

1 June 2023

## **Safe Work Australia**

### **Consultation on a proposed workplace exposure standard for diesel particulate matter**

#### **Submission from Cancer Council Australia, Occupational & Environmental Cancer Committee**

Cancer Council Australia is the nation's peak non-government cancer control organisation. Cancer Council's Occupational and Environmental Cancer Committee (the Committee) includes members with national standing in relevant disciplines including epidemiology, molecular biology, occupational health, occupational hygiene, clinical oncology, and public health. Comments from the Committee form the basis of this submission and their contribution is acknowledged. Cancer Council Australia welcomes the opportunity to provide comment on Safe Work Australia's *Consultation on a proposed workplace exposure standard for diesel particulate matter*.

Submission endorsed by:

Professor Tanya Buchanan, Chief Executive Officer, Cancer Council Australia

Professor Tim Driscoll, Chair, Cancer Council's Occupational and Environmental Cancer Committee

Submission contact:

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## **GENERAL COMMENTS**

Cancer Council commends Safe Work Australia for undertaking work to progress the implementation of a workplace exposure standard (WES) for diesel engine exhaust (DEE) and commissioning SLR Consulting Australia Pty Ltd to review the available literature to determine the potential for a DEE WES and prepare the Research Report.

We strongly support the implementation of a health-based WES for diesel particulate matter (DPM), as measured by respirable elemental carbon (REC), to be adopted across all Australian jurisdictions and applied to all relevant industries.

Cancer Council believes that exposure to DEE should be reduced to as low as reasonably practicable to protect workers and minimise their risk of developing DEE-related lung disease. As per our mission, our interest is in reducing the incidence of lung cancer.

The International Agency for Research on Cancer (IARC) provides the most authoritative information available worldwide about chemicals suspected of causing cancer in humans; the most recent evaluation published in 2014 determined that DEE is carcinogenic to humans (Group 1) and causes lung cancer. Positive associations have also been observed between DEE and bladder cancer.<sup>1</sup>

DEE is listed as one of the 38 priority carcinogens relevant to working conditions in Australia.<sup>2</sup> DEE is the second most common carcinogen workers are exposed to in Australia, with an estimated 1.2 million Australian workers exposed to DEE in 2011.<sup>3</sup> The study by Carey and co-workers<sup>4</sup> estimated that in 2011 about 29% of male workers and 6% of female workers in Australia were occupationally exposed to DEE. Moreover, among the cohort of workers occupationally exposed to DEE in 2012, an estimated 4450 lung cancer cases and 600 bladder cancer cases will develop over the lifetime of the cohort that are thought to be attributable to DEE.<sup>5</sup> Each year, approximately 130 Australians are diagnosed with lung cancer caused by work-related exposure to DEE.<sup>6</sup> Therefore, DEE is an important exposure in the Australian workplace and needs appropriate control.

Cancer Council is concerned that Australia currently does not have a WES for DEE that is implemented in all jurisdictions, across all relevant industries, and protects workers against the risk of lung cancer. Currently, the mining industry in Queensland, Western Australia, and New South Wales, have implemented a WES for DPM of 100  $\mu\text{g}/\text{m}^3$  (0.1  $\text{mg}/\text{m}^3$ ) of air, 8-hour TWA, measured as sub-micron elemental carbon. However, this standard is not a health-based standard and results in an unacceptably high risk to exposed workers.

We acknowledge that the proposed WES of 15  $\mu\text{g REC}/\text{m}^3$  for DPM would be a vast improvement on the 'de facto exposure level' for DEE of 100  $\mu\text{g}/\text{m}^3$  (0.1  $\text{mg}/\text{m}^3$ ). We note the point made in the Research Report that "*A number of approaches for establishing a health-based 8-hour time-weighted average (TWA) for DPM have been explored. They included derivation using data from controlled human exposure studies and derivation using data from experimental studies in rats. The resulting candidate WES values are for REC in the range of 7.5- 25  $\mu\text{g REC}/\text{m}^3$ .*" (p. 4) and that "*An 8-hour TWA of 15  $\mu\text{g REC}/\text{m}^3$  for DPM as respirable elemental carbon is recommended to be applied.*" (p. 5). Although 15  $\mu\text{g REC}/\text{m}^3$  is "*at the low end of the range of approximate epidemiological exposure estimates that have been associated with an increased risk of lung cancer (8-67  $\mu\text{g REC}/\text{m}^3$ )*" (p. 4), Cancer Council Australia believe there should be stricter application of the evidence and therefore **recommend a health-based WES of 10  $\mu\text{g REC}/\text{m}^3$  TWA.**

The WES for DPM should be set as low as reasonably practicable and at a level that appropriately protects the health of workers. The level must also be measurable. We recommend 0.10  $\text{mg}/\text{m}^3$  as a health-based standard because it meets these requirements.

#### 1) Health considerations

- Work by Vermeulen and co-workers<sup>7</sup> provides good evidence that the current 'working limit' of 100  $\mu\text{g REC}/\text{m}^3$  (0.1  $\text{mg}/\text{m}^3$ ) implemented in some Australian jurisdictions is much too high and results in an unacceptable risk to exposed workers. Based on their work, a strong argument can be made to have an exposure level of 10  $\mu\text{g REC}/\text{m}^3$  (0.01  $\text{mg}/\text{m}^3$ ) or lower and a strict application of their work would suggest 1  $\mu\text{g REC}/\text{m}^3$  (0.001  $\text{mg}/\text{m}^3$ ) would be more appropriate.
- The authors looked at excess lifetime risk of lung cancer from DEE exposure at a range of exposure levels, assuming working lifetime exposures (45 years - from age 20 to age 65 years). Typically, in risk assessment, maximum exposure levels are set so the excess risk for workers would be no more than about one death in 1,000. Their study estimated

that at 25 µg REC/m<sup>3</sup> (0.025 mg/m<sup>3</sup>), there would be an extra 69 lung cancer deaths per 1,000 workers. At 10 µg REC/m<sup>3</sup> (0.01 mg/m<sup>3</sup>), the estimate was 20 deaths per 1,000 workers, and at 1 µg REC/m<sup>3</sup> (0.001 mg/m<sup>3</sup>) there would be an extra 1.7 deaths per 1,000 workers.<sup>7</sup> There has been criticism of aspects of the study<sup>8</sup> but sensitivity analyses and subsequent review and analysis of the study data strongly support these estimates.<sup>9,10</sup>

- The WES proposed by Cancer Council is consistent with these results and consistent with the level adopted by the Health Council of the Netherlands (HCOTN).<sup>11</sup>
- A second study by Vermeulen and co-workers published in 2022 estimated the lifetime risk of DEE-related lung cancer with regulatory limits of 50 µg REC/m<sup>3</sup> and 10 µg REC/m<sup>3</sup>. They estimated that these limits would reduce the excess lifetime risk of lung cancer by 21% and 51%, respectively, in comparison to a limit of 1 µg REC/m<sup>3</sup>, which would reduce the excess lifetime risk by 93%.<sup>12</sup>
- In work for the National Research Centre for the Working Environment in Denmark, Saber et al evaluated the relevant literature on DEE from both epidemiological and animal inhalation studies and estimated the exposure levels that would result in excess lung cancer risks of 1:1000, 1:10 000, and 1:100 000 using these two different approaches. The authors recommended the approach using the epidemiological data to derive a health-based WES because this approach relied on data from humans. Based on the meta-analysis of epidemiological studies by Vermeulen et al<sup>7</sup>, the authors reported that the expected excess lung cancer risk was 1:1000 at 0.45 µg/m<sup>3</sup>, 1:10 000 at 0.05 µg/m<sup>3</sup> and 1:100 000 at 0.005 µg/m<sup>3</sup> diesel exhaust particles calculated as elemental carbon.<sup>13</sup>

2) The proposed level should be achievable in workplaces – many workplaces already work to levels well below this.

3) DEE levels, monitored using elemental carbon, can be accurately and reliably measured at levels well below the WES proposed by Cancer Council.<sup>14</sup>

We strongly support the recommendation that such a standard is applied to DPM from both new technology diesel engines (NTDE) and traditional diesel engines (TDE). Whether and to what extent the health risks may be different for modern diesel engines, compared to new engines, is not known. Data to help resolve this uncertainty are not likely to be available for a number of years. In addition, older diesel engines are likely to continue to be used for several decades to come. We note that the level of DEE measured is the level at which workers are exposed, regardless of whether it comes from a new or old engine. Exposure to DEE causes lung cancer. Therefore, it is not appropriate to wait until additional data are available before setting a WES.

We strongly support the recommendation that *“the candidate WES for DPM be applied in conjunction with appropriate management measures to control and/or minimise exposures to other indicators of potential concern within DEE including NO<sub>2</sub>, PAHs, and aldehydes to ensure the risk of health effects from the mixture as a whole is adequately controlled.”* (Research Report p. 5).

Additionally, we also strongly support the recommendation for a 'Carcinogenicity Category 1A' notation for DPM given the weight of evidence from both human and animal studies indicating DEE is a lung carcinogen.

In summary, the available evidence establishes that:

- DEE is a human carcinogen known to cause lung cancer as investigated in the context of occupational exposure.
- A considerable proportion of the Australian workforce is occupationally exposed to DEE.
- A level of **10 µg REC/m<sup>3</sup> (0.01 mg REC/m<sup>3</sup>)** is an acceptable and scientifically supported standard to set until more definitive information is available (should that additional information be considered relevant) to adequately protect Australian workers in critical industries from an elevated risk of developing lung cancer.

## REFERENCES

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2 June 2023

Safe Work Australia  
Submitted via: Online consultation hub

Dear Safe Work Australia,

**Re: Consultation on a proposed Workplace Exposure Standard for diesel particulate matter – adoption of a health-based standard**

All Australians should be able to work in an environment free from harm and Lung Foundation Australia supports the submission by Cancer Council regarding the recommendation to implement a health-based workplace exposure standard (WES) for diesel engine exhaust (DEE) at **10 µg REC/m<sup>3</sup> (0.01 mg REC/m<sup>3</sup>)**.

About us

Lung Foundation Australia (LFA) is the only national charity and leading peak-body dedicated to supporting anyone with a lung disease including lung cancer. For over 31 years we have been the trusted national point-of-call for patients, their families, carers, health professionals and the general community on lung health. There are over 30 different types of lung disease currently impacting 1 in 3 Australians. Our mission is to improve lung health and reduce the impact of lung disease for all Australians. We will continue working to ensure lung health is a priority for all, from promoting lung health and early diagnosis, advocating for policy change and research investment, raising awareness about the symptoms and prevalence of lung disease, and championing equitable access to treatment and care.

Health impacts of DEE

We strongly support and commend Safe Work Australia for this work as DEE is listed as one of the 38 priority carcinogens relevant to working conditions in Australia as noted by Cancer Council<sup>i</sup>. DEE is known to cause lung cancer and current data suggested that approximately 1.2 million Australian workers are exposure to this with an estimated 4,450 lung cancer cases will be developed over the lifetime attributed to DEE<sup>ii</sup>. In Australia, DEE is the second most common carcinogen workers are exposed to and each year approximately 130 Australians are diagnosed with lung cancer caused by work-related exposure to DEE.<sup>iii</sup>

Research estimates that in 2011 (latest figures) 1.2 million Australian workers were exposed to disease exhaust in the workplace with acute and long-term exposure having a negative impact on the worker's health and wellbeing<sup>iv</sup>. It is well reported that workers who are exposed to high levels of diesel engine exhaust (DEE) have an increased risk of lung function decline and increased airway resistance<sup>v</sup>.



## Recommendations

LFA supports Cancer Council's recommendation that a WES level of **10 µg REC/m<sup>3</sup> (0.01 mg REC/m<sup>3</sup>)** would be reasonable to set until more definitive information is available (should that additional information be considered relevant). This is vital to adequately protect Australian workers in critical industries from an elevated risk of developing DEE-related lung disease, specifically lung cancer.

Furthermore, LFA supports the following recommendations:

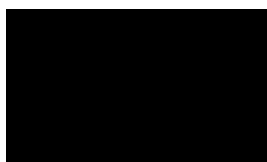
- that such a standard is applied to diesel particulate matter (DPM) from both new technology diesel engines (NTDE) and traditional diesel engines (TDE);
- that the WES for DPM is to be applied in conjunction with the WES for other components of DEE, such as nitrogen dioxide, to ensure the risk of health effects from the mixture as a whole are adequately controlled; and,
- for a 'Carcinogenicity Category 1A' notation for DPM given the weight of evidence from both human and animal studies indicating DEE is a lung carcinogen.

In addition to the proposed WES, a person conducting business or undertaking (PCBUs) / employers should implement the Hierarchy of Controls to enable workers to reduce or manage their exposure to hazardous agents such as DEE. Following this Hierarchy will assist in the management of DEE exposure.

Lastly, LFA strongly advocates for lung health, and we note the significant impacts of air pollution and the need to improve air quality. There is no safe level of air pollution and even exposure to small amounts of air pollution can cause health impacts<sup>vi</sup> as previously mentioned. The implementation of a WES for DPM will assist in the efforts to reduce air pollution.

LFA commends Safe Work Australia in undertaking this consultation to protect Australian workers and urge immediate implementation of the WES for diesel particulate matter. Like Cancer Council, we support the implementation of a health-based WES for diesel particulate matter (as measured by respirable elemental carbon) that is adopted across all Australian jurisdictions and relevant industries. We need to do more to protect our workers from avoidable health issues. Thank you for the opportunity to provide feedback in this consultation. If you would like to discuss this matter further, please contact [REDACTED]

Yours sincerely,



**Mark Brooke**

Chief Executive Officer

**Lung Foundation Australia**

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<sup>i</sup> Fernandez RC, Driscoll TR, Glass DC, Vallance D, Reid A, Benke G, et al. A priority list of occupational carcinogenic agents for preventative action in Australia. *Aust N Z J Public Health*. 2012;36(2):111-5.

<sup>ii</sup> Carey RN, Fritschi L, Driscoll TR, et al. Interventions to Reduce Future Cancer Incidence from Diesel Engine Exhaust: What Might Work? *Cancer Prev Res (Phila)*. 2019;12(1):13-20. doi:10.1158/1940-6207.CAPR-18-0274

<sup>iii</sup> Cancer Council Australia. Diesel fumes at work cause 130 lung cancer cases every year: Cancer Council Australia; 2017. Available from: <https://www.cancer.org.au/media-releases/2017/diesel-fumes-at-work-cause-130-lung-cancer-cases-every-year>

<sup>iv</sup> SafeWork Australia. 2015. *Guide to managing the risks of exposure to diesel exhaust in the workplace*. Available at: <https://www.safeworkaustralia.gov.au/system/files/documents/1702/guidance-managing-risks-exposure-diesel-exhaust-in-the-workplace.pdf>

<sup>v</sup> Ibid

<sup>vi</sup> Victoria Government. *Estimating the health costs of air pollution in Victoria*. Available at: [https://www.climatechange.vic.gov.au/\\_\\_data/assets/pdf\\_file/0022/421717/Final\\_Health-costs-of-air-pollution-in-Victoria.pdf](https://www.climatechange.vic.gov.au/__data/assets/pdf_file/0022/421717/Final_Health-costs-of-air-pollution-in-Victoria.pdf)