

# Review of Health Effects Associated with Exposure to Inhalable Coal Dust

## Researchers

The two researchers were:

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## Aims

The main aims were to:

- Determine what (if any) are the adverse health effects known to arise from exposure to inhalable coal dust;
- If no effects are reported in the literature with respect to inhalable coal dust, determine whether there are any comparisons that can be made to other inhalable dusts; and,
- If possible, determine a suitable workplace exposure standard for inhalable coal dust and establish the degree of protection it provides for specific health outcomes.

## Background

Air monitoring in coal mines has typically focussed on respirable dust, due to the well-documented relationship between respirable dust levels and disease conditions such as coal worker's pneumoconiosis. However, recent monitoring at 3 underground mines in NSW has shown that workers are exposed to elevated levels of inhalable coal dust.

Although the health consequences of exposure to high levels of airborne inhalable coal dust are not well understood, the NSW Department of Mineral Resources is proposing to introduce a workplace exposure standard of 10 mg/m<sup>3</sup>. This paper also examines whether there is a clear basis for this.

The authors conducted a literature review sourcing primary and secondary research papers. The authors also contacted certain prominent researchers in this field.

The health effects of respirable coal dust are well known (CWP, silicosis, emphysema, PMF). However, the effects of inhalable coal dust have not been well researched. The authors divided the possible effects into the upper airways and extra-thoracic region and the effects in the thoracic region separately.

## Project Outcomes

- In relation to the extra-thoracic region, the authors found limited reports of cancer in the upper airways (larynx, pharynx, buccal cavity). However, these reports were few in number with no significant research identifying a causal relationship.
- A greater body of research assessed the possible relationship between coal mining and gastric cancer. Most studies considered coal mining as an occupation, with only a small number of papers assessing the relationship with exposure to coal dust. There was inconsistent evidence of an association with coal mining, but no conclusive evidence of a dose-response relationship with respirable, or inhalable coal dust. Although it is biologically plausible that coal dust exposure could result in gastric cancer, the relationship could be explained by a number of lifestyle and other confounding factors.
- The authors agree with the IARC determination that there is insufficient evidence to classify coal dust as a carcinogen. Well-designed cohort studies carried out on NSW coal miners have not shown an excess of cancers.
- In relation to the thoracic region, the potential of inhalable coal dust to cause COPD and chronic bronchitis was assessed. Although there is convincing evidence of an association between respirable coal dust and COPD and chronic bronchitis, no

research directly assessing inhalable coal and health outcomes was found.

- The authors examined the research assessing the relationship between respirable dust and inhalable dust exposures. There was reasonable evidence of a correlation between the two metrics in the published research, although the studies have not been replicated by any Australian researchers.
- The authors examined data from over 400 paired respirable and inhalable coal dust samples at 3 NSW collieries and 2 coal processing plants. No correlation was observed between the samples suggesting different conditions may exist in Australian mines and the authors suggest further particle size analysis should be conducted. Further data provided by CSPL was broadly supportive of the data supplied by McFadden.
- The authors also considered whether comparisons could be made to any other inhalable dusts. It was concluded that as coal has such unique physico-chemical properties, no such comparisons could be made.
- By way of comment on an inhalable dust standard, the authors examined the basis for the current proposed standard of 10 mg/m<sup>3</sup>. This standard was developed some 30 years ago, primarily to reduce the effects of reduced visibility in the workplace, eye and nose irritation and was set at this level as it was considered reasonably achievable by industry. Subsequent changes in sampling methodologies for inhalable dust led to an effective 3-fold reduction in the inhalable dust limit in real terms.
- On the basis that there was no research assessing inhalable dust, the authors are unable to suggest a suitable health based standard. The authors are aware that ongoing health surveillance is conducted on NSW coal miners and suggest that prior to the implementation of any standard, an epidemiological study is conducted (if feasible) using inhalable dust levels.
- The authors suggest, however, without a suitable exposure standard adverse health

outcomes will be observed including eye, nose and upper airway irritation and chronic bronchitis. There also remains a potential for the development of chronic obstructive airways disease in some workgroups even where there are controlled levels of respirable dust.

- After considering Coal Services' data, which indicate that mean levels of respirable coal dust are 1.51 mg/m<sup>3</sup> and that particulate respirators are frequently used by coal miners, a suitable time frame for the application of any inhalable dust standard would be several years; a period of 5 years is suggested. It would also be likely that the NSW coal mining industry would find it difficult to meet the recommended standard of 10 mg/m<sup>3</sup>, if imposed immediately.
- Based upon these findings, the authors have made recommendations for further work. It is recommended that:
  - Further sampling of inhalable dust should be carried out;
  - Particle size distributions should be characterised;
  - The incidence and prevalence of COPD and upper airways disorders in NSW coal miners should be monitored for possible correlation with inhalable dust levels; and,
  - There should be a phasing in period of 5 years allowed for the implementation of a legally enforceable exposure standard of 10 mg/m<sup>3</sup>. In the meantime, this figure should be regarded as a Best Practice Guideline.

#### **Further Information**

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