AMERICAS ELIMINATION OF SILICOSIS INITIATIVE

WHAT IS SILICA?

Crystalline silica is one of the most common minerals in the earth's crust. Crystalline silica dust is released during numerous operations in which rocks, stones, raw materials, sand, concrete, cement roofing tiles, bricks, pottery, some ores and soils, and silica-containing products are crushed, broken, hammered, drilled, polished, cut, dumped, swept, blown, or subjected to any process that could create visible or invisible dust particles[1].

Crystalline silica in the form of quartz or cristobalite, is classified by the International Agency for Research on Cancer as carcinogenic to humans (Group 1)[2]. This designation means that inhalation of crystalline silica is known to cause cancer in humans.

WHERE ARE WORKERS POTENTIALLY EXPOSED?

Workers may be exposed to crystalline silica in many different workplaces and processes. These include:

- Mines, quarries, **water well drilling operations,** foundries, stone crushing operations, highway repair, masonry workshops
- Construction, excavation, and demolition sites
- Manufacture, etching, & frosting of glass
- Creation of ceramics, stone arts and crafts
- Ceramic tiles
- Gemstone cutting
- Use and production of abrasive powders
- During cleaning and removing paint from ship hulls, stone buildings, metal bridges, and other metal surfaces (sandblasting)[3].

Exposure to silica dust may occur in unexpected or **unknown places.** Not all jobs with the risk of silicosis exposure have been identified. Any job that creates respirable dust from a crystalline silica-containing material, whether raw or manufactured, could place workers at risk of silica-related disease. Preventative action should be initiated before exposure occurs.

WHAT IS SILICOSIS?

Silicosis is one of the oldest occupational diseases, yet it still kills thousands of people worldwide each year. It is an incurable and irreversible lung disease caused by inhalationof dust containing respirable crystalline silica, characterized by scarring of the lung tissue in response to crystalline silica deposition. The global burden of silicosis is substantial. In fact, in 2000 an estimated 8,800 deaths and 486, 000 disability-adjusted life years were attributed to silicosis[4]. These figures do not include the burden from silica-related lung cancer or chronic obstructive lung disease[5].

- In the Brazilian state of Minas Gerais, more than 4500 workers with silicosis have been cumulatively reported. Silicosis had a 53.7 per cent prevalence rate among stone carvers crafting souvenir sculptures in Petropólis, Brazil [6]. It is estimated that in the formal sector there are 2 million Brazilians in contact with crystalline silica for more than 30% of their working time, corresponding to 5.6% of the workforce[7].
- In the USA, it is estimated that more than one million workers are occupationally exposed to free crystalline silica dust each year, some 59, 000 of whom will eventually develop silicosis[8].
- In Quebec, Canada, between 1988 and 1994 40 newly diagnosed workers were compensated for developing silicosis in the workplace. Twelve workers were less than 40 years old[8].
- The Colombian Government estimates that 1.8 million workers in the country are at risk of developing silicosis[8].
- In 2005, in Chile, it was found that there were 32 economic areas with silica exposure, and that 5.4% of the employed workforce is potentially exposed to this substance.[9]

OTHER CONCERNS

- Silicosis cases and deaths are greatly underreported;
- Lack of primary prevention measures such as controlling dust generation, release and spread of dust into the workplace, and lack of respiratory protection;
- Continuous reports of silica dust exposures in a variety of occupations and industries that are at least several times higher than standards in developed and developing countries;
- The association of silica exposure, silicosis and tuberculosis,
- Continuous reports of silicosis deaths in young workers in developing and developed countries[10,11, 12]
- Shortcomings in legislation and inspection for enforcement;
- Lack of resources allocated for the prevention of silica dust exposure.

HOW CAN SILICOSIS BE PREVENTED?

Alice Hamilton (1869-1970), a pioneer occupational physician and hygienist who conducted major studies on silicosis in the USA stated: "obviously the way to attack silicosis is to prevent the formation & escape of dust"[8].

Diagnosis and health surveillance are essential components of any silicosis elimination programme. Although medical and radiological examinations can only detect and not prevent silicosis, these are important complements to primary prevention. Surveillance should be considered a supplement for control strategies and never as a replacement for primary prevention.

GLOBAL RESPONSE

The International Labor Organization/World Health Organization (ILO/WHO) International Programme on the Global Elimination of Silicosis was launched in 1995 and calls for the elimination of silicosis worldwide by 2030[8]. It includes:

- formulation of national, regional and global action plans;
- mobilization of resources for the application of primary and secondary prevention;
- epidemiological surveillance;
- monitoring and evaluation of results; and
- strengthening required national capabilities and the establishment of national programmes.

The programme will depend heavily on cooperation between international organizations, industrialized and developing countries.

In light of the worldwide magnitude of occupational exposure to dust, the prevalence of silicosis and other occupational dust-related diseases, as well as an acute need for increased preventive action, WHO has initiated the Prevention and Control Exchange (PACE) initiative in developing countries. These training programmes aim to prevent and control dust exposure in the work environment.

As an initial step in the PACE initiative, WHO has prepared a basic document[13] addressing topics such as:

- characteristics of dust and its sources;
- problem recognition and evaluation;
- available technical and personal measures to prevent or control the generation, release and dissemination of dust in the workplace; and
- integration of control measures into effective and sustainable programmes.

AMERICAS ELIMINATION OF SILICOSIS INITIATIVE

In 2005, WHO, the Pan American Health Organization (PAHO), Chilean Ministry of Health and ILO requested that the National Institute for Occupational Safety and Health (NIOSH) provide capacity-building technical assistance to eliminate silicosis in the Americas. The Americas Silicosis Initiative was born as a partnership among WHO, PAHO, ILO, Chile, Brazil, and Peru. This initiative is the first regional approach to mitigate silicosis and is based upon sharing expertise to benefit workers and communities of many countries[12].

In 2007, the Peruvian National Institute of Health/National Center for Occupational Health and Environmental Protection (CENSOPAS) asked NIOSH for training to measure occupational exposure to heavy metals (e.g. lead, cadmium, arsenic, selenium) and crystalline silica, control banding and to describe the adverse health effects of crystalline silica exposure. A NIOSH team of experts provided a comprehensive 40-hour technical short course at CENSOPAS. In 2009 the ILO organized with CENSOPAS and an international team of experts, a training for improving chest X-Ray reading skills of Peruvian physicians. In 2009 Chile launched the National Plan for the Elimination of Silicosis.

FUTURE DIRECTIONS

The Americas Elimination of Silicosis Initiative has been very successful in the countries in which it was implemented, as trained professionals continue to characterize, prevent and control exposure to crystalline silica in the workplace. With the cooperation of the various Ministries, adapting and scaling this initiative to other countries in the region will broadly enhance workers' health while meeting the global silicosis elimination target.

REFERENCES

1. *Occupational Health Clinics for Ontario Workers Inc., Silica.*

2. *International Agency for Research on Cancer (IARC) Vol. 100, A review of human carcinogens. [forthcoming]*

3. *National Institute for Occupational Safety and Health (NIOSH) & United States Department of Labor, A Guide to Working Safely with Silica.* http://www.cdc.gov/niosh/pdfs/silicax.pdf

4. *Driscoll T, Nelson DI, Steenland K, Leigh J, Concha-Barrientos M, Fingerhut M, Prüss-Üstün A [2005a]. The global burden of non-malignant respiratory disease due to occupational airborne exposures. Am J Ind Med 48:432-445.*

5. *Driscoll T, Nelson DI, Steenland K, Leigh J, Concha-Barrientos M, Fingerhut M, Prüss-Üstün A [2005b]. The global burden of disease due to occupational carcinogens. Am J Ind Med 48:419-431.*

6. *Antão VCS, Pinheiro GA, Kavakama J, Terra-Filho M [2004]. High prevalence of silicosis among stone carvers in Brazil. Am J Ind Med 45(2):194-201.*

7. *Algranti E, Handar Z; Ribeiro FSN; Bon AMT; Santoa AM; Bedrikow B. Exposición a Sílice y Silicosis en Brasil (PNES). Cien Trab. 2004 Ene-Mar; 6 (11):1-13*

8. *World Health Organization (WHO) 2000, Fact Sheet No. 238: Silicosis, WHO, Geneva, http://www.who.int/mediacentre/factsheets/fs238/en/*

9. *Alcaíno Lara, Juan; Estudio de la Exposición a la Sílice, Chile 2004-2005, Instituto de Salud Pública de Chile.*

10. *CDC (Centers for Disease Control and Prevention) [2008]. Silicosis-related years of potential life lost before age 65 years—United States, 1968—2005. MMWR 57(28):771-775. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5728a3.htm Accessed 28 July 2008.*

11. *Mazurek JM, Attfield MD [2008]. Silicosis mortality among young adults in the United States, 1968—2004. Am J Ind Med 51:568-578.*

12. *Lioce-Mata M, Rice F, Sussell A [2008]. Case study—the Americas Silicosis Initiative. World Health Organization (WHO) Collaborating Centers Case Studies page www.who.int/collaboratingcen- tres/casestudies/en/index8.html Accessed 28 July 2008.*

13. *Prevention and control exchange (PACE): hazard prevention and control in the work environment. Airborne Dust Geneva; OMS; dic. 1999. [220] p*