

Occupational Lung Health: A global problem requiring local awareness

This inaugural Occupational Lung Health special issue of *Respirology* highlights the importance of a healthy work environment and the often severe consequences to workers when occupational hazards are not identified and controlled. This issue provides detailed reviews of one of the earliest recognized occupational lung diseases which continues to be a major global public health issue (silicosis),¹ a disease that is common but poorly recognized (occupational chronic obstructive pulmonary disease)² and the most recent major risk to workers' respiratory health (the COVID-19 pandemic).³

In the field of respiratory medicine, we witness the effects of hazardous exposures on our patients' respiratory health on a daily basis. Most evident is smoking-related lung disease. Respiratory specialists have long been at the forefront of developing a strong evidence base proving the harm of tobacco and have effectively campaigned for strong tobacco control policies.⁴ The hazardous nature of occupational exposures however are often not clear. For example, many may not appreciate that due to flour dust exposure, from a respiratory point of view, bakeries are one of the most hazardous workplaces.⁵ Respiratory specialists have an important role in identifying the associations between exposures and respiratory disease, and drawing attention to failures in hazard control measures.

No person should develop lung disease from going to work, no matter where in the world they live and no matter their level of income. Too frequently, due to competing interests of business profits and the cost associated with implementing effective hazard control measures, workers lose out. This is particularly so in low-income countries where social supports may be limited and an individual's need to financially support a family is often a much higher personal priority than their own health, thereby accepting work in a hazardous job. The duty of employers to provide a safe environment is at the core of Occupational Health and Safety laws around the world. Governments must be more proactive in enforcing these laws, rather than overly focus on supporting short-term interests of business success and profitability.

In low-income countries, the effects of adverse workplace conditions are much more of a daily issue faced by clinicians and their patients than in middle- and high-income countries, where often these concerns are out of mind. Two occupational diseases highlighted in this issue of *Respirology* demonstrate that no country is immune to inadequate control of occupational hazards: the impact of COVID-19 on healthcare workers

(HCW) and a surge in cases of silicosis caused by the production of fashionable artificial stone (AS) kitchen benchtops.^{1,3}

Smallwood et al. present a comprehensive review of *COVID-19 infection and the broader impacts of the pandemic on healthcare workers*, the first new global occupational disease in decades.³ The pandemic has had a major impact on HCWs who have tirelessly provided care for patients with COVID-19 throughout the pandemic. Countless HCWs have acquired COVID-19 through workplace exposures, and thousands have died or are experiencing long-term adverse health effects from the virus. The last 2 years have starkly highlighted the lack of pandemic preparedness of governments and their healthcare systems.

Response to the pandemic has forced governments and employers to rapidly increase their understanding of occupational hazard control measures. Smallwood et al. provide an excellent reminder that a face mask (or respirator) is not the sole means of providing protection to workers, and in fact it is one of the least effective available measures. The review details the 'hierarchy of control measures': elimination, substitution, engineering controls, administrative controls and the most used but least effective, personal protective equipment (PPE), at the very bottom.

In this issue, Landry et al. contribute to the evidence regarding the deficiencies of PPE.⁶ Virus-laden aerosols can travel large distances and remain airborne for prolonged periods. The study is the first to explore the interaction between air purification systems and PPE in protecting against virus aerosol. The study demonstrates that widely used PPE provides incomplete protection from prolonged exposure to virus-laden aerosols, and that skin contamination was greatest on the face, beneath a non-fit-tested N95 respirator.

Smallwood et al. and a study by Hore-Lacy et al. highlight that the effects of respiratory hazards go well beyond respiratory system, in particular the profound impact on mental health.^{3,7} Hore-Lacy et al. investigated the mental health of workers from the AS benchtop industry at risk of silicosis, noting higher levels of stress in workers experiencing dyspnoea.

Occupational silica dust exposure is one of the earliest described causes of lung disease, yet millions of workers continue to be exposed. Recently, over 20,000 incident cases of silicosis have been identified per year, a number that is likely to be a vast underestimation.⁸ Although silicosis has re-emerged in some high-income countries related to high silica content AS, the review *Current global perspectives on*

silicosis demonstrates that this occupational disease has never gone away and global elimination efforts have fallen far short of expectations.¹ As is often the case with occupational health and safety, insecure workers, immigrants and workers in small businesses are at particular risk.

AS silicosis is a newly described, more progressive form of silicosis that has increased attention and research into this disease, particularly from countries where major outbreaks have been reported.^{9–11} Two studies in this issue further increase our understanding of AS silicosis and are a step towards understanding silicosis using modern research techniques.

Apte et al. investigate alveolar silica crystal burden in bronchoalveolar lavage (BAL) fluid from patients with AS silicosis.¹² Crystal burden was positively correlated with years of silica exposure and with a decline in diffusing capacity of the lungs. Apte et al. note a correlation between crystal burden and the rate of decline in lung function in patients with AS silicosis.

Aloe et al. investigate iron-related markers in AS silicosis patients.¹³ The study identified that local lung ferritin levels in the BAL fluid were significantly increased in both simple and complicated silicosis, and positively correlated with circulating serum ferritin levels. The researchers propose that dysfunctional lung macrophages produce excessive levels of ferritin in response to iron-loaded silica exposure, and ferritin spills over into the lung vasculature to increase serum ferritin levels. BAL macrophages were also noted to be morphologically abnormal, being enlarged and vacuolated, with a foam cell-like appearance attributed to lipid loading.

The impact of uncontrolled hazardous occupational exposure on respiratory health remains a major public health challenge worldwide. Despite countries worldwide dealing with similar issues related to many hazards, there is an absence of a sustained global public health response, with the most vulnerable workers suffering as a result. As respiratory specialists, we must continue to identify occupational causes of lung disease, support research and advocate to our governments the need for enforcement of effective control measures to prevent workers from developing occupational respiratory diseases.

CONFLICT OF INTEREST

None declared.

KEYWORDS

occupational health, preventive medicine, silicosis

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