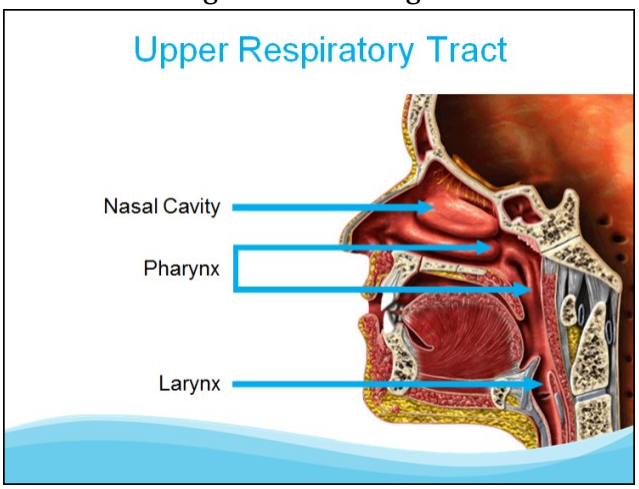
Lung Disease in High-Risk Occupations

This Article originally appeared in OH Today Newsletter (2018) vol. 25 no. 4, pp. 7-10.

The UK Health & Safety Executive (HSE) has identified occupational lung disease as one of its three priority health areas in its latest Strategic Plan because it causes 12,000 deaths a year. In addition, each year workers report 18,000 breathing or lung problems caused or exacerbated by their work, resulting in 400,000 lost working days per annum in the UK.

Occupational lung disease is mostly caused by exposure to a wide range of substances including dusts, fumes, vapours and aerosolised chemicals. When workers breathe in these substances there is a risk that trace levels can remain in the lung after breathing out.



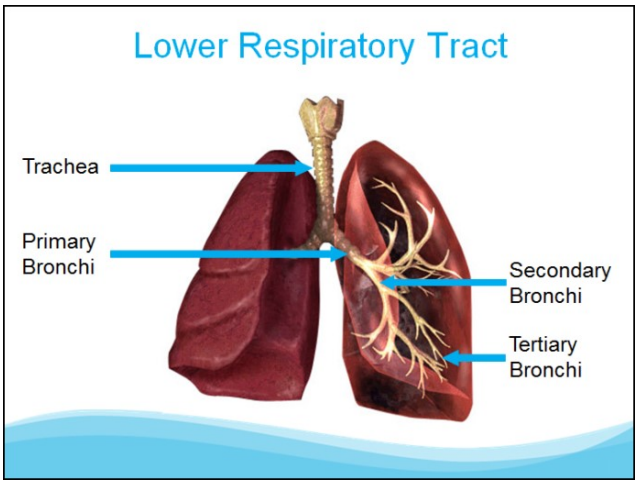
The smaller the inspired particles, the deeper they can penetrate the lung.

The nasal cavity is very good at filtering out large particles, but particles less than 5µm can get through to the trachea.

Particles less than 1µm can get through to the primary and secondary bronchi. Sub-micronic particles can be inhaled into all the conducting airways including the tertiary bronchi.

HSE list high-risk work which can cause life-threatening lung diseases:

- Baking and milling



- Cement, concrete and block manufacture
- Construction - cutting, drilling and sanding
- Quarrying and ground working
- Stonemasonry
- Welding
- Woodworking and furniture

In many cases there is more than one cause, not all work-related. For example firemen exposed to smoke on active duty may also smoke tobacco or vape. There are also many other types of workplace that can cause employees to contract serious and debilitation lung disease, examples include:

- Agriculture
- Civil engineering
- Electronics (soldering)
- Glass and glazing
- Hairdressing
- Foundries and refractories
- Motor vehicle (paint spraying)

- Printing (inks and solvents)
- Textiles and laundries
- Waste management and recycling

In my last article I pointed out that welders and people in their proximity are at risk of many different types of injury including lung damage, often pneumoconiosis - a lung condition caused by inhaling fumes and particles of mineral dust. This group of diseases also includes: asbestosis, silicosis, kaolin (china clay), coal worker's, talcum powder pneumoconiosis and many other kinds of mineral dust, such as pneumoconiosis caused by inhaling barium sulphate, tin oxide, cobalt or tungsten carbide.

It is easy to overlook because lung damage can take many forms and apart from minor symptoms such as a slight cough, it is usually insidious. It can take decades of exposure to be even noticed, by that time it is too late and can become severe and life threatening. The burden of lung disease is borne by the whole family, not just the worker affected. The delayed recognition of lung disease further complicates the problem because as the worker gets older it might simply be put down as ‘my age’.

The HSE points out to employers that they have a duty of care to their employees, i.e. to protect their health, safety and welfare. This extends to other people visiting their premises or otherwise affected by their business. Employers must do whatever is reasonably practicable to make sure that workers and others are protected from anything that may cause harm by controlling health or injury risks that could arise in the workplace. Doing this must start with a risk assessment in the workplace.

When risks are identified there are many mitigation actions to prevent lung disease that employers can instigate. Employers can protect their workers by using:

- alternative processes
- less hazardous materials
- enclosures/effective ventilation
- protective equipment

Lung damage is caused by airborne substances being inhaled, so the most important thing is to keep workplace air clean. Breathing in dusts, gases, fumes and vapours, especially over a period of years can cause irreversible lung damage and other incurable health problems. Some examples:

- occupational asthma
- COPD
- lung cancer
- pneumoconiosis, silicosis
- asbestosis
- allergic alveolitis (bagpipe lung)

Workers awareness of lung disease and their use of respirators and other mitigations is often a part of the problem. For example construction workers view health and safety regulations as overkill and slowing jobs down; and that requirements were more about protecting the employer from litigation than about health and safety. Most construction workers are aware that dust may have a negative impact on lung health, but there is very little understanding about the particular conditions or impact that this might have upon them or the correlation between their practices in the present with long term lung disease later in life.

Another example is bakers. Employers may see lung health mitigations as unnecessary, believ-

ing that their machinery minimises exposure to flour dust, or see mitigations as a way of promoting food hygiene rather than lung health. This is because health and safety in general is dominated by the concept of food health and safety to ensure the food they are producing is high quality and safe for their customers to consume. In addition bakers also typically have very little awareness of the risk flour could represent to lung health because flour is seen as a natural substance that is not hazardous. The hot environment of a bakery means that it is uncomfortable to use respirator masks.

Investigations of other workplaces have also shown that employees that use or manufacture certain flavourings have developed a rare lung disease called bronchiolitis obliterans. In the USA the term "popcorn lung" has often been used to describe the respiratory symptoms and fixed obstructive lung disease seen in these employees. Diacetyl, a ketone with butter flavour characteristics has been shown to be the predominant volatile organic compound present in these work environments. It is suggested that it may be the cause, or a marker for a cause, of respiratory disease in this workforce.

Decreased lung function has occurred in flavouring exposed workers before the onset of symptoms of bronchiolitis obliterans. Signs and symptoms of bronchiolitis obliterans generally develop approximately two to eight weeks after exposure to toxic fumes or a respiratory illness.

Affected people may experience a dry cough, dyspnoea, fatigue and wheezing in the absence of a cold or asthma may also be noted.

Lung Function Testing - Spirometry

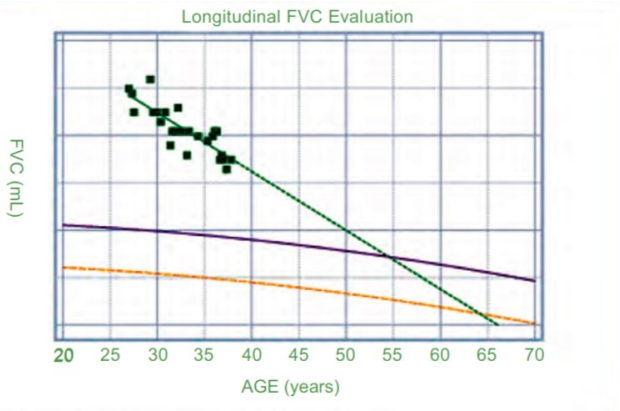
Spirometry is measuring the breathing capacity and airways cross sectional areas of the lungs. It is particularly useful in determining the presence or absence of obstructive lung disease among workers. Tests should include the 1-second forced expiratory volume FEV1, the forced vital capacity FVC and the ratio of these two measurements.

Since spirometry measurements are an important identifying factor of the presence of lung disease, it is recommended that all newly hired employees be asked to complete a health questionnaire including respiratory symptoms or airway obstruction and serve as baseline information for a pre-employment medical exam and subsequent annual evaluation. Workers should be encouraged to report respiratory symptoms or symptoms of eye, nose, throat, or skin irritation.

High quality baseline spirometry should be provided for all new workers before starting work. New workers who have pre-existing lung diseases or abnormal spirometry on pre-placement testing should be evaluated by a physician to determine the risk of exacerbating their lung disease.

Quality spirometers must be used for annual spirometry testing because charting the annual

decline of lung function over the employment period will be impossible without accurate measurements. A decline of 30mL per year is normal; over 100mL a year is abnormal. As these levels of change are relatively small, it is essential that the spirometers used for testing are not just highly accurate, but are consistently so over time. Those performing spirometry testing need to be confident that the test results and year-on-year comparisons can be relied up-on.



Regular accuracy checks using a precision sy-ringe and proper diagnostic device maintenance are important elements that ensure test data reliability and that measurements are certified as traceable to international standards.

Bernard Garbe

Chairman – Vitalograph Group