

Health surveillance for employees exposed to respirable crystalline silica (RCS)

Purpose and scope of guidelines

- More than 2 million employees in many different categories of occupations throughout Europe will be covered by the first European multi-sectorial agreement that has been signed. The sector agreement is aimed at protecting employees that are exposed to crystalline silica dust (quartz), which can lead to silicosis; a pulmonary disease that can be fatal. Silicosis is also linked to other serious pulmonary diseases, such as COPD and lung cancer. The purpose of the sector agreement is to reduce the employees' exposure to quartz dust through better occupational hygiene at the workplace. The sector agreement has been entered into by the large employers and employees' organisations in the EU, with the involvement of the EU commissioner for employment, social affairs and equal opportunities.
- The aim of this document is to describe selective, targeted health surveillance for employees exposed to quartz dust. The surveillance shall, as far as possible, be in accordance with established occupational medicine methods and, also as far as possible, be based on knowledge with a scientific basis.
- The guidelines build on occupational medicine guidelines no. 3.0 "Basisveiledning for selektiv, målrettet helsekontroll av arbeidstakere" (Basic guidelines for selective, targeted health surveillance of employees – only available in Norwegian) (1).
- The guidelines are also based on HSE G404 "Health surveillance for those exposed to respirable crystalline silica" (2).
- "Selective, targeted health control" is defined as a health check that aims to uncover the possible effects of exposure at work.
- The document can be used in two different contexts:
 - Employers who are responsible for businesses with quartz exposure can use the document when ordering health surveillance for its employees from its company health service. The document will then act as an order description.
 - The document can be used by the company health service as guidelines or a standard for carrying out the health surveillance.

Risk assessment of pulmonary disease from quartz exposure

- RCS stands for respirable crystalline silica, known colloquially as quartz. "Respirable" dust means particle size on $<5 \mu\text{m}$. Silica can take an amorphous or crystalline form. It is the crystalline form that can be hazardous to health. It contains 3 minerals: quartz (rock crystal, amethyst, onyx), tridymite and cristobalite.
- Work that entails exposure to dust containing quartz can lead to pulmonary diseases. The risk depends on:
 - How long the employee is exposed to dust
 - How much dust the employee is exposed to

- How large the proportion of crystalline silica in the dust is
- Predisposing factors (e.g. smoking, asthma, COPD, Alpha-1 antitrypsin deficiency)
- Particle size (distribution of particle size)
- RCS dust is very fine dust – almost invisible (< 5 µm). The dust is inhaled through the nose and mouth, and can be in the lungs for many years. It can cause irreversible damage to the lungs before any symptoms develop. The disease it induces can continue to develop even after there is no more exposure.
- Health surveillance is never an alternative to proper exposure control.

Silicosis

- Silicosis is a dust lung disease and the main disease caused by quartz dust (RCS). It causes the development of small, hard lumps of scar tissue that show up on X-ray. The diagnosis is therefore based on signs on X-ray.
 - Chronic silicosis: normally takes some years to develop this (the most common) form of silicosis. The level of exposure can be low, while exposure time is normally more than 10 years.
 - Acute form: this can start over a short period of time, and can have fatal consequences within a few months of the first exposure. This form of silicosis can occur in cases of very high exposure, even before five years.
 - Accelerating form: this form can develop after 5-10 years of relatively high exposure. (5)
- As it is not possible to identify a clear threshold value for the development of silicosis, any reduction of exposure will reduce the risk of silicosis.
- The main symptoms are coughing and breathing problems. Employees with silicosis have a greater risk of contracting tuberculosis and lung cancer, and can also develop kidney diseases and arthritis (and related illnesses). Employees that work with quartz can have a greater risk of developing these illnesses even if they do not have silicosis. (5)

COPD (chronic obstructive pulmonary disease)

- Exposure to RCS can cause COPD. This disease affects the air flow in and out of the lungs and causes dyspnoea, often with chronic coughing and sputum.

Lung cancer

- Lung cancer is defined as one or more malignant tumours in the lungs and/or respiratory passage. There are two main types of lung cancer: small cell lung cancer and non-small cell lung cancer. The symptoms of lung cancer vary, but the most common are a prolonged cough, bloody sputum, hoarseness, headaches, dizziness and weight loss. Heavy breathing or chest pains, and frequent lung infections are also symptoms.
- There is sufficient information to conclude that the relative risk of lung cancer is greater in sufferers of silicosis. Preventing outbreaks of silicosis will, therefore, also reduce the risk of cancer.

Purpose of selective, targeted health surveillance for employees exposed to quartz

- The purpose of the examination is four fold:
 - The primary aim is to identify symptoms and signs in the employees; symptoms and signs that can stem from exposure to quartz. This information will give the company important information on the need to implement measures to reduce the exposure to quartz.
 - The examination also aims to identify persons that have incipient lung changes that can stem from exposure to quartz, so that these can be further explored, the necessary treatment given, and alternative work found where appropriate.
 - Issuing a health certificate for new appointments will also make it possible to identify persons with an existing pulmonary disease that means they should not be working in an environment where they are exposed to quartz.
 - For employees that are leaving their job will the purpose of documentation be any changes of the lungs and give advice for follow-up.

Selection criteria

- Where it is likely that silicosis can develop, health surveillance will be necessary. The risk shall be assessed together with the company health service. The risk is assessed based on the level and length of exposure. The level of exposure is assessed based on a qualitative assessment of quartz in the working atmosphere, as well as the result of the quartz dust measurements.
- In broad outline, it can be said that the following employees shall undergo such an examination:
 - Employees that work on a daily basis in an environment where cases of RCS have been demonstrated.
 - In accordance with the directives in some countries, there will be a requirement for targeted health controls when exposure exceeds 1/5 of the Occupational Exposure Limits (OEL). Where the exposure is lower than 1/5 of the OEL, health surveillance will not be necessary. Seen in light of the intention of the agreement, and since quartz is now defined as carcinogenic¹, we recommend that all employees working on a daily basis in an environment where RCS has been shown, are included in the health surveillance.
 - Employees that work sporadically in a working environment in which the exposure to quarts is above the OEL.
- Employees that sporadically work in an environment in which the exposure is below the OEL do not need to undergo such an examination.

¹ Respirable quarts is define as carcinogenic of the worlds health organisation IARC, and has the mark “K” (carcinogenic)in the Norwegian list over Occupational Exposure Limits. Quarts as a trade article is not classified, and has because of that no cancer warning on the hazard label.

Frequency

- Employees with no special symptoms shall undergo a medical check-up every three years. In operations with a high exposure level and operations that have other exposures that are a strain on the lungs, more frequent health controls must be considered.
- It is crucial that employees experiencing symptoms from the respiratory passage contact the company health service so that a medical check-up can be carried out as required, and not at the standard interval. Silicosis can in some cases develop at such a rate that it will not be intercepted in 3-yearly controls.
- Employers due to start working in a position that carries a risk of exposure to RCS should undergo the examination. (Persons with pulmonary diseases should be advised to seek other work. Persons with existing silicosis or COPD should not work in atmospheres with RCS.)
- Employees that are leaving their job should undergo the medical check-up. They should be given the results of previous examinations and be informed that if they experience any symptoms from the respiratory passage they should get in touch with a doctor in order to have a new examination.

Anamnesis

- Most symptoms that can be linked to silicosis and COPD are revealed on the MRC form (Appendix 1). This questionnaire is an internationally recognised, standardised and validated form devised by the British Thoracic Society for identifying COPD. It is recommended that this form is used to identify relevant symptoms in a structured manner.
 - The MRC form is included as an appendix to the notice of examination, and the employee should complete the form in advance. The company health service goes through the form with the employee, and uses this as a pointer. The guidelines for interpreting the form are very extensive. It will not be natural to use these to record anamnesis, but in some cases it can be pertinent to be backed up by the guidelines (Appendix 2).
- In addition, it can be useful to ask whether an employee prefers to use the lift instead of the stairs, and in the event of a positive response, ascertain further information on any breathing problems.
- Previous and existing pulmonary diseases and atopy must be mapped.
- Familial pulmonary diseases and atopy should be mapped.
- Previous and current exposure to factors that are a strain on the lungs must be mapped.
- Occupational history must be mapped.
- Map the employee's smoking habits. The notice of examination can include a separate paragraph for mapping smoking habits, which the employee can fill out in advance (Appendix 3).
- In areas where tuberculosis exists, special focus should be given to symptoms that can be consistent with tuberculosis. These are: coughing that lasts for weeks and is producing discoloured or bloody sputum, poor appetite and weight loss. Sufferers can also feel listless, have a slight fever, night sweats and experience chills. Some can experience pains when breathing or coughing (pleurisy).

Examinations

- Spirometry with minimum FVC, FEV₁ and FEV % must be carried out, preferably in line with the criteria of the ATS (American Thoracic Society).
- Employees due to start working in a position that carries a risk of exposure to RCS should be X-rayed. This should be repeated every six years.
- Employees that are leaving jobs that entail RCS exposure should be X-rayed.
- For employees that have symptoms from the respiratory passage and/or reduced spirometry values:
 - an X-ray should be requested. Tests for quartz-related pulmonary diseases must include a full-scale X-ray of the thorax; with front and side.
 - a percussion of the thorax should be carried out, an inspection of the respiratory movements, as well as a lung auscultation.
- For further details of the X-ray and CT examinations, refer to HSE information 2/05 (only available in Norwegian) from the Federation of Norwegian Industries (3).

Conclusion after examination

- In the event of a negative result, the next check-up will be in three years and X-rays every six years.
- Where diagnosed silicosis, symptoms are displaying from the respiratory passage and/or spirometry values have fallen, an assessment will be made of whether the employee has a need for further examination or treatment, or whether different work should be found. The assessment shall be based on symptoms and signs, other examinations and investigations, as well as the employee's exposure in terms of quantity and time. In addition to the exposure to quartz, exposure to other factors that put a strain on the lungs will also be considered, including smoking.
- Where it is concluded that an employee has silicosis, the need to investigate whether joints or the kidneys are affected shall also be considered.

Feedback and follow-up

Individual level

- All employees shall be informed of the result of the examination.
- Where the result is positive, with a need for further investigation and follow-up, the employee shall be informed of this.
- The employee shall be informed of what he should watch out for; primarily the development of the symptoms.
- It should be clarified with the employee whether his employer can be informed of the results. (In accordance with the Working Environment Act in Norway, the employee has a duty to report occupational injuries/illnesses.)
- The company health service shall inform the employee of the notifications to send to the public authorities, the employer, insurance companies etc., in the event that an occupational illness is established. (See occupational medicine guidelines 6.23: “Melding av yrkessykdom/yrkesskade - trygde- og erstatningsrettigheter”.) (Notice of occupational illness/injury – rights to benefits and compensation - only available in Norwegian)

Group level

- The company health service shall inform the company, i.e. the employer, the personnel safety representative and the working environment committee of the results made on a group basis. In some cases it may be appropriate to inform the Norwegian Labour Inspection Authority. (The company doctor's report on occupational illness.)
- The company health service shall give notice of what follow-ups should be undertaken by the working environment committee based on the conclusions drawn.
- In addition, the company health service shall give the employer the following information for reporting to the national industry coordinator for quartz (in some cases, the company health service may report directly to the national industry coordinator for quartz on behalf of the company). The data to be reported is likely to be extended in a few years.
 - The number of employees in the company being followed up with general health checks
 - The number of employees in the company being followed up with targeted health surveillance in accordance with the arrangement for quartz

Documentation

- All data shall be filed in the employee's journal.
- The company health service shall keep an exposure register of employees exposed to quartz, and shall keep the register and the results of the lung function tests for 40 years. (It is mandatory for the employer to keep a register of employees that are exposed to carcinogenic substances, but this service should be purchased from the company health service.)

Appendices

1. MRC form
2. Guidelines for interpreting MRC form
3. Information letter to the employee – notice of examination
4. Guidelines for spirometry tests
5. Form for examination describing the content of the examination, with possible space to document the results
6. Overview form of employees exposed to quartz and the next control
7. Standard feedback/follow-up letter to the relevant bodies
8. Reporting form in accordance with the arrangements for quartz

References

1. Occupational medicine guidelines no. 3.0 “Basisveiledning for selektiv, målrettet helsekontroll av arbeidstakere” (T.R.Thomassen 2007)(Basic guidelines for selective, targeted health surveillance of employees – only available in Norwegian)

2. Health and Executive, G404 "Health surveillance for those exposed to respirable crystalline silica"
3. Norsk Industri's HSE information 2/05: "Røntgenologiske helseundersøkelser av lungene – hvorfor og hvordan" (Radiological health examinations of the lungs – why and how – only available in Norwegian)
4. Occupational medicine guidelines no.1.7 "Utredning av personer med mistanke om arbeidsbetinget asbestindusert lungesykdom" (B. Hilt & E. Fernholdt 2005)(Investigation of persons with suspected work-related asbestos-induced pulmonary disease – only available in Norwegian)
5. European Network for Silica (NEPSI) Agreement on Workers Health Protection through the Good Handling and Use of Crystalline Silica and Products containing it
6. See occupational medicine guidelines 6.23: "Melding av yrkessykdom/yrkesskade - trygde- og erstatningsrettigheter" (U. Bratt 2005) (Notice of occupational illness/injury – rights to benefits and compensation - only available in Norwegian)