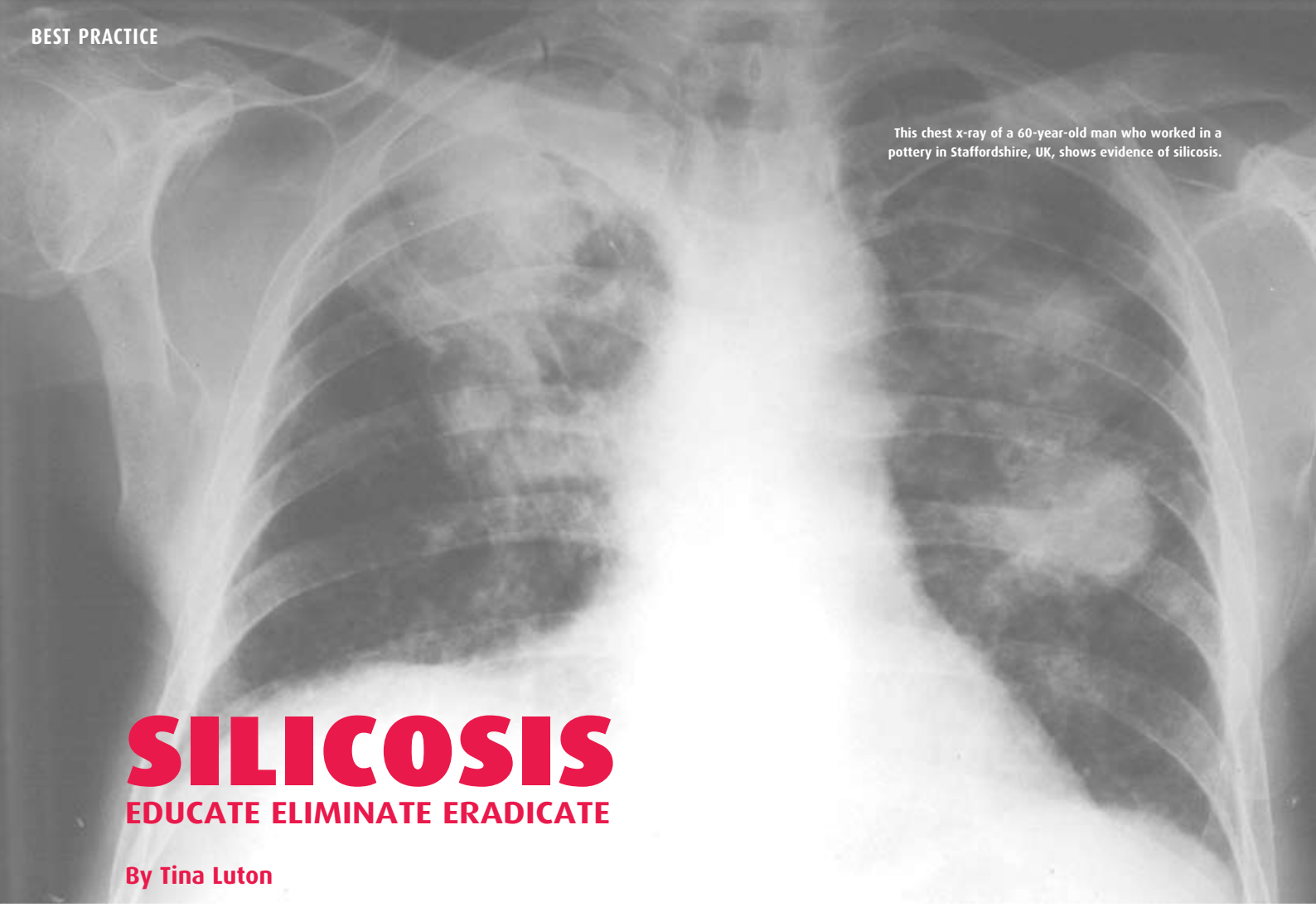

This chest x-ray of a 60-year-old man who worked in a pottery in Staffordshire, UK, shows evidence of silicosis.

SILICOSIS

EDUCATE ELIMINATE ERADICATE

By Tina Luton

Silicosis is one of the oldest occupational diseases known to man. Recognised since ancient times, this incurable lung disease caused by inhalation of dust containing free crystalline silica, is irreversible and the disease progresses even when exposure stops. Silicosis is preventable. However, it continues to pose a very real threat to some people on a daily basis and still kills thousands around the world every year.

Crystalline silica, or silicon dioxide (SiO2), is the basic component of sand, quartz and granite rock. The three most common forms of crystalline silica encountered in industry are quartz, tridymite, and cristobalite. Silica is also found in sandstone, flint, slate and many common building materials including clay bricks, concrete, mortar and tiles.

Silica causes disease when workers breathe in tiny silica particles released into the air with the dust created by cutting, grinding, drilling or blasting rocks. The particles are so small they can only be seen with a microscope, but they are so light that they can remain airborne for a long time. Silica can therefore travel long distances in the air and affect populations not otherwise considered to be at risk.

To put this into context, the eruption of Mount St Helens back in the 1980s would have exposed thousands of people to silica and silica-related respiratory injuries through the inhalation of tridymite or cristobalite in the dust that followed the explosions. Likewise, the collapse of the World Trade Centre in 2001 exposed thousands of people to air-borne silica from the enormous clouds of quartz-laced concrete dust that spewed forth when the twin towers came crashing down. Experts believe that the numbers exposed could easily reach into the millions when you think of the people that directly inhaled the dust during emergency response and evacuation, during the post-collapse demolition, and through contaminated ventilation systems of buildings in the lower Manhattan area.

THE EFFECTS OF SILICA DUST

In 1996 the International Agency for Research on Cancer (IARC) classified crystalline silica dust as a Group 1 human lung carcinogen.

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 the disease are also at greater risk of developing lung cancer.

Workers can be exposed to silica containing dusts while working on highway construction, loading, dumping and hauling or crushing rocks, cutting or grinding or chipping stone, demolition or concrete or masonry structures. Work in mines, quarries, foundries, and construction sites, in the manufacture of glass, ceramics, and abrasive powders, and in masonry workshops is particularly risky. Sandblasting is one of the highest risk operations.

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)

GLOBAL CAMPAIGN TO ELIMINATE SILICOSIS

Some people believe silicosis is now not a problem while others argue that it is the new asbestosis.

In 1995, International Labour Organisation (ILO) and the World Health Organisation (WHO) launched the Global Campaign on Elimination of Silicosis. The program aims at the global reduction of silicosis by 2015 and its elimination worldwide as an occupational health problem by the year 2030.

Leading specialists from the US, Canada, UK, France, Germany and Japan have been involved in the implementation of the program, which has run extensive training seminars in Brazil, India, Mexico, Morocco, Tunisia, Ukraine, Peru, Turkey, Venezuela, Thailand, Vietnam and Indonesia. Each country develops its own national silicosis elimination program to organise their efforts in a systematic way. To date, Brazil, China, India, Chile, Vietnam, Thailand and South Africa have established national programs, with 22 countries showing strong interest in taking part.

Top: A report commissioned by the India Committee of the Netherlands claims that the stone quarrying and processing industry in India is largely informal and hazardous working conditions are common. (Photo courtesy of Marjolein Stoop) Above: Tiny, deadly silica particles are released into the air with the dust created by cutting, grinding, drilling or blasting rocks.

Top: A woman hammers granite stones into small rocks in a quarry outside Bangalore. Below: Boys in the village of Budhpura in India's Bundi district pose by sandstone cobbles.

Exposure to crystalline silica dust has been under investigation and control in Australia for more than a century. In 1905, investigation of the hard rock mining industry in Western Australia was carried out. In 1914 a Royal Commission was appointed to investigate safety issues in Broken Hill mines, while surveillance by the NSW Silicosis Board (now the Dust Diseases Board) and NSW Health Department resulted in the investigation and control for Sydney sandstone workers. Regulations to control dust disease were enacted in Western Australia and New South Wales by the 1920s.

The Dust Diseases Board provides information on the proportion of compensation payments made for all lung diseases, including asbestosis and silicosis. According to figures released in the board's *Making a Difference Annual Report 2004/2005*, there have been 435 deaths from silicosis since 1968.

Under the NSW dust diseases scheme, compensation payments were made to 188 Australian workers and 276 dependants during 2004–05 for silicosis. The proportion of compensation payments made by the board for silicosis lung cancer accounted for 8 per cent of the dust-related lung cancers compensated by the board from 1994 to 2005.

AUSTRALIAN EXPOSURE STANDARD

An exposure standard was set for silica in 1983–84 with the National Health and Medical Research Council (NHMRC) recommending exposure standards specifically for quartz (0.2 mg/m3), cristobalite (0.1 mg/m3) and tridymite (0.1 mg/m3). In 1988 the exposure standard was reconsidered and a reduction to 0.1 mg/m3 for respirable fraction of quartz, silica (fused) and tripoli and 0.5 mg/m3 for cristobalite and tridymite was recommended. Following public comment, it was agreed that further examination of the issue was warranted. Between 1988 and 1996 no formal national exposure standard for crystalline silica existed although some mining and OH&S authorities issued their own. From 1996, the National Occupational Health and Safety Commission (NOHSC) reinstated the original NHMRC exposure standard.

On 1 January 2005, a revised national exposure standard of 0.1 mg/m3 for quartz, cristobalite and tridymite came into effect.

While regulations appear to have had an impact on silica-related disease, NOHSC has noted that "due to a long lag time between exposure and symptoms, it is difficult to ascertain how many people develop silica-related conditions, and when the causative exposure occurred".

In 1993, a review by the NOHSC of the state-by-state silicosis records indicated that there were probably less than 20–30 new cases per year and the generality was that these cases arose from uncontrolled exposure situations (that is, industries and occupations where there was minimal or negligible adherence to the legislative exposure standard and control requirements).

Reviews of data on new cases of silicosis from the mining industry have also indicated that the incidence of silicosis has fallen. In Western Australia, for example, there were only three cases where the person had commenced employment after 1968 and none after 1994.

The Australian Institute of Occupational Hygienists (AIOH) commented that a review of the statistics commissioned by Worksafe Australia in 2004 substantiated the small number of new cases of silicosis arising from Australian industries.

It was therefore concluded that the absence of cases corresponds to the implantation of the respirable crystalline silica exposure standard and to the educational programs and safety management of companies, and that when the cases still arising as a legacy of the past have all been accounted for, new incidences of the disease will have been virtually eradicated.

Other countries are not so well off.

STATISTICS AROUND THE WORLD

Lung diseases are the most frequent occupational diseases in China. Between 1991 and 1995, China recorded more than 500 000 cases of silicosis, with around 6000 new cases and more than 24,000 deaths occurring each year, mostly among older workers.

In India, a prevalence of 55 per cent was found in one group of workers – many of them very young – engaged in the quarrying of shale sedimentary rock and subsequent work in small, poorly ventilated sheds.

In Brazil, in the state of Minas Gerais alone, more than 4500 workers have been diagnosed with silicosis. In drought-affected regions in the north-east of the country the hand-digging of wells through layers of rock with very high quartz content (97 per cent), an activity that generates great quantities of dust in confined spaces, resulted in a prevalence of 26 per cent of silicosis, with many cases of accelerated forms. The state of Rio de Janeiro banned sandblasting after a quarter of shipyard workers were found to have silicosis.

Results from an International Social Security Association survey conducted in 2003 show that the main challenge in Rwanda with regard to occupational diseases is silicosis. The disease affects 37 per cent of

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miners in Latin America. The Colombian Government estimates that 1.8 million workers in the country are at risk of developing the disease.

Closer to home, the National Institute of Occupational Safety and Health (NIOSH) estimates that more than 1.7 million workers in the US are exposed to free crystalline silica dusts on a daily basis. More than 100 000 of these are sandblasters. The US Department of Labour (DOL) estimates that 300 people die each year from silica-related disease, but the true number is not known.

DISEASE DETECTION AND DUST CONTROL

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

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

The only effective protection against silicosis is to prevent silica dust in the air.

Under Occupational Safety and Health legislation employers in all Australian states and territories must take measures to ensure that workers are not exposed to silica dust.

There a number of simple control measures that can be taken.

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

Do not use silica-containing materials for abrasive blasting. Use other products that contain glass beads, pumice, steel grit, or walnut shells.

Tools causing dust, such as 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 should be in place with hoses as close as possible to the head of cutting tools.

Tools such as power saws, jack picks and scabbling picks should be fitted with a water attachment to suppress dust. Spraying with water during processes such as grinding or drilling can reduce the amount of dust by as much as 75 per cent.

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. Under no circumstances should dry sweeping take place in areas where silica dust could be present.

Work clothing should be vacuumed before removal. Ideally, shower and change before leaving the work site and do not take contaminated clothes home. Do not eat, drink, or smoke near dusty areas, and always wash up before eating, drinking or smoking to remove any lingering dust.

Respiratory Protective Equipment should be looked at as a last resort when all other preventative solutions 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. 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.

Conduct regular air-monitoring to measure silica levels in the work area. Dust levels in the air should be monitored by a competent person. However, exposure levels in settings such as construction sites are highly variable and air sampling alone is not enough to indicate the health risks from airborne silica dust.

CORPORATE SOCIAL RESPONSIBILITY

In December 2006, the US Department of Labour's Occupational Safety and Health Administration (OSHA) formed an alliance with the New England Concrete Masonry Association (NECMA) and the Massachusetts Division of Occupational Safety's Consultation Program (MDOS-CP) and launched an outreach and enforcement effort aimed at preventing and reducing injuries, illnesses and fatalities among workers in New England's cut stone products industries.

The program focuses on workplaces that cut, shape, finish, handle or distribute concrete, granite, marble and other natural or engineered stone or stone products. The industry, which is primarily made up of smaller employers, has grown rapidly in the past few years, prompted by an increased demand for countertops and other stone products. At the same time, fatality and injury rates among its workers have increased.

Hazards to which industry workers can be exposed are amputation hazards from unguarded machinery; musculoskeletal injuries from using pneumatic tools; hearing loss from noise overexposures; crushing by improperly stored or handled stone slabs – six workers in New England have died since August 2004, five of them crushed by stone

slabs – silicosis and other lung diseases from exposure to airborne concentrations of silica caused by grinding and cutting.

"The need for direct intervention is clear," said Marthe Kent, OSHA's New England regional administrator. "This program seeks to persuade employers to take effective steps to address hazards before they harm workers and focus appropriate enforcement action toward those employers who do nothing."

On the other side of the globe, a Dutch report From Quarry to Graveyard' released in September 2006 looks at the corporate social responsibility (CSR) in the natural stone sector in the Netherlands and aims to address social and environmental issues in the supply chain.

Commissioned by the India Committee of the Netherlands in collaboration with sustainable development group CREM and the Centre for Research on Multinational Corporations (SOMO), the report focuses on the labour, social, environmental and economic issues in the quarrying, processing and trade of natural stone from developing countries, in particular India, where – according to the report – the stone quarrying and processing industry is largely informal and hazardous working conditions are common.

In granite, marble and sandstone quarries, workers – allegedly almost 20 per cent of which are children, some as young as six – are exposed to a high incidence of fatal occupational diseases such as silicosis and tuberculosis. These diseases are also common in non-mechanised processing plants. The most basic safety provisions, such as dust masks, protective shoes and gloves, are usually absent.

India has the largest number of non-school going children workers in the world. Despite the country's constitution prohibiting the employment of children below the age of 14 years in factories, mines or hazardous occupations, a 2005 report commissioned by the India Committee of the Netherlands and entitled *Budhpura: Ground Zero – Sandstone Quarrying in India,* estimates that out of the 100,000 quarry workers in the Bundi district, roughly 15,000 to 20,000 are children. There are an estimated 8000 child labourers involved in making cobbles in the village of Budhpura alone.

According to the Department of Mines and Geology of the Government of Rajasthan there are 74 quarries in Budhpura but the real figure is allegedly much higher due to illegal quarrying. In Rajasthan there are an estimated 1100 marble slab manufacturing units, making up 90 per cent of the total marble slabs produced in India.

Natural stone companies and trade organisations in the Netherlands are increasingly aware of the concept of CSR and some, including natural stone wholesaler Oprey & Beisterveld, paving specialist Feikema, and the General Dutch Alliance for Natural Stone, are participating in the Working Group on Sustainable Natural Stone, which aims to develop and implement viable mechanisms to clean up the international supply chain of natural stone.

At present, public policy is primarily occupied with issues related to the social and environmental impact of the use of natural stone in the Netherlands, however, government policy on sustainable purchasing of natural stone will be implemented by 2010.

CSR awareness is also being raised in the UK, where 10 per cent of the decorative paving market is currently made up of sandstone exported from Rajasthan.

ETHICAL TRADING

Marshalls, a leading manufacturer of natural stone and hard landscaping products, and presently the only company in the hard landscaping industry to belong to the Ethical Trading Initiative (ETI), a diverse alliance of retailers and brands, trade unions and non-government organisations working collectively to tackle the complex

questions posed by ethical trade, has adopted the ETI base code at Stoneshippers India, its sole supplier in Rajasthan.

Stoneshippers India has been independently audited to ensure that quarry workers and their communities receive a fair deal under the ETI base code, which includes the principles that child labour should not be used, no-one should be forced to work, working conditions should be safe and healthy, wages should be enough to live on and workers should be treated equally.

On 4 February 2007, Marshall's also pledged to fund the work of Hadoti Hast Shilp Sansthan (HHSS), a non-government organisation helping to transform the lives of poor migrant workers in remote areas of India.

As well as delivering basics such as clean drinking water, medical facilities, shelters and nurseries, HHSS focuses on education, training and employment and helps rural people to implement sustainable development. Funding from Marshalls will be used to help improve the lives of families working in the quarries around Bhundi and Kota by providing doctors, medicines, equipment, and regular health check-ups to help diagnose silicosis and treat diseases such as tuberculosis.

Group marketing director Chris Harrop decided to offer Marshalls' support after a trip to India in December 2006, when he witnessed first hand the terrible working and living conditions in many of the illegal quarries in Rajasthan.

"The exploitation of child labour, bonded labour and migrant labour are all very serious issues for the sandstone industry. Unlike other hard landscaping manufacturers, all our imported sandstone is ethically sourced from independently audited sources. But other purchasers for the UK market are not so careful. So we're also helping to address the roots of social injustice in Rajasthan by supporting the valuable work of HHSS," he said.

Spraying with water during processes such as cutting, grinding or drilling rock can reduce the amount of silica dust by as much as 75 per cent.

While health, safety and social issues continue to exist within the natural stone industries around the globe, it is increasingly evident that individual companies, corporations and government and non-government organisations are taking positive steps to stamp out unacceptable work practices.

When it comes to silicosis, education and training are key. Ensuring that workers are aware of the dangers of breathing in silica dust and by providing them with the correct equipment, protective gear and properly ventilated working environments, the worldwide elimination of silicosis as an occupational health problem by the year 2030 is achievable.

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