- It can be used for clients with their own respirators to help eliminate any hygienic concerns associated with sharing a test mask.
- Full-face masks can be used to their full potential. Qualitative methods limit the use of full-face masks to environments where half masks are allowed because these methods are limited to a half-mask fit factor pass level of 100. Standards from many regulatory agencies throughout the world require a fit factor pass level of 500 or more for full-face masks. The particle counting device can accurately measure "fit factors" up to 100 000.
- The quantitative mask fitting software complies with many regulatory standards including those from the Canadian Standards Association.

SureHire highly recommends quantitative mask fitting techniques because it gives unbiased and precise results. This translates into increased protection and safety for your employees.

# Pulmonary Function Tests

Pulmonary function tests are an array of tests designed to determine the quantity of air a client's lungs can hold, how quickly that client can move air in and out of their lungs, and how efficient the lungs can exchange oxygen and carbon dioxide gases. A spirometry test is often the initial pulmonary function test performed. The client breathes forcefully into a mouthpiece attached to the spirometer (recording device) to measure the rate and quantity of airflow from a client's lungs.

## Results

Information obtained from the spirometry test includes the forced vital capacity (**FVC**), the forced expiratory volume in one second (**FEV<sub>1</sub>**) and the **FEV<sub>1</sub>/FVC ratio**.

- The **FVC** is the amount of air you can exhale with force after you inhale as deeply as possible.
- The **FEV<sub>1</sub>** is the amount of air you can expire with one breath and is often measured after one second.
- The **FEV<sub>1</sub>/FVC ratio** is the percentage of total forced vital capacity that was expelled in one second.

## Confounding Variables

There are many pre-determined variables that can affect lung function. These include:

- Age - the natural elasticity of the lungs decreases with age thereby decrease lung volumes and capacities
- Gender – males generally have higher lung volumes and capacities than females even when body height and weight is taken into consideration

- Body height and weight – smaller and shorter people often have lower lung volumes and capacities
- Race – All races have different pulmonary function test results

## Abnormal Results

Once controlled for the above variables, an abnormal lung function is determined if the client has a FVC of less than 80%, FEV<sub>1</sub> of less than 80% or FEV<sub>1</sub>/FVC ratio of less than 70%. This client is then referred to their physician for follow-up including a chest x-ray.

## OH & S

The Occupational Health and Safety Code of Alberta (Part 4, Section 40) states that all workers exposed to asbestos, silica or coal dust must have a health assessment that includes a spirometry test. In addition, the WCB's *Alberta Permanent Clinical Impairment Guide* states that "where the worker suffers chest disease due in part to occupational and in part to non-occupational factors, the overall disability will be presumed to be related to the employment and compensation awarded accordingly."

For these reasons, SureHire strongly recommends that those companies with employees exposed to any airborne chemicals, dusts or toxins conduct spirometry testing. Baseline tests should be performed during pre-employment screening and repeated every year for comparison of lung function. SureHire also recommends that these employees are mask fit tested prior to access of the job site as part of due diligence in prevention of lung diseases.

## How SureHire's 'Healthy Lung' Program Can Help

- SureHire offers both **qualitative and quantitative mask fit testing** to ensure a proper facial mask seal
- SureHire can perform baseline **spirometry testing** as part of the pre-employment testing process and again at regular intervals to monitor lung changes
- SureHire's **PFT tracking program** can automatically inform you when employee's require a follow-up spirometry exam and allow instant comparison to previous results
- SureHire offers educational **workplace wellness seminars** including smoking cessation

For more information about SureHire's healthy lung program, please contact our offices.