Silica Dust and Silicosis

With the boom in construction going on around Sydney, we often see workers in excavators digging in a cloud of dust. Or you may see construction workers drilling or cutting into concrete with no respiratory protection.

These workers are at high risk of developing *silicosis*, a serious lung disease caused by the accumulation of silica dust in the lungs. The scarring of the lungs causes stiffening, which will obstruct breathing and cause shortness of breath. This can lead to permanent heart and lung disease.

What is silica dust?

Silica is the main component in sand and in rocks like sandstone and granite. Many workplaces are not aware that common building products such as clay bricks, concrete, tiles and fibro cement products contain silica. Silica dust is usually created when such building products, sandstone or rocks are cut, drilled or worked on in a way that creates fine particles of silica in the air. It is breathing in this crystalline form of silica that causes silicosis.

Who is affected?

Silicosis is not a naturally occurring disease. Its development is directly associated with workplace exposure to silica dust. Workers who are most at risk include those engaged in tunnelling and excavation work, road building, demolition work and explosive blasting work, as well as those in slate, granite cutting and glass manufacturing industries, brickmaking and some manufacturing processes.

Health effects of silica dust

Initial exposure to silica dust will cause irritation of the eyes, nose and throat like most other dusts. However, if excessive amounts of silica dust are breathed into the lungs over a period of time, it can cause damage to the lung tissue. Other than some breathlessness during exercise, the disease can remain free of symptoms for 10-20 years after exposure.

The most common form of silicosis develops after long exposure to relatively low concentrations. Once the disease has begun, it will continue to progress even if the worker is removed from further exposure. There is no medical treatment for silicosis. People with silicosis are also at greater risk of developing lung cancer. In 1996 the International Agency for Research on Cancer classified crystalline silica dust as a human carcinogen (Group 1).

The size of the silica particles is important in causing the disease. Larger particles are usually prevented from reaching the lung's small air sacs. It is the smaller particles (less than five thousandths of a millimetre) that are the most dangerous.

The development of silicosis depends on a number of factors, including:

- The amount and kind of dust inhaled.
- The percentage of free silica in the dust.
- The form of silica.
- The size of the silica particles.
- The duration of exposure.
- The individual's natural body resistance.
- The presence or absence of complicating factors (such as infection).

How is silicosis detected?

The disease is difficult to detect in the early stages because of the absence of symptoms. Frequent dry coughing, shortness of breath, wheezing and increasing tiredness are possible early indicators.

There are three main methods of diagnosis:

1. **Chest x-rays** are the most reliable and the earliest means of detection. An x-ray can show the presence of fibrous tissue.
2. **Work history** is particularly useful in differentiating silicosis from other dust-related diseases with similar symptoms and formation, such as asbestosis.
3. **Lung function tests,** performed using a *spirometer*, assess the performance of the lungs.

How to control silica dust at work

The only effective protection against silicosis is to prevent silica dust in the air. Under their obligations in the *NSW Occupational Health and Safety Act 2000*, employers must take measures to ensure that workers are not exposed to silica dust. There are a number of simple control measures that can be taken.

Substitution

Where possible, less toxic substances should be substituted for silica sand:

- Olivine and zircon sand should be used in moulds and cores in foundries.
- Metallic shot, slag products or grit should be used for abrasive blasting. (It is now illegal to use sand for abrasive blasting).
- Alumina should be substituted for flint in china placing in pottery.
- In some building work, silica dust problems can be eliminated by using pre-built materials for plumbing and wiring.

Engineering Controls

Tools causing dust, for example, grinders and saws, should be fitted with dust extraction devices. Where possible, dusty processes should be fully enclosed and have an exhaust hood attached. Where this is not possible, a local ventilation system with hoses fitted as close as possible to the head of cutting tools.

Use tools fitted with a water attachment to suppress dust, for example, on power saws, jackpicks and scabbling picks. Spraying with water in processes such as grinding or drilling can reduce the amount of dust by as much as 75%.

An American study of foundries showed that overexposure to silica dust was the result of poorly designed and/or poorly maintained ventilation systems.

Good Housekeeping

Regular vacuuming and wet sweeping of floors and machinery to remove settled dust is particularly important to stop dust being kicked back into the air. Work clothing should be vacuumed before removal. Under no circumstances should dry sweeping take place in areas where silica dust could be present.

Posters and signs warning of the presence of free silica should be prominently displayed.

Respiratory Protective Equipment

This should be looked at as a last resort when all other preventative solutions possible have been put in place. Respiratory Protective Equipment can vary from a simple disposable mask to a full respirator supplying clean air for particularly high concentrations of dust.

In all cases, the equipment should fit properly and be regularly cleaned and checked. Dust masks are unsuitable for use with a beard, and in these cases, an air supplied respirator with a hood or a helmet and visor should be used.

All these preventive measures should not be looked at in isolation but in combination with each other. It is very important that workers potentially exposed to silica dust have a chest x-ray every two years, to allow for early diagnosis.

Dust levels in the air should be monitored by a competent person. The exposure limit for silica dust is 0.1 mg/m^3. However, exposure levels in settings like construction sites are highly variable and air sampling alone is not enough to indicate the health risks from airborne silica dust.

Useful references

WorkCover NSW, *Dust in the Workplace – How to Prevent Silicosis*

For further information and advice contact the Workers Health Centre