

SILICA RELATED LUNG DISEASES

What is silica?

Silica is a mineral that constitutes a major part of the earth's crust and is found in many types of rocks and soils. Silica exists in a number of forms such as quartz, glass, or it may be combined with other elements to form silicates which are found in a large number of other rocks. Quartz, or crystalline silica, is the form which can be a health hazard. Quartz is believed to have important health effects because of its shape and size which enable it to be inhaled into the airways and small air sacs. When quartz is heated it can change into other forms of crystalline silica, which are also hazardous to health.

How does it get into the lungs?

An important property of quartz is that it can exist as very small dust particles. Dust particles are often generated when rock containing quartz is drilled, blasted or crushed by machinery. The very small particles can then become airborne. These dust particles can be inhaled and breathed into the lungs. The dust passes through the airways into the small air sacs called alveoli where gas exchange occurs, and can be deposited in the airways and air sacs.

Small amounts of airways dust can be removed by coughing. Dust which enters into the air sacs, on the other hand, can only be removed by local cells which engulf the particles and then carry them away from the lung tissue into the blood stream and to other parts of the body. Normally there is a balance between the amount of dust breathed into the lung and the body's ability to get rid of it from the lungs.

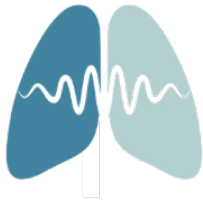
In very dusty situations, however, the clearance mechanism is overwhelmed and the deposited dust then clogs the lung tissues via the airways and the air sacs. The only way to get the retained dust out of the lungs is either to pass it on to other cells or cough it up in the phlegm or sputum.

What can it do?

When quartz dust lies within the lung tissues, chemical reactions can occur which result in tissue injury followed by the healing response of the lung. This is similar to an injury to the skin such as a cut which usually heals leaving a small scar. Thus, damage by quartz in the lung tissue causes a small scar, in the form of a small nodule which can be seen on a chest x-ray. This type of lung damage is called silicosis.

The effect that this damage has on breathing depends upon the amount of quartz dust retained in the lung, the degree of the healing response, and the size and number of nodules seen on the chest x-ray. The healing response can vary in different people, with some people developing a much more severe response. This response can be seen in a condition known as progressive massive fibrosis (PMF). This condition is caused by a consolidation of the silica nodules which may cause severe disability.

An early symptom of quartz dust exposure can be a persistent productive cough. This can be due both to the lung's attempt to clear the dust, and to some earlier injury to the airways.



If there is reaction to silica in the airway wall, this can result in narrowing of the airways and a feeling of shortness of breath. If many air sacs are involved, the number can be reduced, also resulting in a feeling of shortness of breath. This can be particularly noticed when doing hard work or exercise.

Another lung disease associated with silica exposure is carcinoma of the lung. Recent research, including epidemiological studies on data held by the Dust Diseases Board of New South Wales, indicates people with silicosis have an increased risk of lung cancer. It must be pointed out however, that this cancer occurs only in extremely rare occasions. Working with silica does not increase the risk of cancer unless there is clear evidence of silicosis.

How can it be detected?

Scar tissue in the lung can be detected by a simple chest x-ray showing the appearance of small nodules. As the amount of silica retained in the lung increases, the number and frequency of these opacities also increases.

Lung function tests can also be used to measure the effect of silica in the lungs. In the early stages there may be no change in lung function. However, as the silica accumulates there can be an interference of the ability to shift air quickly, which can be measured by spirometry, or in the ability of the lung to exchange oxygen, which can be measured by special lung function tests or exercise tests.

What should I do?

The most important measure is to reduce the amount of crystalline silica retained in the lungs. Once silica is in the lung there is little that can be done to get most of it out again.

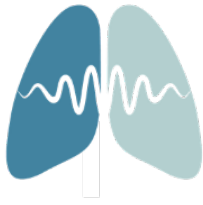
If you are working or in an environment where crystalline silica is present you may well be inhaling significant amounts of silica. Attempts should be made to reduce this amount. Preferably this would involve not working with silica to begin with.

If this is not possible, attempts to isolate the job so that there is no exposure to silica or increasing the ventilation to reduce the amount of silica in the air should be made. In situations where this is not possible, then personal protective equipment which supplies filtered or clean air will reduce exposure.

These measures are particularly relevant to those people working in jobs where they have daily exposure to silica. Measures must be taken to ensure that airborne silica dust is kept low and that central measures are in place and checked regularly.

The early detection of significant retained quartz is important. If early silicosis is detected, it is very important to stop any further exposure. If further exposure is avoided, the resultant effects on breathing may be insignificant.

If quartz dust has been retained in the lungs, it is important to reduce exposure to other respiratory hazards such as tobacco smoking. There is a possibility of an interaction with the harmful effects of cigarette smoking and the retained silica. This is particularly relevant in terms of problems that could arise involving the airways, including airways obstruction and lung cancer.



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If significant disability arises from silica exposure there may be compensatory avenues that could be pursued. This can be discussed with your local doctor, respiratory physician, your employer, union, or the Dust Diseases Board.

Please Note: This information is intended by The Australian Lung Foundation to be used as a guide only and is not an authoritative statement. Please consult your family doctor or specialist respiratory physician if you have further questions relating to the information provided here.